TRIZ

Practicum

Patent's Examples

Nota bene

Книгу «**TRIZ Practicum. Patent's Examples**»
підготовано до друку групою
«**COMCON*TRIZ & FRT Corp**»
для власних наукових та навчальних цілей.

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TRIZ

Practicum

Patent's Examples

by
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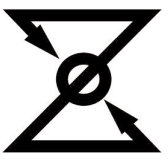

COMCON*TRIZ & FRT Corp
2012

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Introduction

У серії книг «TRIZ Practicum» представлено процеси розв'язування задач із використанням інструментів ТРИЗ.

In the series of books «TRIZ Practicum» was showed processes of solving problems with using instruments of TRIZ.

Ця книга є доповненням до серії «TRIZ Practicum».
Тут представлено тільки тексти патентів.

This book is an addition to the series «TRIZ Practicum».
Here are the text of patents only.

Заявником є «Samsung Electronics». Всі ці патенти – результат виконання практичних проектів для цієї компанії. З іншого боку ці патенти показують, що нові рішення було реалізовано на практиці і зараз вони продаються не тільки у Південній Кореї, але також в Євросоюзі, США, Японії, Китаї...

The applicant is «Samsung Electronics». All of these patents – it is the result of the implementation of practical projects for this company. On the other hand, these patents show that the new solutions have been implemented in practice, and now they are sold not only in South Korea but also in the European Union, USA, Japan, China...

В даному випадку дуже важливо, що всі технічні рішення, які показані тут, отримано із використанням інструментів ТРИЗ, перш за все – АРИЗ-85В.

In this case, it is important that all the technical solutions, which are shown here, were obtained with the use of TRIZ instruments, primarily – ARIZ-85V.

Наша подяка сайту http://patentsearch.jp/ за надання вільного доступу до текстів патентів, розміщених у цій книзі.

Our thanks to the site http://patentsearch.jp/ for providing free access to the texts of patents, which placed in this book.

Винахідник, автор рішень для цих патентів – Олександр Теодор Нарбут, Майстер ТРИЗ за списком Г.С.Альтшуллера, доктор фізико-математичних наук, професор.

The inventor, autor of the solutions for this patents is Alexander Theodor Narbut, TRIZ Master by G.S.Altshuller, Doctor Sc., Professor.

Але процес у практичних проектах – це завжди «командна робота».

From right to left: QChan Jun, V.A.Leniashin, V.S.Cherniak, A.Th.Narbut, V.J.Krasnoslobodsev, Dong-Lyoul Shin, G.A.Severinets. Suwon, South Korea, April, 2002.

But process of the practice projects – it's «team's work» always.

На цьому знімку – інженери-винахідники, разом із якими обговорювалися та виконувалися всі ці проекти.

In this photo – engineers-inventors, with whom discussed and implemented all these projects.

* * *

* * *

«Бонусний додаток» до цієї книги – тексти патентів (точніше – авторських свідоцтв).

From right to left: R.B.Shapiro, G.S.Altshuller, V.N.Zhuravliova. Baku, Azerbaijan, (former USSR), 1959. (Photo from site altshuller.ru)

«The bonus addition» to this book – the texts of five patents (or rather – author's certificates).

Г.С.Альтшуллер та Р.Б.Шапіро отримали ці рішення тоді, коли реалізація ТРИЗ тільки починалася...

G.S.Altshuller and R.B.Shapiro make these solutions when the implementation of TRIZ just begun ...

Наша подяка сайту http://patentdb.su/ за надання вільного доступу до текстів цих авторських свідоцтв.

Our thanks to the site http://patentdb.su/ for providing free access to the texts of these author's certificates.

Редактори.

Editors.

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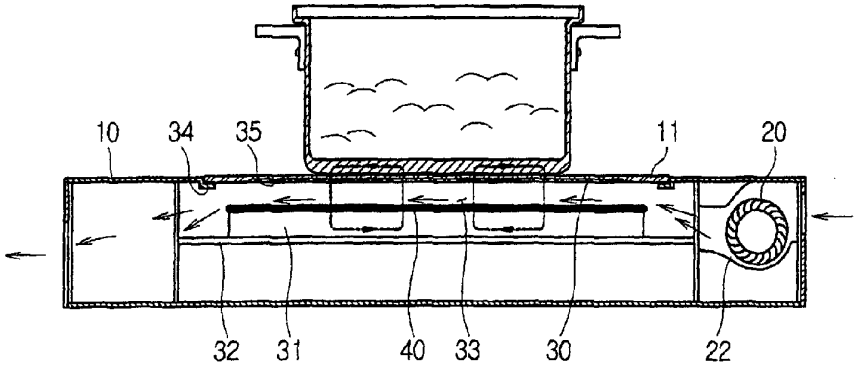
(54) Composite cooking Apparatus

(57) A composite cooking apparatus having a body (10), a heating unit (30), and an induction heating unit (40). The heating unit (30) is positioned in the body to generate heat used to heat food. The induction heating (40) unit is positioned adjacent to the heating unit (30) to generate a magnetic field to cook the food by induction heating. The induction heating unit (40) has at least one wire (41), a coating (51) of which is exposed to an electron beam to strengthen a heat resistance thereof.

FIG 2



EP 1 536 670 A1

Description

[0001] The present invention relates, in general, to composite cooking apparatuses, and more particularly, to a composite cooking apparatus that radiates electron beams to coatings of element wires forming a work coil, which is an induction heating unit, thus strengthening heat resistance.

[0002] Generally, an electronic cooking apparatus that performs cooking using electromagnetic induction heating applies a magnetic force to a cooking container, and then performs cooking using heat generated from the cooking container due to the applied magnetic force. The electronic cooking apparatus generates heat using a magnetic field, so that it may perform cooking without generating air pollution. Further, the electronic cooking apparatus typically has thermal efficiency of about 80% or above, so that it is an excellent cooking machine in an aspect of energy efficiency.

[0003] A conventional electronic cooking apparatus typically includes a work coil, to which a current is supplied to generate a magnetic field, an upper plate placed on the work coil to allow a cooking container to be seated thereon, and a ferrite plate placed below the work coil to allow lines of a magnetic force to pass therethrough.

[0004] In the conventional electronic cooking apparatus having the above construction, when a current is supplied to the work coil, a magnetic field is formed around the work coil. At this time, magnetic force lines forming the magnetic field form a closed loop that connects the upper plate, an inside of a bottom of the iron cooking container and the ferrite plate.

[0005] When the magnetic force lines formed in this way pass through the inside of the bottom of the iron cooking container, an eddy current is generated in the cooking container, and heat is generated from the iron cooking container by an electrical resistance as the eddy current flows. Further, the heat generated from the iron cooking container is transmitted to food placed in the cooking container, and thus the food is cooked.

[0006] However, the conventional electronic cooking apparatus is problematic in that it performs cooking in an induction heating manner, so that only an iron container capable of executing induction heating can be used as a cooking container, and a non-iron container cannot be used as a cooking container.

[0007] Further, the conventional electronic cooking apparatus is problematic in that, when cooking is performed using only a work coil, a cooking time lengthens if an amount of food increases, so that the electronic cooking apparatus is not suitable for cooking a large amount of food.

[0008] According to the present invention there is provided an apparatus and method as set forth in the appended claims. Preferred features of the invention will be apparent from the dependent claims, and the description which follows.

[0009] Accordingly, the present invention provides a composite cooking apparatus, which cooks by directly generating heat through a heating unit as well as by generating heat using induction heating, thus performing cooking regardless of materials of a cooking container.

[0010] According to another aspect the present invention provides a composite cooking apparatus, which simultaneously drives an induction heating unit and a heating unit when a large amount of food is cooked, thus quickly performing cooking.

[0011] In a further aspect the present invention provides a composite cooking apparatus having a heating unit and an induction heating unit with a work coil having a wire, in which a coating of the wire is radiated with electron beams to strengthen a heat resistance of the induction heating unit, to prevent the induction heating unit from being damaged due to heat generated from the heating unit.

[0012] Additional aspects and/or advantages of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

[0013] In one aspect of the present invention there is provided a composite cooking apparatus, including a body, a heating unit positioned in the body to generate heat used to heat food, and an induction heating unit positioned adjacent to the heating unit to generate a magnetic field to cook the food by induction heating, the induction heating unit having at least one wire, a coating of which is exposed to an electron beam to strengthen heat resistance thereof. The coating may have been exposed to an electron beam during manufacture.

[0014] According to another aspect of the invention there is provided a method of manufacturing a wire of an induction heating unit, the method comprising exposing a coating of the wire to an electron beam to strengthen heat resistance thereof.

[0015] For a better understanding of the invention, and to show how embodiments of the same may be carried into effect, reference will now be made, by way of example, to the accompanying diagrammatic drawings in which:

FIG. 1 is a perspective view showing an external shape of a composite cooking apparatus, according to an embodiment of the present invention;

FIG. 2 is a sectional view taken along line II - II of FIG. 1;

FIG. 3 is a sectional view showing a work coil of the composite cooking apparatus of FIG. 1; and

FIG. 4 is a front view showing an element wire (magnet wire) forming the work coil of the composite cooking apparatus of FIG. 1.

[0016] Reference will now be made in detail to the embodiments of the present invention, examples of which

are illustrated in the accompanying drawings, wherein like reference numerals refer to the like elements throughout. The embodiments are described below to explain the present invention by referring to the figures.

[0017] As is shown in FIG. 1, a composite cooking apparatus, according to an embodiment of the present invention, includes a body 10 and heat resisting plates 11 placed on a portion of a top surface of the body 10 to allow various cooking containers to be seated thereon. An input unit 13 is placed on a center of a front surface of the body 10 to input operation commands to the composite cooking apparatus. Inlets 12 are positioned in opposite sides of the input unit 13 to draw air used to disperse heat generated from a planar heating element (30 of FIG. 2), which will be described later, by allowing the air to move under the planar heating element (30 of FIG. 2).

[0018] A cylindrical blowing fan 20 is located in a front portion of an inside of the body 10 to compulsorily blow air drawn through the inlets 12 under the planar heating element (30 of FIG. 2). A fan motor 21 is provided at an end of the blowing fan 20 to rotate the blowing fan 20. Outlets 14 are positioned in a rear surface of the body 10 to discharge air flowing under the planar heating element (30 of FIG. 2) to an outside of the body 10. An auxiliary cabinet 15, in which a receiving space is formed, is placed below the body 10.

[0019] The composite cooking apparatus of the present invention, constructed as shown in FIG. 2, is provided with the planar heating element 30, positioned below the heat resisting plate 11 while coming into contact with the heat resisting plate 11. The planar heating element 30 is a product, in which high-technology ceramic materials composed of fine particles, and conductive special carbon particles are uniformly distributed on fiber fabric, and which has a uniform heating density and a low power consumption.

[0020] When a current is supplied to the planar heating element 30, heat is generated from the planar heating element 30 and food is heated by the heat. In this way, the planar heating element 30 performs cooking by directly heating a cooking container. The planar heating element 30 is inserted into a groove 35 positioned in a central lower portion of the heat resisting plate 11, which is seated on top of fixing members 34.

[0021] A work coil 40 is placed below the planar heating element 30, spaced apart from the planar heating element 30 by a predetermined distance. In this case, the work coil 40 is formed in a shape in which a Litz wire 41 (see FIG. 3) is wound in a spiral form. Magnetic force lines generated from the work coil 40 pass through an inside of a bottom of the cooking container via the heat resisting plate 11.

[0022] If variations occur in the magnetic force lines passing through the cooking container, a large amount of eddy current is generated inside a bottom of the cooking container, and heat is generated due to an electrical resistance of the cooking container to the eddy current. In this way, the work coil 40 cooks food in an induction heating manner. Because the eddy current should be generated to cook food in the induction heating manner, it is not possible to perform cooking in the induction heating manner with a cooking container made of a non-iron material, because it is incapable of generating the eddy current.

[0023] A ferrite plate 31 is positioned below the work coil 40 while coming into contact with the work coil 40. Ferrite is a solid solution, in which impurities melt in iron having a body-centered cubic crystal structure, and which functions to shield the magnetic force lines generated from the work coil 40 by allowing the magnetic force lines to pass through the ferrite. Therefore, the magnetic force lines generated from the work coil 40 form a loop passing through the ferrite plate 31 placed below the work coil 40 after passing through the inside of the bottom of the cooking container via the heat resisting plate 11. A support 32 is placed below the ferrite plate 31 to support both the work coil 40 and the ferrite plate 31.

[0024] As noted previously, the planar heating element 30 and the work coil 40 are spaced apart from each other by the predetermined distance, so that an air insulating layer is formed in a space therebetween. In this case, to further improve an insulating effect, air is compulsorily moved through the air insulating layer. Therefore, according to one aspect, the air insulating layer is mainly used as an air moving path 33.

[0025] According to one aspect, the blowing fan 20 is placed on a right side of the air moving path 33 (as is shown in FIG. 2), to compulsorily blow air into the air moving path 33. According to one aspect, the blowing fan 20 is a multi-blade cross-flow fan, which provides air drawn through the inlets 12 to the air moving path 33. An air guiding member 22 is positioned around the blowing fan 20 to guide air blown by the blowing fan 20 to the air moving path 33.

[0026] As is shown in FIGS. 3 and 4, the work coil 40 of the composite cooking apparatus of the present invention is formed so that the Litz wire 41 is arranged in the spiral form. The Litz wire 41 is formed by binding a plurality of element wires (magnet wires) 50, in which copper wires or aluminum wires with high electrical conductivity are applied with coatings formed at high temperatures.

[0027] Further, each of the element wires 50 of the Litz wire 41 used in the composite cooking apparatus is manufactured in such a way that an inner conductor 52 is covered with a coating 51 made of a high molecular weight compound (for example, polyester) and then an electron beam is radiated onto the coating 51. When the electron beam is radiated onto the coating 51, a molecular structure of the coating 51 is changed from an initial linear structure to a mesh structure by a cross linkage phenomenon.

[0028] In the cross linkage phenomenon, chemical bonds are formed as in the case where a bridge is

placed between any two atoms of a plurality of linearly bound atoms. In this case, covalent bonds are generally formed.

[0029] A high molecular weight compound forming chemical bonds by the cross linkage forms a three-dimensional mesh structure. There are at least two methods of: adding a crosslinking agent, and radiating an electron beam.

[0030] If the coating 51 of each of the element wires 50 is changed to a mesh structure due to the radiation of the electron beam, mechanical characteristics, heat resistance, chemical resistance, internal stress resistance, and the like are improved compared to the coating with the initial linear structure. Therefore, if the electron beam is radiated onto the coating 51 of each of the element wires 50 forming the work coil 40, to prevent the work coil 40 from being damaged due to the heat generated from the planar heating element 30, an internal structure of the coating 51 is changed to strengthen heat resistance, thus effectively isolating radiation heat transmitted to the work coil 40 without installing a separate insulating plate.

[0031] According to one aspect, the element wires 50 of the work coil 40 used in the present invention are manufactured so that the coatings 51 of the element wires 50, onto which electron beams are radiated and which are made of high molecular weight compounds, are covered with magnetic viscosity layers (not shown). Viscosity of the magnetic viscosity layers is low at normal temperatures, and increases if the temperature increases above a predetermined level, so that bonds between the element wires 50 forming the Litz wire 41 are secured.

[0032] Hereinafter, an operation of the composite cooking apparatus of the present invention is described.

[0033] A user places a cooking container on the heat resisting plate 11 and then inputs an operation command to the composite cooking apparatus through the input unit 13. The operation command is then transmitted to a control unit (not shown). The control unit analyzes the operation command and then determines which of the planar heating element 30 and the work coil 40 to supply with a current.

[0034] If the input operation command requires operations of both the planar heating element 30 and the work coil 40, the control unit controls an inverter (not shown) to supply a current to both the planar heating element 30 and the work coil 40.

[0035] When the current is supplied to the planar heating element 30, a temperature of approximately 500°C or greater is generated from the planar heating element 30 due to a resistance thereof. The resulting heat is transmitted to the cooking container placed on the heat resisting plate 11.

[0036] When a high-frequency current is supplied to the work coil 40, a magnetic field is formed around the work coil 40, so that an eddy current is formed in the cooking container due to the magnetic field. The eddy current generates heat according to an electrical resistance while passing through the cooking container. In this way, the heat generated from both the planar heating element 30 and the work coil 40 is transmitted to cook food.

[0037] A part of the heat generated from the planar heating element 30 is transmitted downward from the planar heating element 30 in a heat transmission manner using radiation. The heat emitted downward from the planar heating element 30 reaches the work coil 40. The bonds between the respective element wires 50 of the Litz wire 41 forming the work coil 40 are further secured due to the radiation of electron beams thereby strengthening heat resistance of the work coil 40. Thus, the work coil 40 is safely protected against the heat generated from the planar heating element 30.

[0038] While power is supplied to the planar heating element 30, the control unit moves air through the air moving path 33 by rotating the blowing fan 20, thus obtaining a superior heat isolating effect.

[0039] If sufficient heat is applied to the food and then the cooking has been completed, an OFF command is input by the user, and the controller receives the OFF command to shut off power supplied to both the planar heating element 30 and the work coil 40, thus terminating the cooking operation.

[0040] Through the above process, the operation of the present invention is terminated.

[0041] As is apparent from the above description, the present invention provides a composite cooking apparatus that cooks food by directly generating heat through a heating unit as well as by generating heat using induction heating, thus performing cooking regardless of the materials of a cooking container and quickly cooking a large amount of food.

[0042] Further, the present invention is advantageous in that it radiates electron beams to coatings of element wires forming a work coil, which is an induction heating unit, to strengthen heat resistance of the coatings, thus preventing the induction heating unit from being damaged due to heat generated from a heating unit without installing a separate insulating plate.

[0043] Although a few preferred embodiments have been shown and described, it will be appreciated by those skilled in the art that various changes and modifications might be made without departing from the scope of the invention, as defined in the appended claims.

[0044] Attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

[0045] All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination,

except combinations where at least some of such features and/or steps are mutually exclusive.

[0046] Each feature disclosed in this specification (including any accompanying claims, abstract and drawings) may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

[0047] The invention is not restricted to the details of the foregoing embodiment (s). The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

Claims

1. A composite cooking apparatus, comprising:

   a body (10);
   a heating unit (30) positioned in the body (10) to generate heat used to heat food; and
   an induction heating unit (40) positioned adjacent to the heating unit (30) to generate a magnetic field to cook the food by induction heating, the induction heating unit (40) having at least one wire (41), a coating (51) of which is exposed to an electron beam to strengthen a heat resistance thereof.

2. The composite cooking apparatus according to claim 1,
   wherein when the coating (51) is exposed to the electron beam, a molecular structure of the coating (51) is changed, to strengthen the heat resistance thereof.

3. The composite cooking apparatus according to claim 2,
   wherein the molecular structure of the coating (51) is changed from an initial linear structure to a mesh structure after the coating (51) is exposed to the electron beam.

4. The composite cooking apparatus according to any preceding claim, wherein the induction heating unit (40) is wound in a spiral.

5. The composite cooking apparatus according to any preceding claim, wherein the at least one wire (41) comprises a magnetic viscosity layer.

6. A composite cooking apparatus, comprising:

   a body (10) ;
   a heating element (30) placed in the body (10) to generate heat used to heat food; and
   a work coil (40) placed below the heating element (30) to generate a magnetic field to cook the food by induction heating, the work coil (40) being provided with a coating (51), which is exposed to an electron beam to strengthen a heat resistance thereof.

7. The composite cooking apparatus according to claim 6,
   wherein when the coating (51) of the work coil (40) is exposed to the electron beam, a molecular structure of the coating (51) is changed, to strengthen the heat resistance thereof.

8. The composite cooking apparatus according to claim 7,
   wherein the molecular structure of the coating (51) is changed from an initial linear structure to a mesh structure after the coating (51) is exposed to the electron beam.

9. The composite cooking apparatus according to claim 6, claim 7 or claim 8, wherein the work coil (40) is wound in a spiral.

10. A composite cooking apparatus, comprising:

    a first heating unit (30) generating heat transferred to a cooking container; and
    a second heating unit (40), comprising a wire (41) with a coating (51) exposed to an electron beam to strengthen a heat resistance of the coating (51), and selectively generating a magnetic field, magnetic force lines of which pass through a bottom of the cooking container.

11. The composite cooking apparatus according to claim 10,
    wherein:

    the second heating unit (40) is adjacent to the first heating unit (30) and separated from the first heating unit (30) by a predetermined space; and
    the composite cooking apparatus further comprises a fan (20) moving air through the predetermined space.

12. The composite cooking apparatus according to claim 11, further comprising:

    a body (10) having an inlet (12) and an outlet (14),

    wherein an air moving path (33) is defined between inlet (12) and the outlet (14) to guide air moved by

the fan (20), and includes the predetermined space.

13. The composite cooking apparatus according to any one of claims 10 to 12, wherein when the coating (51) is exposed to the electron beam, linearly bound atoms of the coating (51) form covalent bonds therebetween.

14. The composite cooking apparatus according to any one of claims 10 to 13, wherein the induction heating unit (40) comprises a Litz wire (41) wound in a spiral.

15. A composite cooking apparatus, comprising:

a body (10) having a cooking surface and air inlets (12) and outlets (14) defining respective ends of an air moving path (33);
a heat resisting plate (11) disposed on the cooking surface;
a planar heating element (30), contacting the heat resisting plate (11), and comprising a fiber fabric having finely particulated ceramic materials and conductive carbon particles uniformly distributed thereon;
an induction heating unit (40) adjacent to the planar heating element (30) and separated from the heating element (30) by a predetermined space, the induction unit (40) comprising a wire (41) with a coating (51) exposed to an electron beam to strengthen a heat resistance thereof; and
a fan (20) forcing air through the air moving path (33), the predetermined space being included in the air moving path (33).

16. A composite cooking apparatus, comprising:

a conduction heating unit (30); and
an induction heating unit (40), the conduction and
induction heating units (30,40) being driven simultaneously to speed cooking.

17. An induction heating unit (40) of a composite cooking apparatus having a conduction heating unit (30), the induction heating unit (40) comprising:

at least one wire (41) with a coating (51) exposed to an electron beam to strengthen a heat resistance thereof.

FIG 1

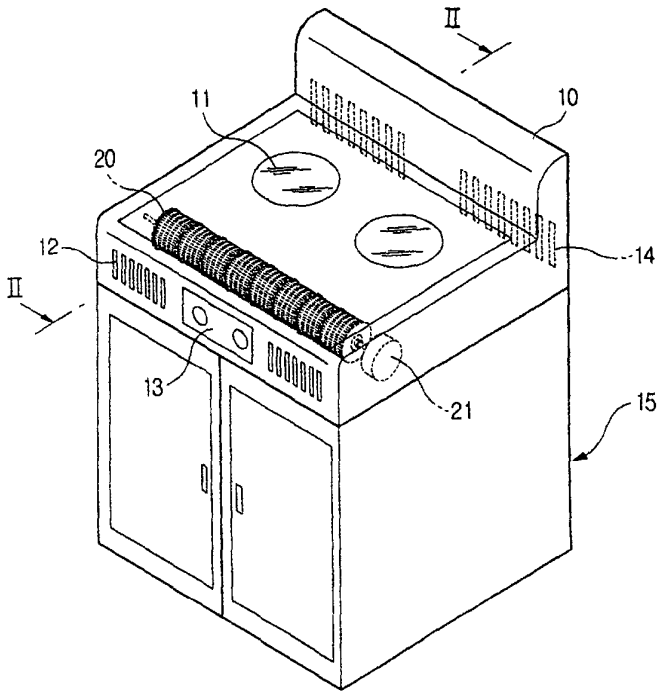


FIG 2

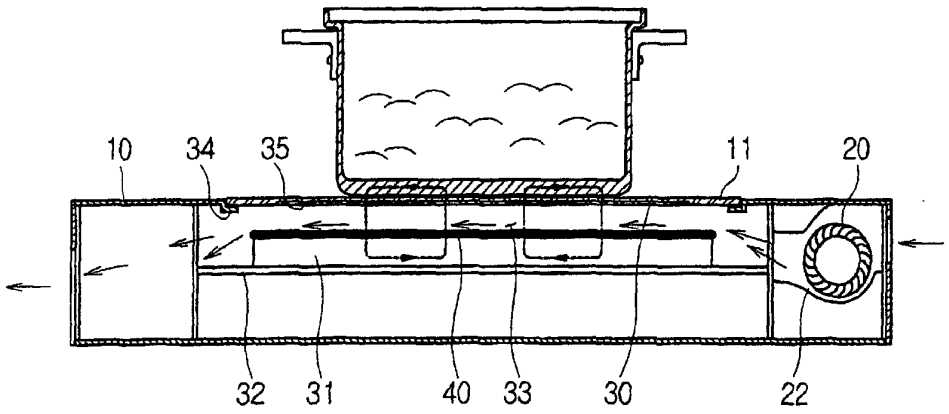


FIG 3

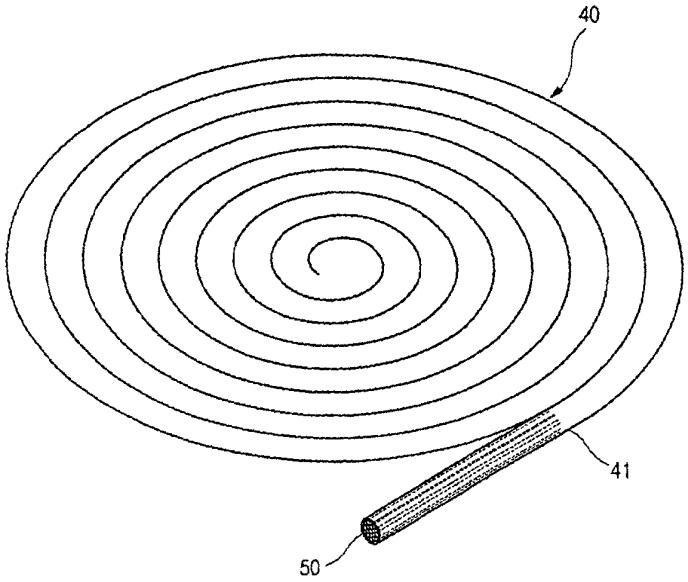
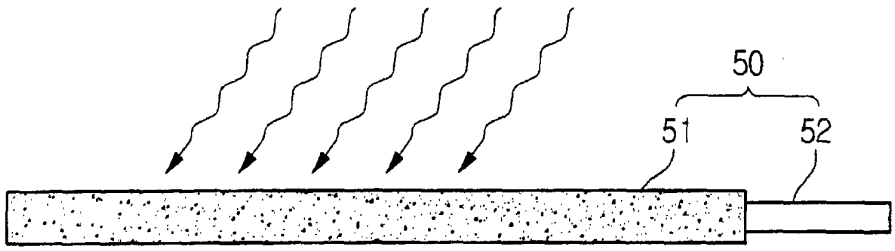


FIG 4



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 25 3654

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X Y	DE 195 00 448 A (EGO ELEKTRO BLANC & FISCHER) 11 July 1996 (1996-07-11) * abstract * * column 1, lines 56-61 * * column 2, lines 14-20 * * column 4, lines 3-31 * * claims 1-5 * * figures 1-8 * -----	16 1-15,17	H05B6/12 H05B3/74
Y	WO 96/27887 A (HUBER & SUHNER AG ; GIELENZ GERHARD (CH)) 12 September 1996 (1996-09-12) * abstract * * page 1, lines 3-13 * -----	1-15,17	
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A	FR 2 763 201 A (AEG HAUSGERAETE GMBH) 13 November 1998 (1998-11-13) * abstract * * page 3, lines 17-20 * * claim 1 * * figures 1-5 * -----	1-17	TECHNICAL FIELDS SEARCHED (Int.Cl.7) H05B H01B C08K

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	2 December 2004	DE LA TASSA LAFORGUE

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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L : document cited for other reasons

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1

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 04 25 3654

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02-12-2004

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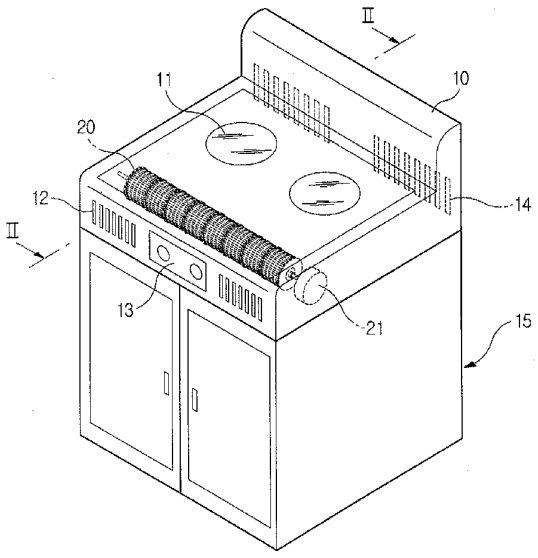
(54) Composite cooking apparatus

(57) A composite cooking apparatus having a body (10), a heating unit (30), an induction heating unit (50), and an insulating plate (40). The heating unit (30) is positioned in the body (10) to generate heat used to heat food. The induction heating unit (50) is positioned adjacent to the heating unit (30) to generate a magnetic field to cook the food by induction heating. The insulating plate (40) is positioned between the heating unit (30) and the induction heating unit (50) to prevent heat generated from the heating unit (30) from being transmitted to the induction heating unit (50). Further, the insulating plate (40) is provided with at least one heat reflecting layer (41) to reflect the heat generated from the heating unit (30).

FIG 1



EP 1 536 669 A2

Description

[0001] The present invention relates, in general, to composite cooking apparatuses, and more particularly, to a composite cooking apparatus that includes an insulating plate with a heat reflecting layer formed thereon is installed between a planar heating element and a work coil, thus improving an insulating effect.

[0002] Generally, an electronic cooking apparatus that performs cooking using electromagnetic induction heating applies a magnetic force to a cooking container, and then performs cooking using heat generated from the cooking container due to the applied magnetic force. The electronic cooking apparatus generates heat using a magnetic field, so that it may perform cooking without generating air pollution. Further, the electronic cooking apparatus typically has thermal efficiency of about 80% or above, so that it is an excellent cooking machine in an aspect of energy efficiency.

[0003] A conventional electronic cooking apparatus typically includes a work coil, to which a current is supplied to generate a magnetic field, an upper plate placed on the work coil to allow a cooking container to be seated thereon, and a ferrite plate placed below the work coil to allow lines of a magnetic force to pass therethrough.

[0004] In the conventional electronic cooking apparatus having the above construction, when a current is supplied to the work coil, a magnetic field is formed around the work coil. At this time, magnetic force lines forming the magnetic field form a closed loop that connects the upper plate, an inside of a bottom of the iron cooking container and the ferrite plate.

[0005] When the magnetic force lines formed in this way pass through the inside of the bottom of the iron cooking container, an eddy current is generated in the cooking container, and heat is generated from the iron cooking container by an electrical resistance as the eddy current flows. Further, the heat generated from the iron cooking container is transmitted to food placed in the cooking container, and thus the food is cooked.

[0006] However, the conventional electronic cooking apparatus is problematic in that it performs cooking in an induction heating manner, so that only an iron container capable of executing induction heating can be used as a cooking container, and a non-iron container cannot be used as a cooking container.

[0007] Further, the conventional electronic cooking apparatus is problematic in that, when cooking is performed using only a work coil, a cooking time lengthens if an amount of food increases, so that the electronic cooking apparatus is not suitable for cooking a large amount of food.

[0008] According to the present invention there is provided an apparatus and method as set forth in the appended claims. Preferred features of the invention will be apparent from the dependent claims, and the description which follows.

[0009] Accordingly, the present invention provides a composite cooking apparatus that cooks by directly generating heat through a heating unit as well as by generating heat using induction heating, thus performing cooking regardless of materials of a cooking container.

[0010] The present invention provides a composite cooking apparatus, which simultaneously drives an induction heating unit and a heating unit when a large amount of food is cooked, thus quickly performing cooking.

[0011] The present invention provides a composite cooking apparatus, in which a heat reflecting layer is positioned on an insulating plate to prevent the induction heating unit from being damaged due to heat generated from the heating unit, thus improving an insulating effect.

[0012] Additional aspects and/or advantages of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

[0013] In one aspect of the present invention there is provided a composite cooking apparatus, including a body, a heating unit positioned in the body to generate heat used to heat food, an induction heating unit positioned adjacent to the heating unit to generate a magnetic field used to cook the food by induction heating, and an insulating plate positioned between the heating unit and the induction heating unit to prevent heat generated from the heating unit from being transmitted to the induction heating unit.

[0014] In another aspect of the present invention there is provided a composite cooking apparatus, including a body, a heating element placed in the body to generate heat used to heat food, a work coil disposed in the body to generate a magnetic field to cook the food by induction heating, an insulating plate disposed adjacent to the heating element to prevent heat generated from the heating element from being transmitted to the work coil, and a blowing fan to compulsorily move air through an air moving path positioned between the insulating plate and the work coil.

[0015] For a better understanding of the invention, and to show how embodiments of the same may be carried into effect, reference will now be made, by way of example, to the accompanying diagrammatic drawings in which:

FIG. 1 is a perspective view showing an external shape of a composite cooking apparatus, according to an embodiment of the present invention;

FIG. 2 is a sectional view taken along line II - II of FIG. 1; and

FIG. 3 is a sectional view showing an insulating plate of the composite cooking apparatus of FIG. 1.

[0016] Reference will now be made in detail to the embodiments of the present invention, examples of which

are illustrated in the accompanying drawings, wherein like reference numerals refer to the like elements throughout. The embodiments are described below to explain the present invention by referring to the figures.

[0017] As is shown in FIG. 1, a composite cooking apparatus, according to an embodiment of the present invention, includes a body 10 and heat resisting plates 11 placed on a portion of a top surface of the body 10 to allow various cooking containers to be seated thereon. An input unit 13 is placed on a center of a front surface of the body 10 to input operation commands to the composite cooking apparatus. Inlets 12 are positioned in opposite sides of the input unit 13 to draw air used to disperse heat generated from a planar heating element (30 of FIG. 2), which will be described later, by allowing the air to move under an insulating plate (40 of FIG. 2), which will be described later.

[0018] A cylindrical blowing fan 20 is located in a front portion of an inside of the body 10 to compulsorily blow air drawn through the inlets 12 under the insulating plate (40 of FIG. 2). A fan motor 21 is provided at an end of the blowing fan 20 to rotate the blowing fan 20.

[0019] Outlets 14 are positioned in a rear surface of the body 10 to discharge air flowing under the insulating plate (40 of FIG. 2) to an outside of the body 10. An auxiliary cabinet 15, in which a receiving space is formed, is placed below the body 10.

[0020] The composite cooking apparatus of the present invention, constructed as shown in FIG. 2, is provided with the planar heating element 30, positioned below the heat resisting plate 11 while coming into contact with the heat resisting plate 11. The planar heating element 30 is a product, in which high-technology ceramic materials composed of fine particles, and conductive special carbon particles are uniformly distributed on fiber fabric, and which has a uniform heating density and a low power consumption.

[0021] When a current is supplied to the planar heating element 30, heat is generated from the planar heating element 30 and food is heated by the heat. In this way, the planar heating element 30 performs cooking by directly heating a cooking container.

[0022] The insulating plate 40 is placed below the planar heating element 30 to prevent the heat generated from the planar heating element 30 from being transmitted to a work coil 50, which will be described later. According to one aspect, the insulating plate 40 contacts the planar heating element 30. According to another aspect, the insulating plate 40 is spaced apart from the planar heating element 30 by a predetermined distance to improve an insulating effect. In this case, a spaced interval may be arbitrarily set in consideration of thermal efficiency and the insulating effect.

[0023] The insulating plate 40 is inserted into fixing members 34 extended from the top surface of the body 10. The planar heating element 30 is inserted into a groove 35 positioned in a central lower portion of the heat resisting plate 11, which is seated on tops of the fixing members 34.

[0024] The work coil 50 is placed below the insulating plate 40, spaced apart from the insulating plate 40 by a predetermined distance. In this case, the work coil 50 is formed in a shape in which a Litz wire is wound in a spiral form. Magnetic force lines generated from the work coil 50 pass through an inside of a bottom of the cooking container via the insulating plate 40 and the heat resisting plate 11.

[0025] A large amount of eddy current is generated inside the bottom of the cooking container due to the magnetic force lines, and heat is generated by an electrical resistance of the cooking container to the eddy current. In this way, the work coil 50 cooks food in an induction heating manner. Because the eddy current should be generated to cook food in the induction heating manner, it is not possible to perform cooking in the induction heating manner with a non-iron cooking container incapable of generating the eddy current.

[0026] A ferrite plate 31 is positioned below the work coil 50 while coming into contact with the work coil 50. Ferrite is a solid solution, in which impurities melt in iron having a body-centered cubic crystal structure, and which functions to shield the magnetic force lines generated from the work coil 50 by allowing the magnetic force lines to pass through the ferrite. Therefore, the magnetic force lines generated from the work coil 50 form a loop passing through the ferrite plate 31 placed below the work coil 50 after passing through the inside of the bottom of the cooking container via the insulating plate 40 and the heat resisting plate 11. A support 32 is placed below the ferrite plate 31 to support both the work coil 50 and the ferrite plate 31.

[0027] As noted previously, the insulating plate 40 and the work coil 50 are spaced apart from each other by the predetermined distance, so that an air insulating layer is formed in a space therebetween. In this case, to further improve an insulating effect, air is compulsorily moved through the air insulating layer. Therefore, according to one aspect the air insulating layer is mainly used as an air moving path 33.

[0028] According to one aspect the blowing fan 20 is placed on a right side of the air moving path 33 (as shown in FIG. 2), to compulsorily blow air into the air moving path 33. According to one aspect the blowing fan 20 is a multi-blade cross-flow fan, which provides air drawn through the inlets 12 to the air moving path 33. An air guiding member 22 is positioned around the blowing fan 20 to guide air blown by the blowing fan 20 to the air moving path 33.

[0029] As is shown in FIG. 3, the insulating plate 40 includes a base plate 42 and a heat reflecting layer 41 coated on a top surface of the base plate 42. Further, the insulating plate 40 is installed to be spaced apart from the planar heating element 30 by a predetermined distance d to effectively isolate heat transmitted from the planar heating element 30 by heat conduction.

[0030] According to one aspect, the base plate 42 of

the insulating plate 40 is made of a packing-type insulating material. According to one aspect, the packing-type insulating material has air bubbles. According to another aspect, the packing-type insulating material is made of glass fiber containing asbestos fiber. According to yet another aspect, the packing-type insulating material is made of fireproof brick. According to another aspect, the base plate 42 is made of a material in which boron nitride is added to heat resisting plastic.

[0031] According to one aspect, a material with excellent heat reflectance is coated on the heat reflecting layer 41. Therefore, a material, such as a ceramic film, an aluminum oxide (Al203), or a beryllium oxide (BEO), may be used for the heat reflecting layer 41. A ceramic is an inorganic non-metal material made through heat-processing at high temperatures, and has high surface luminance, excellent heat resistance and excellent rub resistance. Therefore, when radiation heat generated from the planar heating element 30 comes into contact with the ceramic film coated on the insulating plate 40, the radiation heat is reflected due to the high surface luminance, so that it may be expected that the insulating effect be improved.

[0032] The aluminum oxide and the beryllium oxide are materials with high infrared reflectance. Even though the radiation heat generated from the planar heating element 30 is emitted in an infrared ray form, the radiation heat is reflected from an aluminum oxide layer or a beryllium oxide layer formed on the insulating plate 40, so that the heat is scarcely transmitted to the work coil 50. Moreover, infrared rays reflected from the aluminum oxide layer or the beryllium oxide layer are directed again to the cooking container. Therefore, although a same amount of energy is supplied, heat reaching the cooking container increases compared to a case where the aluminum oxide layer or the beryllium oxide layer is not used, thus obtaining additional effect, such as improvement of energy efficiency.

[0033] In this way, if the heat reflecting layer is positioned on the insulating plate, radiation heat is reflected close to total reflection even though the radiation heat is emitted from the planar heating element 30 at high temperatures (typically, 500°C or above), thus obtaining a considerable insulating effect.

[0034] One of the ceramic film, the aluminum oxide layer and the beryllium oxide layer having high heat reflectance may be coated on the base plate 42. But according to one aspect, to obtain a superior insulating effect, a heat resisting plastic layer may be coated on the base plate 42 and a ceramic film layer may be positioned on the heat resisting plastic layer.

[0035] Further, it is also possible to coat a ceramic film layer on the base plate 42, and form either an aluminum oxide layer or a beryllium oxide layer on the ceramic film layer.

[0036] Hereinafter, an operation of the composite cooking apparatus of the present invention is described.

[0037] A user places a cooking container on the heat resisting plate 11 and then inputs an operation command to the composite cooking apparatus through the input unit 13. The operation command is then transmitted to a control unit (not shown). The control unit analyzes the operation command and then determines which of the planar heating element 30 and the work coil 50 to supply with a current.

[0038] If the input operation command requires operations of both the planar heating element 30 and the work coil 50, the control unit controls an inverter (not shown) to supply a current to both the planar heating element 30 and the work coil 50.

[0039] When the current is supplied to the planar heating element 30, a temperature of approximately 500°C or greater is generated from the planar heating element 30 due to a resistance thereof. The resulting heat is transmitted to the cooking container placed on the heat resisting plate 11.

[0040] When a high-frequency current is supplied to the work coil 50, a magnetic field is formed around the work coil 50, so that an eddy current is formed in the cooking container due to the magnetic field. The eddy current generates heat according to an electrical resistance while passing through the cooking container. In this way, the heat generated from both the planar heating element 30 and the work coil 50 is transmitted to cook food.

[0041] A part of the heat generated from the planar heating element 30 is transmitted downward from the planar heating element 30 in a heat transmission manner using radiation. Heat radiant rays emitted downward from the planar heating element 30 reach the heat reflecting layer 41 of the insulating plate 40, and are reflected from the heat reflecting layer 41 directed upward from the insulating plate 40. Therefore, an insulating effect is further improved compared to a typical insulating plate.

[0042] While power is supplied to the planar heating element 30, the control unit moves air through the air moving path 33 by rotating the blowing fan 20, thus obtaining a superior heat isolating effect.

[0043] If sufficient heat is applied to the food and then the cooking has been completed, an OFF command is input by the user, and the controller receives the OFF command to shut off power supplied to both the planar heating element 30 and the work coil 50, thus terminating the cooking operation.

[0044] Through the above process, the operation of the present invention is terminated.

[0045] As is apparent from the above description, the present invention provides a composite cooking apparatus that cooks food by directly generating heat through a heating unit as well as by generating heat using induction heating, thus performing cooking regardless of the materials of a cooking container and quickly cooking a large amount of food.

[0046] Further, the present invention is advantageous in that a heat reflecting layer is formed on an insulating

plate, thus preventing an induction heating unit from being damaged due to heat generated from a heating unit.

[0047] Although a few preferred embodiments have been shown and described, it will be appreciated by those skilled in the art that various changes and modifications might be made without departing from the scope of the invention, as defined in the appended claims.

[0048] Attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

[0049] All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

[0050] Each feature disclosed in this specification (including any accompanying claims, abstract and drawings) may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

[0051] The invention is not restricted to the details of the foregoing embodiment(s). The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

Claims

1. A composite cooking apparatus, comprising:

   a body (10);
   a heating unit (30) positioned in the body (10) to generate heat used to heat food;
   an induction heating unit (50) positioned adjacent to the heating unit (30) to generate a magnetic field to cook the food by induction heating; and
   an insulating plate positioned between the heating unit (30) and the induction heating unit (50) to prevent heat generated from the heating unit (30) from being transmitted to the induction heating unit (30).

2. The composite cooking apparatus according to claim 1, wherein the insulating plate (40) is provided with at least one heat reflecting layer (41) to reflect the heat generated from the heating unit (20).

3. The composite cooking apparatus according to claim 2, wherein the at least one heat reflecting layer (41) comprises a ceramic layer.

4. The composite cooking apparatus according to claim 3, wherein the at least one heat reflecting layer (41) further comprises an aluminum oxide layer adjacent to the ceramic layer.

5. The composite cooking apparatus according to claim 3 or claim 4, wherein the at least one heat reflecting layer (41) further comprises a beryllium oxide layer adjacent to the ceramic layer.

6. The composite cooking apparatus according to any one of claims 2 to 5, wherein the at least one heat reflecting layer (41) comprises a ceramic layer adjacent to a heat resisting plastic layer (42) positioned on the insulating plate (40).

7. The composite cooking apparatus according to any preceding claim, wherein the insulating plate is spaced apart from the heating unit (30) by a predetermined distance.

8. A composite cooking apparatus, comprising:

   a body (10);
   a heating element (30) placed in the body (10) to generate heat used to heat food;
   a work coil (50) disposed in the body (10) to generate a magnetic field to cook the food by induction heating;
   an insulating plate (40) disposed adjacent to the heating element (30) to prevent heat generated from the heating element (30) from being transmitted to the work coil (50); and
   a blowing fan (20) to compulsorily move air through an air moving path positioned between the insulating plate (40) and the work coil (50).

9. The composite cooking apparatus according to claim 8, wherein the insulating plate (40) is provided with at least one heat reflecting layer (41) to reflect the heat generated from the heating element (30).

10. The composite cooking apparatus according to claim 9, wherein the at least one heat reflecting layer (41) comprises a ceramic layer.

11. The composite cooking apparatus according to claim 10, wherein the at least one heat reflecting layer (41) further comprises an aluminum oxide layer adjacent to the ceramic layer.

12. The composite cooking apparatus according to claim 10 or claim 11, wherein the at least one heat reflecting layer (41) further comprises a beryllium

oxide layer adjacent to the ceramic layer.

13. The composite cooking apparatus according to any one of claims 9 to 12, wherein the at least one heat reflecting layer (41) comprises a ceramic layer adjacent to a heat resisting plastic layer (42) positioned on the insulating plate (40).

14. The composite cooking apparatus according to any one of claims 8 to 13, wherein the insulating plate (40) is spaced apart from the heating element (30) by a predetermined distance.

15. The composite cooking apparatus according to any one of claims 8 to 14, wherein the body (10) is provided with at least one inlet (12) to draw the air into the body (10) and at least one outlet (14) to discharge air moved through the air moving path to an outside of the body (10).

16. A composite cooking apparatus, comprising:

a first heating unit (30) generating heat transferred to a cooking container; and
a second heating unit (50), selectively generating a
magnetic field, magnetic force lines of which pass through a bottom of the cooking container; and
an insulating plate (40) disposed between the first and
second heating units (30, 50) to protect the second heating unit (50) from the heat generated by the first heating unit (30).

17. The composite cooking apparatus according to claim 16, wherein the insulating plate (40) comprises:

a base plate (42); and
at least one heat reflecting layer (41).

18. The composite cooking apparatus according to claim 17, wherein the at least one heat reflecting layer (41) has a high surface luminance.

19. The composite cooking apparatus according to claim 17 or claim 18, wherein the at least one heat reflecting layer (41) has a high infrared reflectance.

20. A composite cooking apparatus, comprising:

a conduction heating unit (30);
an induction heating unit (50), the conduction and
induction heating units (30,50) being driven simultaneously to speed cooking; and
an insulating plate (40) disposed between the conduction and induction heating units (30 to 50) to protect the induction heating unit (50) from the heat generated by the conduction heating element (30).

FIG 1

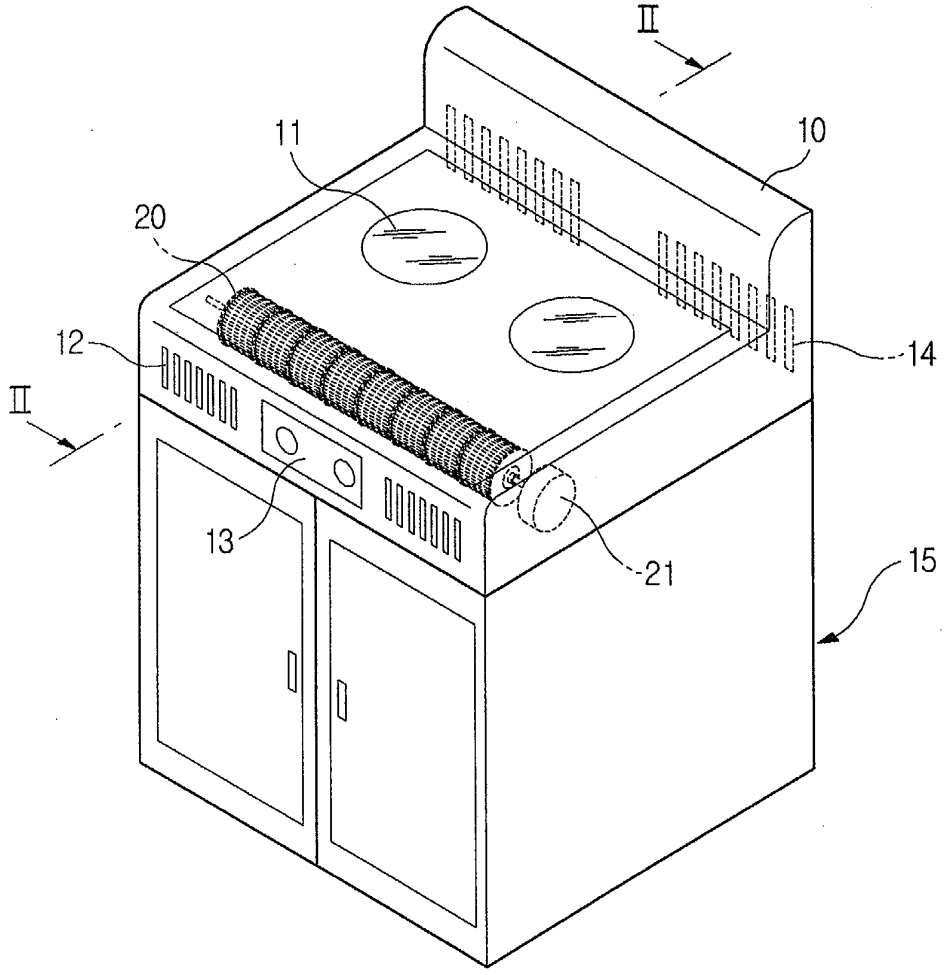


FIG 2

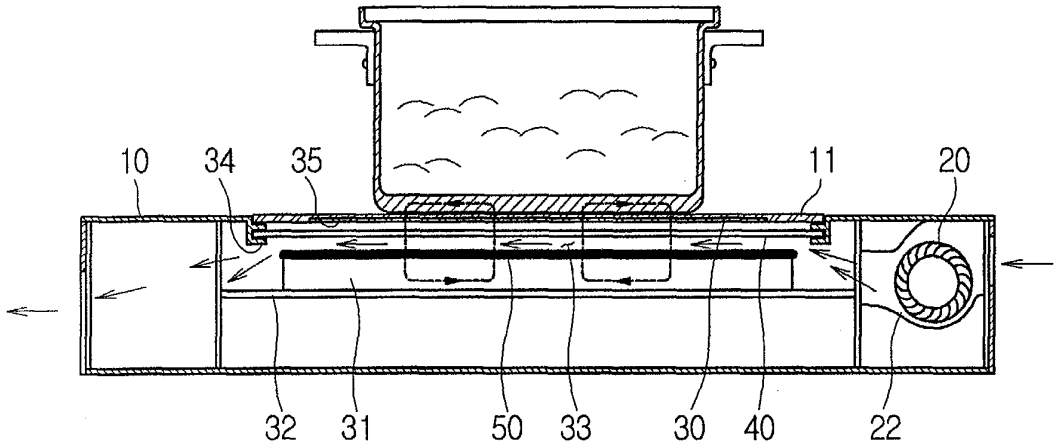
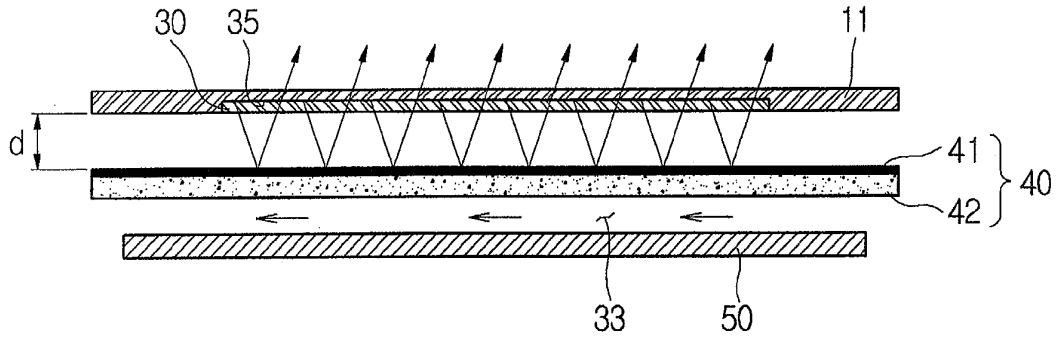


FIG 3



US006847798B2

(12) **United States Patent**
Cho et al.

(10) **Patent No.: US 6,847,798 B2**
(45) **Date of Patent: Jan. 25, 2005**

(54) **FUSING DEVICE FOR AN ELECTROPHOTOGRAPHIC IMAGE FORMING APPARATUS**

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(73) Assignee: **Samsung Electronics Co., Ltd.**, Suwon-si (KR)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/624,899**

(22) Filed: **Jul. 23, 2003**

(65) **Prior Publication Data**

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(30) **Foreign Application Priority Data**

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(51) **Int. Cl.**[7] **G03G 15/20**
(52) **U.S. Cl.** **399/330**; 219/216; 432/60
(58) **Field of Search** 399/307, 330, 399/334; 219/216, 388, 469; 432/60; 492/46

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Primary Examiner—Robert Beatty
(74) *Attorney, Agent, or Firm*—Staas & Halsey LLP

(57) **ABSTRACT**

A fusing device for an electrophotographic image forming apparatus. The fusing device includes a heat pipe, both ends of which are sealed and in which a predetermined amount of a working fluid is contained, a cylindrical roller which surrounds the heat pipe, and a heating element which is installed between the cylindrical roller and the heat pipe. The working fluid is supercooled at room temperature, and crystallizing and producing heat when acted on by a mechanical force, and at least one mechanical unit applies a mechanical force to the heat pipe and crystallizes the supercooled working fluid.

10 Claims, 5 Drawing Sheets

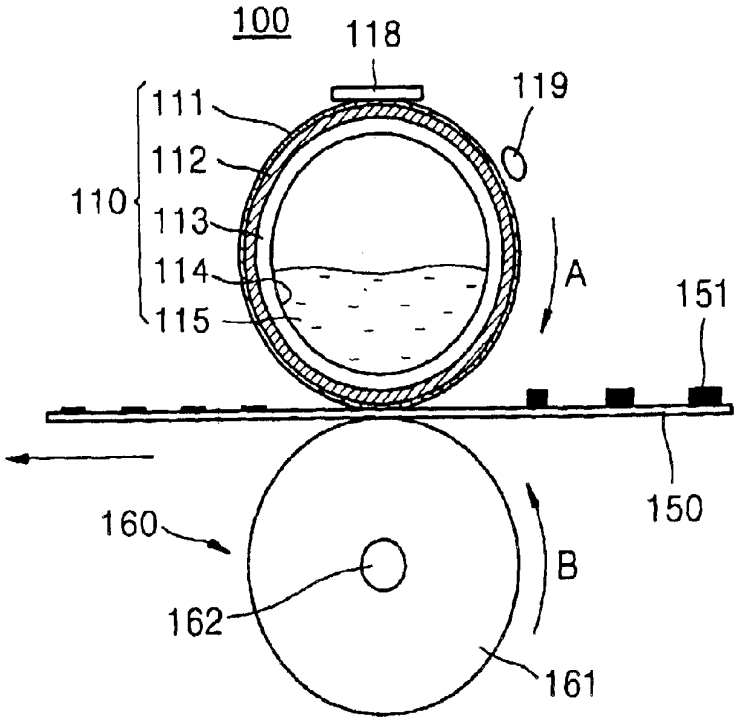


FIG. 1 (PRIOR ART)

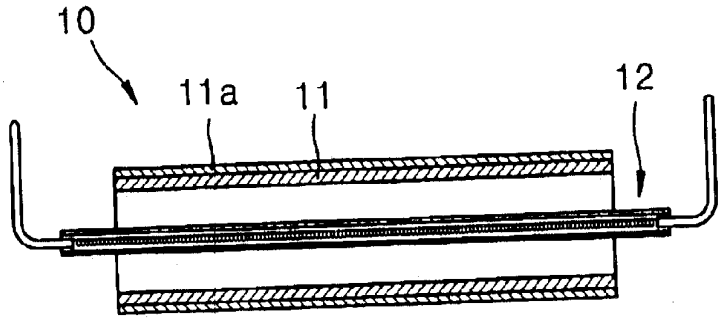


FIG. 2 (PRIOR ART)

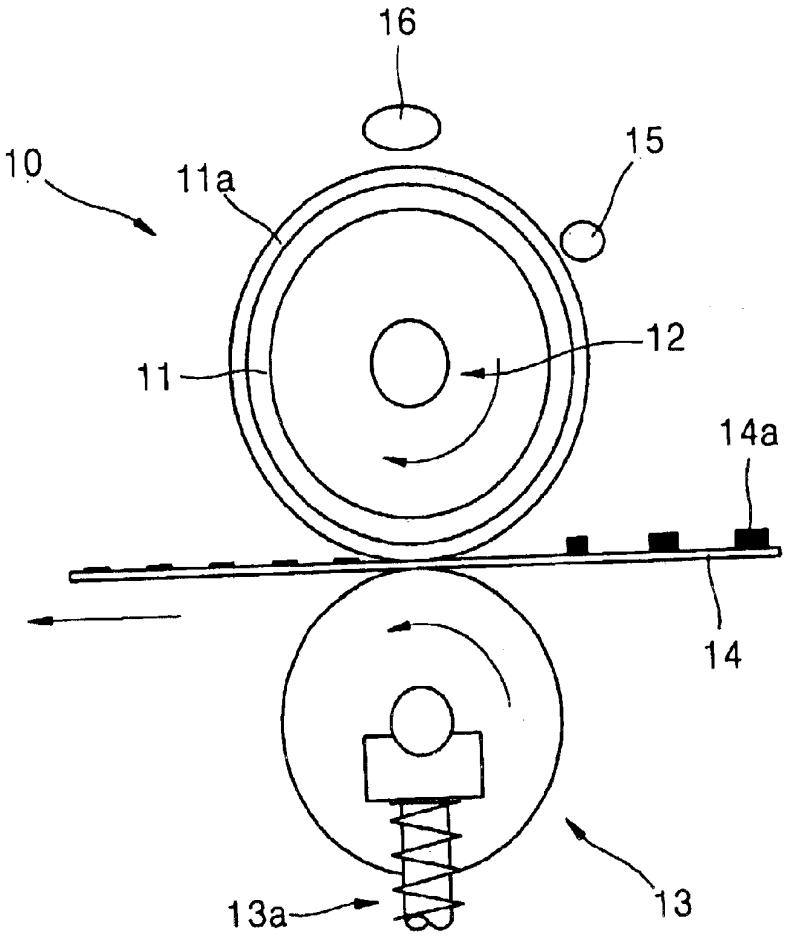


FIG. 3

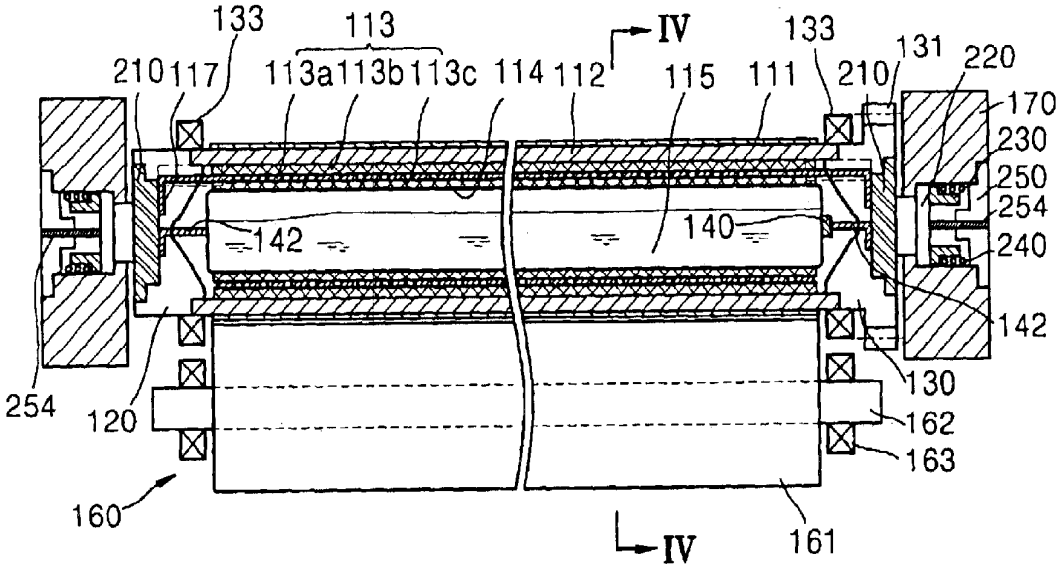

133
113
IV
133
131
220
210
117
113a
113b
113c
114
112
115
111
210
170
230
250
254
240
142
140
142
130
254
120
162
163
160
161
IV

FIG. 4

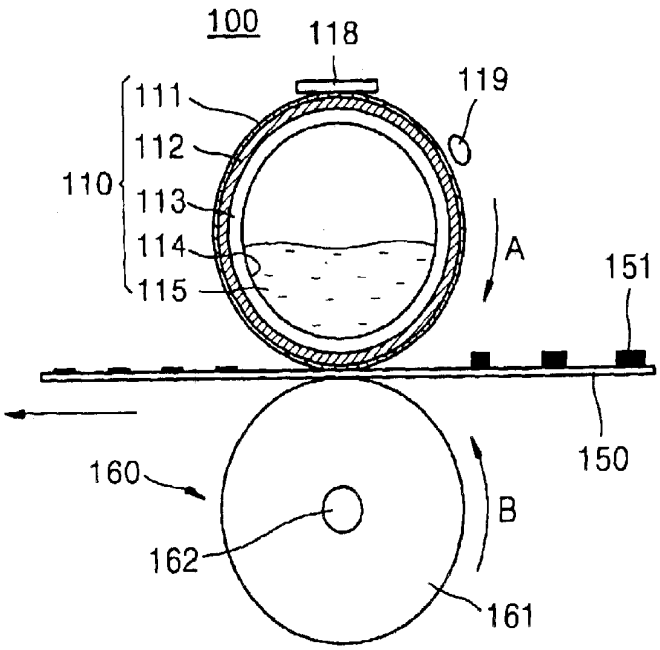

100
118
119
111
112
110
113
114
115
A
151
150
160
B
162
161

FIG. 5A

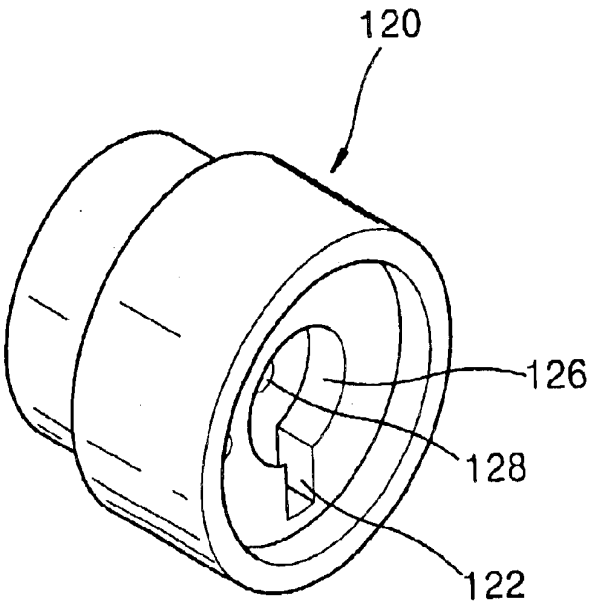


FIG. 5B

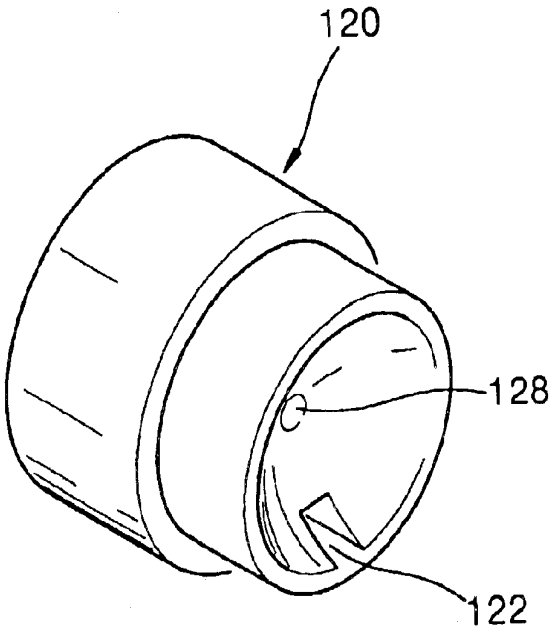


FIG. 6A

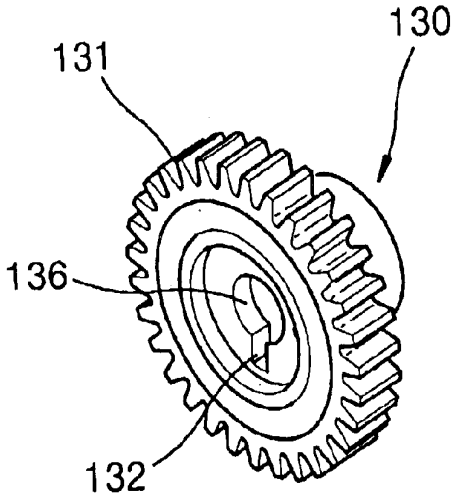


FIG. 6B

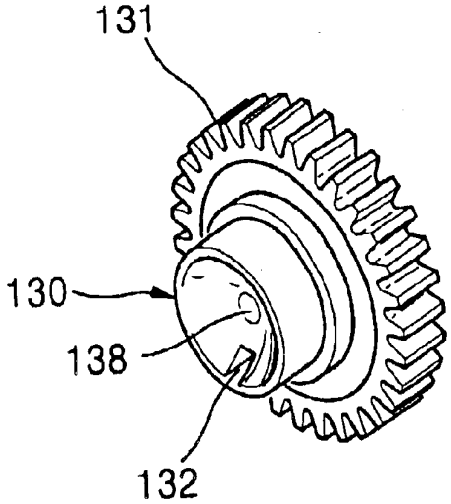
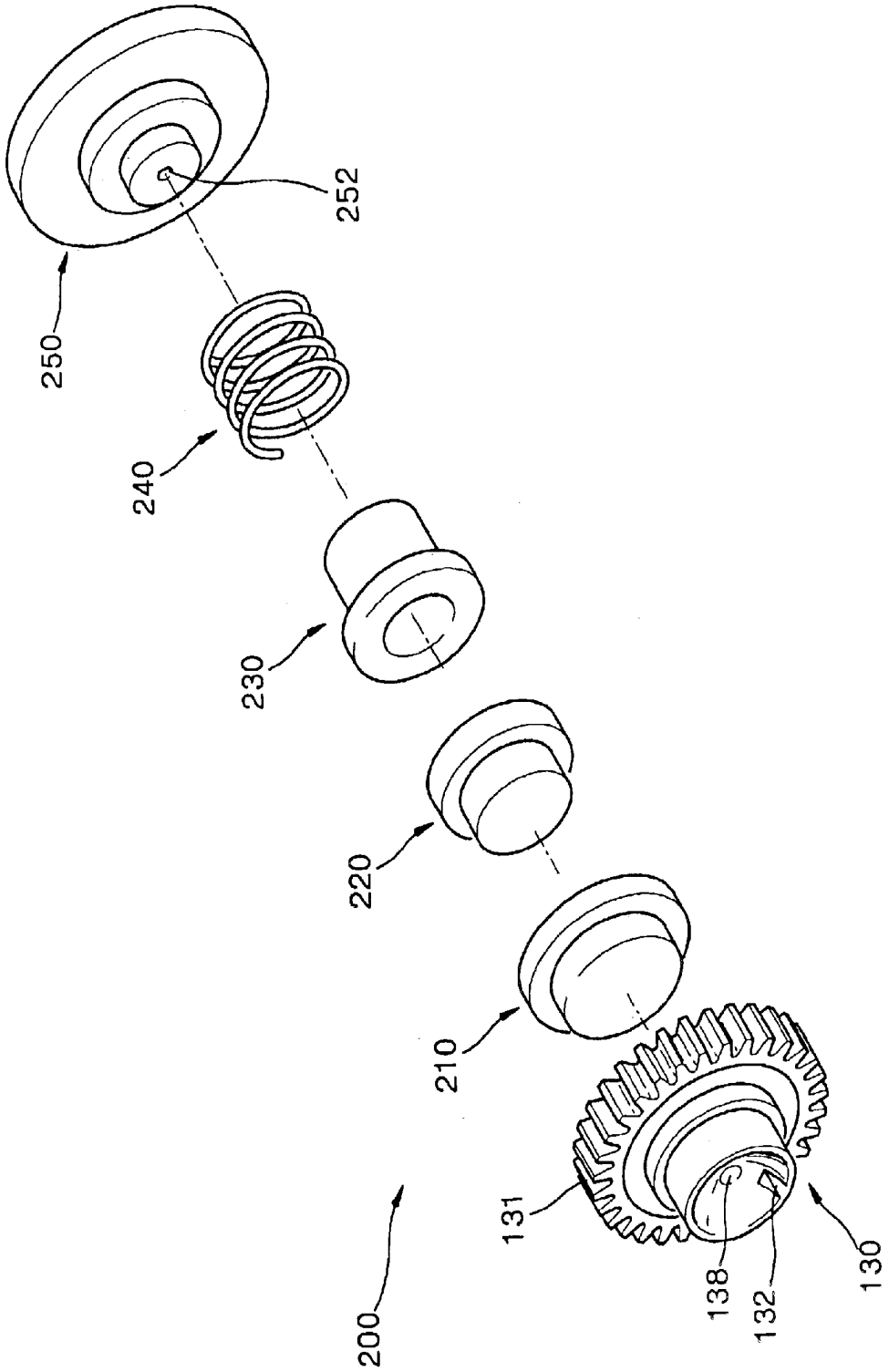


FIG. 7



FUSING DEVICE FOR AN ELECTROPHOTOGRAPHIC IMAGE FORMING APPARATUS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the priority of Korean Patent Application No. 2002-64545, filed on Oct. 22, 2002, in the Korean Intellectual Property Office, the disclosure of which is incorporated herein in its entirety by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a fusing device for an electrophotographic image forming apparatus, and more particularly, to a fusing device for an electrophotographic image forming apparatus that uses heat generated when supercooled sodium acetate is crystallized, for an instant rising temperature of a fusing roller.

2. Description of the Related Art

In general, an electrophotographic printer includes a fusing device which heats the paper onto which a toner image is transferred, melts the toner image in a powder state on the paper, and fuses the melted toner image on the paper. The fusing device includes a fusing roller which fuses toner onto the paper, and a pressing roller which pushes the paper against the fusing roller.

FIG. **1** is a schematic profile cross-sectional view of a conventional fusing roller using a halogen lamp as a heat source, and FIG. **2** is a schematic frontal cross-sectional view of a conventional fusing device using the fusing roller of FIG. **1**. Referring to FIG. **1**, a fusing roller **10** includes a cylindrical roller **11** and a halogen lamp **12** installed inside the cylindrical roller **11**. A TEFLON® coating layer **11***a* is formed on a circumference of the cylindrical roller **11**. The cylindrical roller **11** is heated by radiant heat generated from the halogen lamp **12**.

Referring to FIG. **2**, a pressing roller **13** is placed under the fusing roller **10** to be opposite to the fusing roller **10**, and paper **14** is placed between the fusing roller **10** and the pressing roller **13**. The pressing roller **13** is elastically supported by a spring **13***a*. The pressing roller **13** closely adheres the paper **14**, which is passing between the fusing roller **10** and the pressing roller **13**, to the fusing roller **10** with a predetermined pressure. In this case, the toner image **14***a*, which is formed on the paper **14** in a powder state, is fused on the paper **14** due to the predetermined pressure and heat while passing between the fusing roller **10** and the pressing roller **13**.

A thermistor **15** and a thermostat **16** are installed at one side of the fusing roller **10**. The thermistor **15** measures a surface temperature of the fusing roller **10**, and the thermostat **16** cuts off power supplied to the halogen lamp **12** when the surface temperature of the fusing roller **10** exceeds a predetermined value. The thermistor **15** measures the surface temperature of the fusing roller **10** and transmits an electrical signal corresponding to the measured temperature to a controller (not shown) of a printer (not shown). The controller controls the power supplied to the halogen lamp **12** according to the measured temperature and maintains the surface temperature of the fusing roller **11** within a given range. When the temperature of the fusing roller **11** exceeds the predetermined set value because the controller fails in controlling the temperature of the fusing roller **11**, a contact (not shown) of the thermostat **16** becomes open to cut off the supply of power to the halogen lamp **12**.

Power consumption of a conventional fusing device using the halogen lamp **12** as a heat source is large. In particular, the conventional fusing device requires a fairly long warming-up time when power is supplied to the fusing device. Thus, a new fusing device having a short warming-up time is required.

SUMMARY OF THE INVENTION

The present invention provides a fusing device for an electrophotographic image forming apparatus that reduces a warming-up time by using melting heat of a supercooled working fluid during cold-start of the fusing device.

According to one aspect of the present invention, there is provided a fusing device for an electrophotographic image forming apparatus. The device includes a heat pipe, both ends of which are sealed and in which a predetermined amount of a supercooled working fluid capable of crystallizing and producing heat when acted on by a mechanical force is contained, a cylindrical roller which surrounds the heat pipe, and a heating element which is installed between the cylindrical roller and the heat pipe. At least one mechanical unit, which applies a mechanical force to the heat pipe and crystallizes the supercooled working fluid, is provided.

Also, the device may further include a cooling fan which supercools the working fluid.

Also, the mechanical unit may be a vibrator attached to one end side of the heat pipe.

Also, the vibrator may include a timer which operates the vibrator for several seconds only during cold-start.

Also, the vibrator may further include a motor, and the motor and the heating element may be connected in parallel to an external power supply.

Additional aspects and/or advantages of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and/or other aspects and advantages of the present invention will become more apparent by describing in detail preferred embodiments thereof with reference to the attached drawings in which:

FIG. **1** is a schematic profile cross-sectional view of a conventional fusing roller using a halogen lamp as a heat source;

FIG. **2** is a schematic frontal cross-sectional view of a conventional fusing device using the fusing roller of FIG. **1**.

FIG. **3** is a schematic frontal cross-sectional view of a fusing device for an electrophotographic image forming apparatus according to an embodiment of the present invention;

FIG. **4** is a cross-sectional view taken along line IV—IV of FIG. **3**;

FIGS. **5**A and **5**B are perspective views of a first end cap of FIG. **3**;

FIGS. **6**A and **6**B are perspective views of a second end cap of FIG. **3**; and

FIG. **7** is an exploded perspective view of a power connection unit of FIG. **3**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference will now be made in detail to the present preferred embodiments of the present invention, examples

of which are illustrated in the accompanying drawings, wherein like reference numerals refer to the like elements throughout. The embodiments are described below in order to explain the present invention by referring to the figures. Thicknesses of layers or regions shown in drawings are exaggerated for clarity of the specification.

FIG. **3** is a schematic frontal cross-sectional view of a fusing device for an electrophotographic image forming apparatus according to a first embodiment of the present invention, and FIG. **4** is a cross-sectional view taken along line IV—IV of FIG. **3**. Referring to FIGS. **3** and **4**, a fusing device **100** includes a fusing roller **110** having a cylindrical roller **112** which rotates in a direction in which a sheet of printer paper **150** having a toner image **151** thereon is ejected, i.e., in a direction indicated by an arrow A, and a pressing roller **160** which is installed to face the fusing roller **110** through the paper **150** therebetween and rotates in a direction indicated by an arrow B to be in a contact with the fusing roller **110**.

A toner protective layer **111** is formed of TEFLON® to a predetermined thickness, i.e., at a thickness of 20–30 μm, on the cylindrical roller **112**. A heater **113** is disposed on an inner surface of the cylindrical roller **112**, and a heat pipe **114**, both ends of which are sealed, is disposed on an inner surface of the heater **113**.

Meanwhile, a thermistor **118**, which measures a surface temperature of the fusing roller **110**, is installed on the toner protective layer **111**. Also, a thermostat **119** is installed at one side of the toner protective layer **111** and cuts off power supplied to the heater **113** and prevents overheating when the surface temperature of the fusing roller **110** is rapidly increased.

The heater **113** includes an Ni—Cr resistive coil **113***a* which generates heat by electricity supplied from an external power supply. Mica sheets **113***b* and **113***c*, which are insulating layers, are placed on and under the resistive coil **113***a*. The heater **113** includes a lead **117** which connects electricity to the resistive coil **113***a* formed on both ends of the heater **113**. A Cr—Fe coil may be used as the resistive coil **113***a* in one embodiment of the present invention.

The heat pipe **114** is formed in a tube shape, and both ends of the pipe are sealed. A predetermined amount of a working fluid **115** is contained in the heat pipe **114**. The working fluid **115** is a sodium acetate solvent and exists in a supercooled liquid state at a room temperature. In general, the sodium acetate solvent is used as a heat pack. The sodium acetate solvent is increased to a predetermined temperature, i.e., 54 C, when the sodium acetate is crystallized by an external shock. Also, if the temperature of the sodium acetate solvent exceeds 120 C due to heat generated in the heater **113**, water, which is mixed with the sodium acetate to form the sodium acetate solvent, is separated from the sodium acetate. The separated water, as well as water remaining in the sodium acetate solvent, is vaporized, and thus, the working fluid **115** serves as a thermal medium which transfers the heat to the cylindrical roller **112**, prevents a temperature deviation on the surface of the cylindrical roller **112**, and heats the overall cylindrical roller **112** within a short time.

If a sodium acetate solvent in which 10 g of sodium acetate mixed with 75 g of water is used as the working fluid **115**, and the sodium acetate solvent supercooled at a room temperature is stimulated, sodium acetate is crystallized, and the temperature of the sodium acetate solvent is increased to about 54 C. Here, if the percentage of sodium acetate in a sodium acetate solvent is increased, the temperature due to crystallization is increased, but the increase is very slight. Thus, preferably, the ratio of sodium acetate to water in the sodium acetate solvent is 100–150% by weight. The working fluid **115** takes a volume ratio of 5–70% with respect to the volume of the heat pipe **114**, preferably, 50–65%. A volume ratio of the working fluid **115** less than 5% is not preferable because a dry out is highly likely to occur.

Meanwhile, preferably, a cooling device, for example, a cooling fan (not shown), is provided at one side of the fusing roller **110**. When the image forming apparatus is off, the cooling fan may be used to supercool the sodium acetate solvent in the heat pipe **114**.

The heat pipe **114** is formed of copper (Cu), aluminum (Al), or aluminum alloy. The cylindrical roller **112** is heated by the heater **113** and by the vaporized heat generated from the working fluid **115** in the heat pipe **114**. The heat transferred to the cylindrical roller **12** then fuses the toner **151**, which is in a powder state formed on the paper **150**. The cylindrical roller **112** is formed of stainless steel, aluminum (Al), or copper (Cu)

A vibrator **140**, which is electrically driven, is attached to one end side of the heat pipe **114**. During a cold-start, an externally-controlled power is supplied to the vibrator **140**, and the vibrator **140** is driven by a timer for a predetermined amount of time. The vibrator **140** vibrates one end side of the heat pipe **114** to vibrate the sodium acetate solvent **115**, thereby solidifying the sodium acetate solvent **115**. Due to a heat generated in the solidifying process, the working fluid **115** is instantaneously increased to a predetermined temperature, for example, 54 C. Power connection to a motor of the vibrator **140** will be described later.

First and second end caps **120** and **130** are inserted in both ends of the cylindrical roller **112**. The structure of the second end cap **130** is substantially similar to the first end cap **120**, the significant difference being that a gear **131** is formed along an outer surface of the second end cap **130**. The gear on the outer surface of the second end cap **130** is engaged with a gear (not shown) of a motor (not shown), and is rotated by that motor's gear. Also, bearings **133** are installed at both ends of the fusing roller **110** to support the rotating fusing roller **110**.

FIGS. **5**A and **5**B are perspective views of a first end cap **120** of FIG. **3**, and FIGS. **6**A and **6**B are perspective views of a second end cap **130** of FIG. **3**. Referring to FIGS. **5**A through **6**B, lead holes **122** and **132**, through which a lead (**142** of FIG. **3**) is connected to both ends of the resistive coil **113***a*, and lead holes **128** and **138**, through which a lead (**142** of FIG. **3**) is connected to a motor (not shown) of the vibrator **140**, are formed in the first and second end caps **120** and **130**, respectively. One terminal of the motor of the vibrator **140** is connected to one end side of the heat pipe **114**, and is connected to external power through the lead **142** provided at the other end side of the heat pipe **114**. The other terminal of the motor of the vibrator **140** is connected to the external power through the lead **142**. Thus, the heater **113** and the motor of the vibrator **140** are connected in parallel to the external power, and a controlled power is supplied to the heater **113** and the motor of the vibrator **140**. Electrode grooves **126** and **136**, in which an electrode **210** is inserted, are formed at the center of the first and second end caps **120** and **130** opposite to the end of the heat pipe **114**. The electrode **210** supplies electricity to the leads **117** and **142** which pass through the lead holes **122**, **132**, **128**, and **138**, respectively.

FIG. **7** is an exploded perspective view of a power connection unit **200** connected to the second end cap **130**. Referring to FIG. **7**, the power connection unit **200** is

installed in a frame (**170** of FIG. **3**) and transfers external power to the heater **113**. The power connection unit **200** includes an electrode **210** inserted in the electrode grooves **126** and **136**, a brush **220** which contacts the electrode **210**, and an elastic element **240** which closely adheres the brush **220** to the electrode **210** for an electrical contact. The brush **220** is connected to a lead (**254** of FIG. **3**) supplied from an external power supply and transfers electricity to the electrode **210**.

The elastic element **240** provides an elastic force to a spacer **230** so that the brush **220** is closely adhered to the electrode **210**. Even though thermal expansion or thermal contraction repeatedly occurs while the fusing roller **110** is operated, the elastic element **240** absorbs the resulting deformation to prevent the brush **220** from being isolated from the electrode **210**. Preferably, a compression spring is used as the elastic element **240**. In this embodiment, a lead (**254** of FIG. **3**) from the external power supply is connected to the brush **220** through a lead hole **252**. In this embodiment, the lead **254** and the elastic element **240** could make incidental contact, and sparks could occur. Thus, the spacer **230** is installed between the brush **220** and the elastic element **240**, in order to prevent a spark and also to prevent the end cap **130** from contacting the frame **170** due to the drawn-back brush **220**.

An end of the elastic element **240** is confined in the frame **170** by an insulating plate **250**. The insulating plate **250** supports the elastic element **240**. Thus, the brush **220** is first installed in a through hole formed in the frame **170**. Then the spacer **230** and the elastic element **240** are installed in the through hole. Next, the insulating plate **250** is installed so that the elastic element **240** is not drawn back.

The first and second end caps **120** and **130** may be made of a resin, such as polyphenylene sulfide (PPS), in which a filler material such as glass fiber, having small thermal deformation even at a high temperature, is inserted. Poly butylene terephthalate (PBT) and nylon are other possible preferred materials for the first and second end caps **120** and **130**.

The pressing roller **160** includes an elastic roller **161**, which contacts the fusing roller **110** and forms a fusing nip therebetween, and a shaft **162** which supports the elastic roller **161**. Bearings **163**, disposed at the circumference of the end of the shaft **162**, support the pressing roller **160**.

A process of manufacturing the fusing device **110** of an electrophotographic image forming apparatus having the above structure according to the present invention will be described below.

One end of a nearly cylindrical tube, which will be used as the heat pipe **114**, is sealed. An injection hole is formed at the other end of the cylindrical tube, through which a compression medium supplied from outside, i.e., a compressed liquid, is injected. In this case, it is preferable that deformation is reduced during the enlarging process at both ends of the cylindrical tube by forging both the ends in advance to remove a ductility and to planarize. Next, a circumference of the cylindrical tube **114** is wound by a mica sheet **113***c*. Then the resistive coil **113***a* is wound around the mica sheet **113***c*. Subsequently, the circumference of the cylindrical tub **114** wound by the resistive coil **113***a* is again wound by a mica sheet **113***b*. Next, the cylindrical tube **114** is inserted inside the cylindrical roller **112**, an outer surface of which is coated with TEFLON®. Subsequently, the compression medium is injected into the cylindrical tube **114** through the injection hole at the end of the cylindrical tube **114** under a predetermined pressure, i.e., 150 bars, and thereby the cylindrical tube **114** is enlarged. As a result, the cylindrical tube **114** and the heater **113** are closely adhered to the inside of the cylindrical roller **112**. Therefore, the cylindrical tube **114** is enlarged, and an air gap is not formed between the heater **113** and the cylindrical roller **112**, thus improving heat transfer efficiency.

The operation of the fusing device for an electrophotographic image forming apparatus having the above structure according to the present invention will be described in detail with reference to the accompanying drawings.

First, a cold start of the fusing device, in which the heat pipe filled with a predetermined volume of a sodium acetate solvent in a supercooled state at a room temperature is installed, will be described. If a controlled power is supplied from the external lead **254**, this power is connected to the lead **117** of the heater **113** and the lead **142** of the motor of the vibrator **140** through the brush **220** and the electrode **210**. Then, the vibrator **140** is driven by the timer for a predetermined amount of time and vibrates part of the sodium acetate solvent **115** in the heat pipe **114**. Due to this vibration, part of the sodium acetate starts to be crystallized and heated such that the temperature of the working fluid **115** is increased to 54 C. As a result, the heat pipe **114** is increased to a predetermined temperature. Heat is also generated at the resistive coil **113***a*. Most of the heat generated at the heater **113** is transferred to the cylindrical roller **112**. As such, the fusing roller **110** is rapidly increased to a target temperature, i.e., 180 C.

Subsequently, heat generated at the heater **113** is transferred to the heat pipe **114**. Due to this heat, the temperature of the heat pipe **114** is increased. If the temperature of the heat pipe **114** is increased over 120 C, the water which was mixed with the sodium acetate in the heat pipe **114** is heated and vaporized, and the heat formed by producing this steam is transferred to the cylindrical roller **112** through the heater **113** installed on the circumference of the heat pipe **114**. Heat generated at the heater **113** and heat generated at the working fluid **115** is transferred to the cylindrical roller **112** such that the fusing roller **110** is maintained at a predetermined temperature. In particular, a heat transfer rate of the steam in the heat pipe **114** is high. Thus, a temperature deviation on the surface of the fusing roller **110** can be greatly decreased, and printing quality of the fusing device **100** is improved.

Subsequently, in a printing mode, the toner **151** is transferred in a powder state onto the paper **150**, and the paper **150** passes between the fusing roller **110** and the pressing roller **160**, and the toner **151** is fused onto the paper **150** by the fusing roller **110** maintained at a predetermined temperature.

Meanwhile, as the fusing roller **110** fuses the paper **150**, the heat of the fusing roller **110** is taken to the paper **150**, and the steam inside the heat pipe **114** loses heat and is liquefied. Then, the working fluid **115**, to which heat is transferred by the heater **114**, is vaporized such that the surface temperature of the fusing roller **110** is maintained at a target temperature suitable for fusing the toner **151** onto the paper **150**. As such, the working fluid **115** in the heat pipe **114** serves as a thermal medium which repeatedly performs vaporization and liquefaction and maintains the fusing roller **110** at a predetermined temperature.

In general, a fusing temperature of a toner image is about 160–190 C. The fusing device **100** according to the present invention reaches the target temperature within about 12 seconds. The thermistor **118** measures the surface temperature of the fusing roller **110** and a controller (not shown) maintains the surface temperature of the fusing roller **110**

within a predetermined range suitable for fusing the toner **151** onto the paper **150**. If adjustment of the surface temperature fails and the surface temperature of the fusing roller **110** rapidly increases, the thermostat **119** cuts off the power connection unit **200** connected to the thermostat **119** through a mechanical operation and prevents a rapid increase in the surface temperature of the fusing roller **110**. This power supply operation may be varied according to a set temperature, and may be performed using various controlling methods such as periodic on/off, pulse width modulation (PWM), or proportional and integral (PI).

Meanwhile, if an electrophotographic image forming apparatus having a fusing device according to the present invention is entered into a long-term standstill state, and the fusing device **100** stops, the cooling fan at one side of the image forming apparatus is operated such that the working fluid, including sodium acetate, is supercooled, and the supercooled sodium acetate solvent is again formed in the heat pipe **114**.

As described above, in the fusing device for an electrophotographic image forming apparatus according to the present invention, during a cold-start, a warming-up time can be reduced using a melting heat of a supercooled sodium acetate solvent, and in a printing mode, the surface temperature of a fusing roller can be uniformly maintained using a thermal medium in the heat pipe.

Although a few preferred embodiments of the present invention have been shown and described, it would be appreciated by those skilled in the art that changes may be made in this embodiment without departing from the principles and spirit of the invention, the scope of which is defined in the claims and their equivalents.

What is claimed is:

1. A fusing device for an electrophotographic image forming apparatus, the device comprising:

a heating pipe, both ends of which are sealed and in which a predetermined amount of a working fluid is contained, wherein the working fluid is supercooled at room temperature, and crystallizing and producing heat when acted on by a mechanical force;

a cylindrical roller which surrounds the heat pipe;

a heating element which is installed between the cylindrical roller and the heating pipe;

at least one mechanical unit which applies the mechanical force to the heating pipe and crystallizes the supercooled working fluid; and

a pressing roller which closely adheres to the fusing roller.

2. The device of claim **1**, wherein the working fluid is a sodium acetate solvent.

3. The device of claim **2**, wherein the sodium acetate solvent has a volume ratio of 50–65% with respect to the volume of the heating pipe.

4. The device of claim **2**, wherein the ratio of sodium acetate to water in the sodium acetate solvent is 100–150% by weight.

5. The device of claim **1**, further comprising a cooling fan which supercools the working fluid.

6. The device of claim **1**, wherein the mechanical unit is attached to one end side of the heating pipe.

7. The device of claim **6**, wherein the mechanical unit is a vibrator.

8. The device of claim **7**, wherein the vibrator includes a timer which operates the vibrator for several seconds only during cold-start.

9. The device of claim **7**, wherein the vibrator includes a motor, and the motor and the heating element are connected in parallel to an external power supply.

10. The device of claim **9**, wherein one terminal of the motor is connected to one end side of the heat pipe, and the remaining side of the heat pipe and the remaining terminal of the motor are each connected to the external power supply.

* * * * *

US007026587B2

(12) **United States Patent**
Yang et al.

(10) **Patent No.: US 7,026,587 B2**
(45) **Date of Patent: Apr. 11, 2006**

(54) **COMPOSITE COOKING APPARATUS**

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(73) Assignee: **Samsung Electronics Co., Ltd.**, Suwon-si (KR)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/878,404**

(22) Filed: **Jun. 29, 2004**

(65) **Prior Publication Data**

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(30) **Foreign Application Priority Data**

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(51) **Int. Cl.**
H05B 6/12 (2006.01)

(52) **U.S. Cl.** **219/622**; 219/623; 219/624; 219/672; 219/675; 219/601; 219/443.1

(58) **Field of Classification Search** 219/620–627, 219/672–677, 601, 680, 443.1, 468.1; 427/487
See application file for complete search history.

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Primary Examiner—Philip H. Leung
(74) *Attorney, Agent, or Firm*—Staas & Halsey LLP

(57) **ABSTRACT**

A composite cooking apparatus having a body, a heating unit, and an induction heating unit. The heating unit is positioned in the body to generate heat used to heat food. The induction heating unit is positioned adjacent to the heating unit to generate a magnetic field to cook the food by induction heating. The induction heating unit has at least one wire, a coating of which is exposed to an electron beam to strengthen a heat resistance thereof.

13 Claims, 4 Drawing Sheets

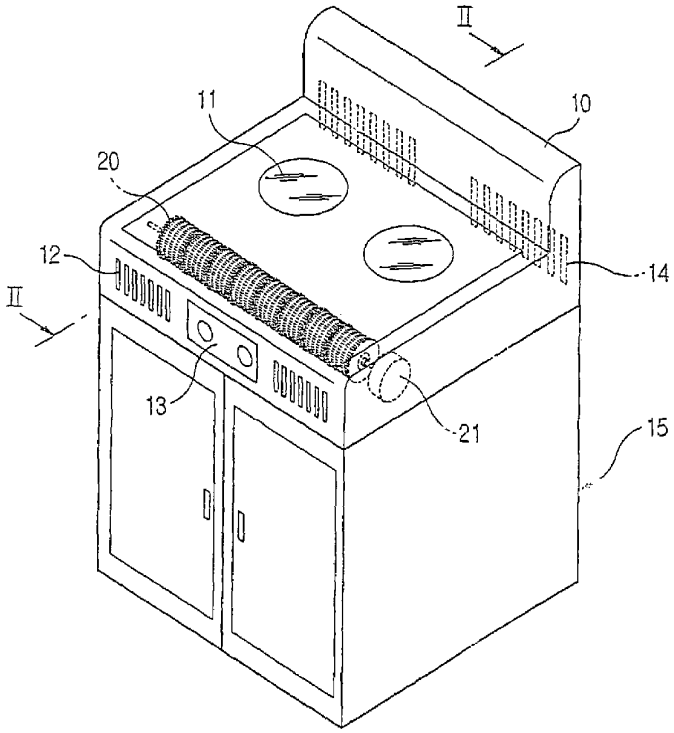


FIG. 1

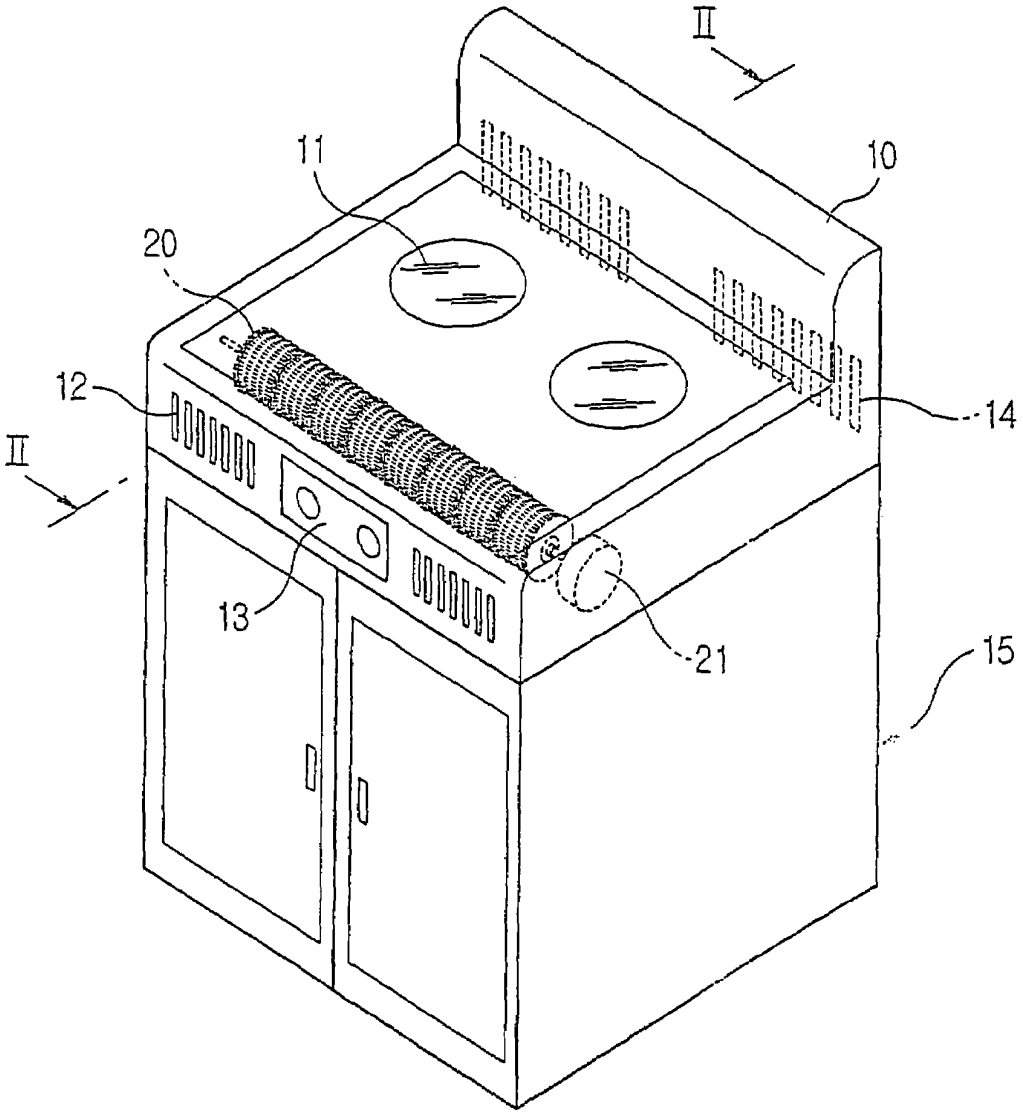


FIG. 2

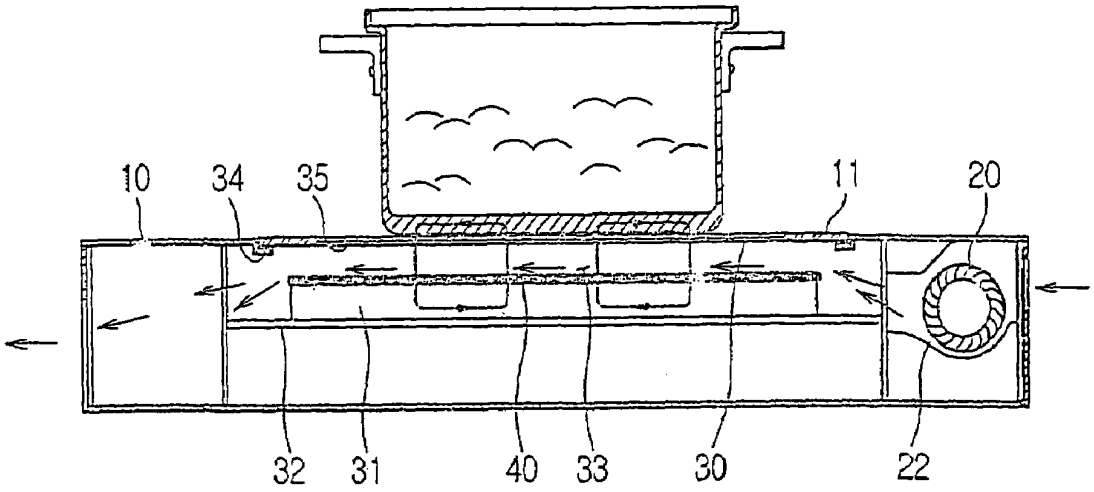


FIG. 3

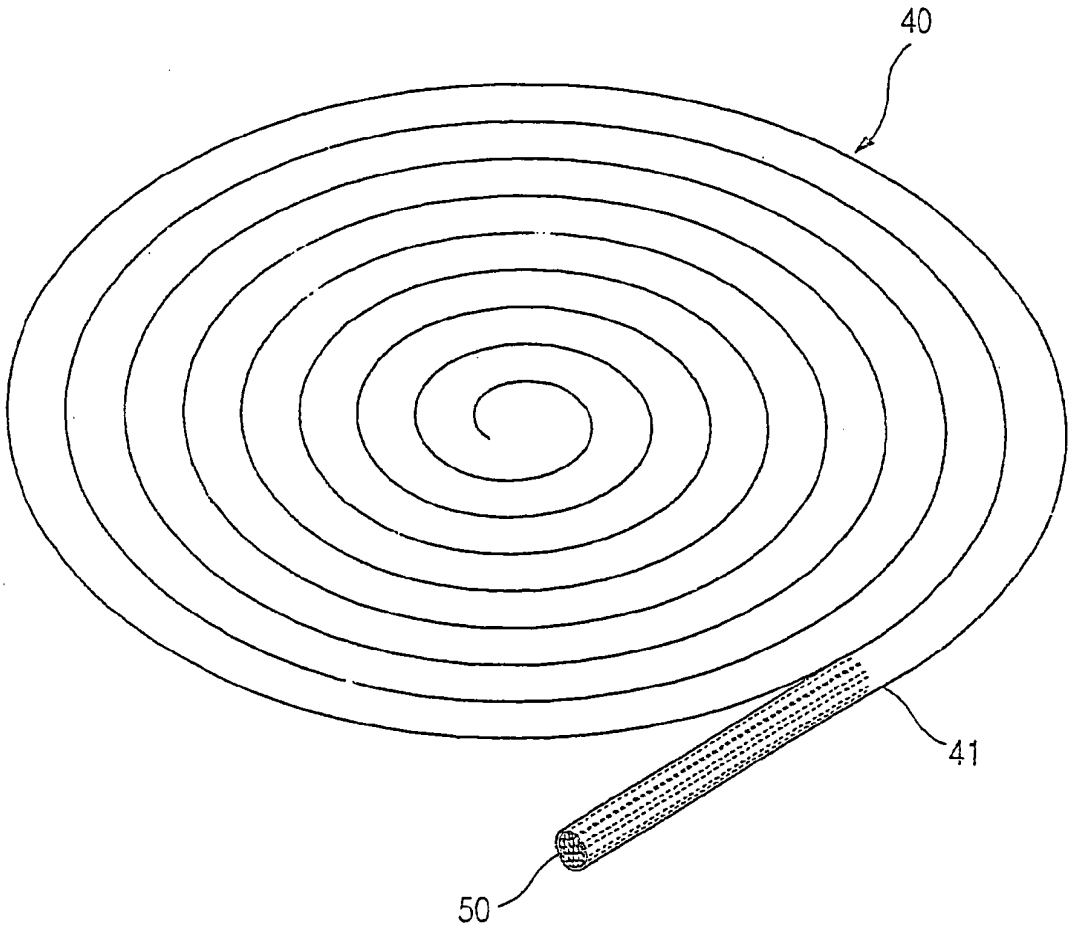
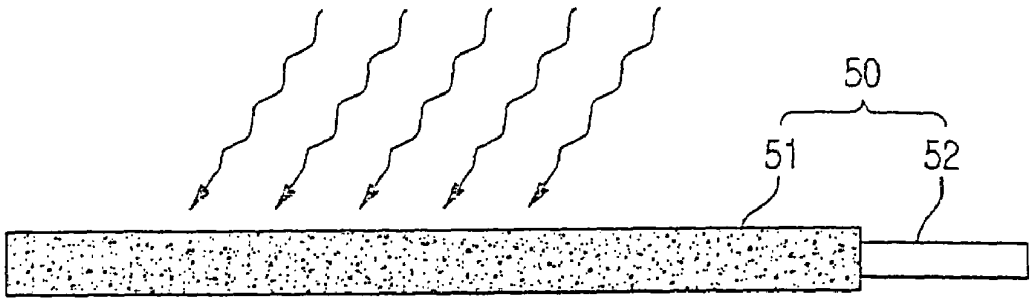


FIG. 4



COMPOSITE COOKING APPARATUS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of Korean Patent Application No. 2003-85930, filed Nov. 29, 2003 in the Korean Intellectual Property Office, the disclosure of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates, in general, to composite cooking apparatuses, and more particularly, to a composite cooking apparatus that radiates electron beams to coatings of element wires forming a work coil, which is an induction heating unit, thus strengthening heat resistance.

2. Description of the Related Art

Generally, an electronic cooking apparatus that performs cooking using electromagnetic induction heating applies a magnetic force to a cooking container, and then performs cooking using heat generated from the cooking container due to the applied magnetic force. The electronic cooking apparatus generates heat using a magnetic field, so that it may perform cooking without generating air pollution. Further, the electronic cooking apparatus typically has thermal efficiency of about 80% or above, so that it is an excellent cooking machine in an aspect of energy efficiency.

A conventional electronic cooking apparatus typically includes a work coil, to which a current is supplied to generate a magnetic field, an upper plate placed on the work coil to allow a cooking container to be seated thereon, and a ferrite plate placed below the work coil to allow lines of a magnetic force to pass therethrough.

In the conventional electronic cooking apparatus having the above construction, when a current is supplied to the work coil, a magnetic field is formed around the work coil. At this time, magnetic force lines forming the magnetic field form a closed loop that connects the upper plate, an inside of a bottom of the iron cooking container and the ferrite plate.

When the magnetic force lines formed in this way pass through the inside of the bottom of the iron cooking container, an eddy current is generated in the cooking container, and heat is generated from the iron cooking container by an electrical resistance as the eddy current flows. Further, the heat generated from the iron cooking container is transmitted to food placed in the cooking container, and thus the food is cooked.

However, the conventional electronic cooking apparatus is problematic in that it performs cooking in an induction heating manner, so that only an iron container capable of executing induction heating can be used as a cooking container, and a non-iron container cannot be used as a cooking container.

Further, the conventional electronic cooking apparatus is problematic in that, when cooking is performed using only a work coil, a cooking time lengthens if an amount of food increases, so that the electronic cooking apparatus is not suitable for cooking a large amount of food.

SUMMARY OF THE INVENTION

Accordingly, it is an aspect of the present invention to provide a composite cooking apparatus, which cooks by directly generating heat through a heating unit as well as by generating heat using induction heating, thus performing cooking regardless of materials of a cooking container.

It is another aspect of the present invention to provide a composite cooking apparatus, which simultaneously drives an induction heating unit and a heating unit when a large amount of food is cooked, thus quickly performing cooking.

It is a further aspect of the present invention to provide a composite cooking apparatus having a heating unit and an induction heating unit with a work coil having a wire, in which a coating of the wire is radiated with electron beams to strengthen a heat resistance of the induction heating unit, to prevent the induction heating unit from being damaged due to heat generated from the heating unit.

Additional aspects and/or advantages of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

The above and/or other aspects are also achieved by providing a composite cooking apparatus, including a body, a heating unit positioned in the body to generate heat used to heat food, and an induction heating unit positioned adjacent to the heating unit to generate a magnetic field to cook the food by induction heating, the induction heating unit having at least one wire, a coating of which is exposed to an electron beam to strengthen heat resistance thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

These and/or other aspects and advantages of the invention will become apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompanying drawings, of which:

FIG. **1** is a perspective view showing an external shape of a composite cooking apparatus, according to an embodiment of the present invention;

FIG. **2** is a sectional view taken along line II—II of FIG. **1**;

FIG. **3** is a sectional view showing a work coil of the composite cooking apparatus of FIG. **1**; and

FIG. **4** is a front view showing an element wire (magnet wire) forming the work coil of the composite cooking apparatus of FIG. **1**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference will now be made in detail to the embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to the like elements throughout. The embodiments are described below to explain the present invention by referring to the figures.

As is shown in FIG. **1**, a composite cooking apparatus, according to an embodiment of the present invention, includes a body **10** and heat resisting plates **11** placed on a portion of a top surface of the body **10** to allow various cooking containers to be seated thereon. An input unit **13** is placed on a center of a front surface of the body **10** to input operation commands to the composite cooking apparatus. Inlets **12** are positioned in opposite sides of the input unit **13** to draw air used to disperse heat generated from a planar heating element (**30** of FIG. **2**), which will be described later, by allowing the air to move under the planar heating element (**30** of FIG. **2**).

A cylindrical blowing fan **20** is located in a front portion of an inside of the body **10** to compulsorily blow air drawn through the inlets **12** under the planar heating element (**30** of FIG. **2**). A fan motor **21** is provided at an end of the blowing

fan **20** to rotate the blowing fan **20**. Outlets **14** are positioned in a rear surface of the body **10** to discharge air flowing under the planar heating element (**30** of FIG. **2**) to an outside of the body **10**. An auxiliary cabinet **15**, in which a receiving space is formed, is placed below the body **10**.

The composite cooking apparatus of the present invention, constructed as shown in FIG. **2**, is provided with the planar heating element **30**, positioned below the heat resisting plate **11** while coming into contact with the heat resisting plate **11**. The planar heating element **30** is a product, in which high-technology ceramic materials composed of fine particles, and conductive special carbon particles are uniformly distributed on fiber fabric, and which has a uniform heating density and a low power consumption.

When a current is supplied to the planar heating element **30**, heat is generated from the planar heating element **30** and food is heated by the heat. In this way, the planar heating element **30** performs cooking by directly heating a cooking container. The planar heating element **30** is inserted into a groove **35** positioned in a central lower portion of the heat resisting plate **11**, which is seated on top of fixing members **34**.

A work coil **40** is placed below the planar heating element **30**, spaced apart from the planar heating element **30** by a predetermined distance. In this case, the work coil **40** is formed in a shape in which a Litz wire **41** (see FIG. **3**) is wound in a spiral form. Magnetic force lines generated from the work coil **40** pass through an inside of a bottom of the cooking container via the heat resisting plate **11**.

If variations occur in the magnetic force lines passing through the cooking container, a large amount of eddy current is generated inside a bottom of the cooking container, and heat is generated due to an electrical resistance of the cooking container to the eddy current. In this way, the work coil **40** cooks food in an induction heating manner. Because the eddy current should be generated to cook food in the induction heating manner, it is not possible to perform cooking in the induction heating manner with a cooking container made of a non-iron material, because it is incapable of generating the eddy current.

A ferrite plate **31** is positioned below the work coil **40** while coming into contact with the work coil **40**. Ferrite is a solid solution, in which impurities melt in iron having a body-centered cubic crystal structure, and which functions to shield the magnetic force lines generated from the work coil **40** by allowing the magnetic force lines to pass through the ferrite. Therefore, the magnetic force lines generated from the work coil **40** form a loop passing through the ferrite plate **31** placed below the work coil **40** after passing through the inside of the bottom of the cooking container via the heat resisting plate **11**. A support **32** is placed below the ferrite plate **31** to support both the work coil **40** and the ferrite plate **31**.

As noted previously, the planar heating element **30** and the work coil **40** are spaced apart from each other by the predetermined distance, so that an air insulating layer is formed in a space therebetween. In this case, to further improve an insulating effect, air is compulsorily moved through the air insulating layer. Therefore, according to one aspect, the air insulating layer is mainly used as an air moving path **33**.

According to one aspect, the blowing fan **20** is placed on a right side of the air moving path **33** (as is shown in FIG. **2**), to compulsorily blow air into the air moving path **33**. According to one aspect, the blowing fan **20** is a multi-blade cross-flow fan, which provides air drawn through the inlets **12** to the air moving path **33**. An air guiding member **22** is positioned around the blowing fan **20** to guide air blown by the blowing fan **20** to the air moving path **33**.

As is shown in FIGS. **3** and **4**, the work coil **40** of the composite cooking apparatus of the present invention is formed so that the Litz wire **41** is arranged in the spiral form. The Litz wire **41** is formed by binding a plurality of element wires (magnet wires) **50**, in which copper wires or aluminum wires with high electrical conductivity are applied with coatings formed at high temperatures.

Further, each of the element wires **50** of the Litz wire **41** used in the composite cooking apparatus is manufactured in such a way that an inner conductor **52** is covered with a coating **51** made of a high molecular weight compound (for example, polyester) and then an electron beam is radiated onto the coating **51**. When the electron beam is radiated onto the coating **51**, a molecular structure of the coating **51** is changed from an initial linear structure to a mesh structure by a cross linkage phenomenon.

In the cross linkage phenomenon, chemical bonds are formed as in the case where a bridge is placed between any two atoms of a plurality of linearly bound atoms. In this case, covalent bonds are generally formed.

A high molecular weight compound forming chemical bonds by the cross linkage forms a three-dimensional mesh structure. There are at least two methods of: adding a crosslinking agent, and radiating an electron beam.

If the coating **51** of each of the element wires **50** is changed to a mesh structure due to the radiation of the electron beam, mechanical characteristics, heat resistance, chemical resistance, internal stress resistance, and the like are improved compared to the coating with the initial linear structure. Therefore, if the electron beam is radiated onto the coating **51** of each of the element wires **50** forming the work coil **40**, to prevent the work coil **40** from being damaged due to the heat generated from the planar heating element **30**, an internal structure of the coating **51** is changed to strengthen heat resistance, thus effectively isolating radiation heat transmitted to the work coil **40** without installing a separate insulating plate.

According to one aspect, the element wires **50** of the work coil **40** used in the present invention are manufactured so that the coatings **51** of the element wires **50**, onto which electron beams are radiated and which are made of high molecular weight compounds, are covered with magnetic viscosity layers (not shown). Viscosity of the magnetic viscosity layers is low at normal temperatures, and increases if the temperature increases above a predetermined level, so that bonds between the element wires **50** forming the Litz wire **41** are secured.

Hereinafter, an operation of the composite cooking apparatus of the present invention is described.

A user places a cooking container on the heat resisting plate **11** and then inputs an operation command to the composite cooking apparatus through the input unit **13**. The operation command is then transmitted to a control unit (not shown). The control unit analyzes the operation command and then determines which of the planar heating element **30** and the work coil **40** to supply with a current.

If the input operation command requires operations of both the planar heating element **30** and the work coil **40**, the control unit controls an inverter (not shown) to supply a current to both the planar heating element **30** and the work coil **40**.

When the current is supplied to the planar heating element **30**, a temperature of approximately 500° C. or greater is generated from the planar heating element **30** due to a resistance thereof. The resulting heat is transmitted to the cooking container placed on the heat resisting plate **11**.

When a high-frequency current is supplied to the work coil **40**, a magnetic field is formed around the work coil **40**, so that an eddy current is formed in the cooking container due to the magnetic field. The eddy current generates heat

according to an electrical resistance while passing through the cooking container. In this way, the heat generated from both the planar heating element **30** and the work coil **40** is transmitted to cook food.

A part of the heat generated from the planar heating element **30** is transmitted downward from the planar heating element **30** in a heat transmission manner using radiation. The heat emitted downward from the planar heating element **30** reaches the work coil **40**. The bonds between the respective element wires **50** of the Litz wire **41** forming the work coil **40** are further secured due to the radiation of electron beams thereby strengthening heat resistance of the work coil **40**. Thus, the work coil **40** is safely protected against the heat generated from the planar heating element **30**.

While power is supplied to the planar heating element **30**, the control unit moves air through the air moving path **33** by rotating the blowing fan **20**, thus obtaining a superior heat isolating effect.

If sufficient heat is applied to the food and then the cooking has been completed, an OFF command is input by the user, and the controller receives the OFF command to shut off power supplied to both the planar heating element **30** and the work coil **40**, thus terminating the cooking operation.

Through the above process, the operation of the present invention is terminated.

As is apparent from the above description, the present invention provides a composite cooking apparatus that cooks food by directly generating heat through a heating unit as well as by generating heat using induction heating, thus performing cooking regardless of the materials of a cooking container and quickly cooking a large amount of food.

Further, the present invention is advantageous in that it radiates electron beams to coatings of element wires forming a work coil, which is an induction heating unit, to strengthen heat resistance of the coatings, thus preventing the induction heating unit from being damaged due to heat generated from a heating unit without installing a separate insulating plate.

Although an embodiment of the present invention has been shown and described, it would be appreciated by those skilled in the art that changes may be made in this embodiment without departing from the principles and spirit of the invention, the scope of which is defined in the claims and their equivalents.

What is claimed is:

1. A composite cooking apparatus, comprising:
- a body;
- a heating unit positioned in the body to generate heat used to heat food, the heating unit including a fiber fabric having finely particulated ceramic materials and conductive carbon particles uniformly distributed thereon; and
- an induction heating unit positioned adjacent to the heating unit to generate a magnetic field to cook the food by induction heating, the induction heating unit having at least one coated wire,
- wherein a coating of the wire has been exposed to an electron beam that changes a molecular structure of the coating, to strengthen a heat resistance thereof.

2. The composite cooking apparatus according to claim **1**, wherein the molecular structure of the coating is changed from an initial linear structure to a mesh structure after the coating is exposed to the electron beam.

3. The composite cooking apparatus according to claim **1**, wherein the induction heating unit is wound in a spiral.

4. The composite cooking apparatus according to claim **1**, wherein the at least one wire comprises a magnetic viscosity layer.

5. A composite cooking apparatus, comprising:
- a body;
- a planar heating element comprising a fiber fabric having finely particulated ceramic materials and conductive carbon particles uniformly distributed thereon, the planar heating element being placed in the body to generate heat used to heat food; and
- a work coil placed below the heating element to generate a magnetic field to cook the food by induction heating, the work coil being provided with a coating,
- wherein the coating has been exposed to an electron beam that changes a molecular structure of the coating, to strengthen a heat resistance thereof.

6. The composite cooking apparatus according to claim **5**, wherein the molecular structure of the coating is changed from an initial linear structure to a mesh structure after the coating is exposed to the electron beam.

7. The composite cooking apparatus according to claim **5**, wherein the work coil is wound in a spiral.

8. A composite cooking apparatus, comprising:
- a first heating unit generating heat transferred to a cooking container; and
- a second heating unit, comprising a wire with a coating exposed to an electron beam to strengthen a heat resistance of the coating, and selectively generating a magnetic field, magnetic force lines of which pass through a bottom of the cooking container,
- wherein the first heating unit comprises a planar heating element including a fiber fabric having finely particulated ceramic materials and conductive carbon particles uniformly distributed thereon.

9. The composite cooking apparatus according to claim **8**, wherein:
- the second heating unit is adjacent to the first heating unit and separated from the first heating unit by a predetermined space; and
- the composite cooking apparatus further comprises a fan moving air through the predetermined space.

10. The composite cooking apparatus according to claim **9**, further comprising:
- a body having an inlet and an outlet,
- wherein an air moving path is defined between inlet and the outlet to guide air moved by the fan, and includes the predetermined space.

11. The composite cooking apparatus according to claim **8**, wherein when the coating is exposed to the electron beam, linearly bound atoms of the coating form covalent bonds therebetween.

12. The composite cooking apparatus according to claim **8**, wherein the induction heating unit comprises a Litz wire wound in a spiral.

13. A composite cooking apparatus, comprising:
- a body having a cooking surface and air inlets and outlets defining respective ends of an air moving path;
- a heat resisting plate disposed on the cooking surface;
- a planar heating element, contacting the heat resisting plate, and comprising a fiber fabric having finely particulated ceramic materials and conductive carbon particles uniformly distributed thereon;
- an induction heating unit adjacent to the planar heating element and separated from the heating element by a predetermined space, the induction unit comprising a wire with a coating exposed to an electron beam to strengthen a heat resistance thereof; and
- a fan forcing air through the air moving path, the predetermined space being included in the air moving path.

* * * * *

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(12) **United States Patent**
Hoh et al.

(10) **Patent No.: US 7,081,603 B2**
(45) **Date of Patent: Jul. 25, 2006**

(54) **COMPOSITE COOKING APPARATUS**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/878,062**

(22) Filed: **Jun. 29, 2004**

(65) **Prior Publication Data**

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(30) **Foreign Application Priority Data**

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(51) **Int. Cl.**
H05B 6/12 (2006.01)

(52) **U.S. Cl.** **219/601**; 219/620; 219/622; 219/443.1; 219/452.11

(58) **Field of Classification Search** 219/620–627, 219/601, 677, 680, 443.1–452.13; 392/422–431
See application file for complete search history.

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(74) *Attorney, Agent, or Firm*—Staas & Halsey LLP

(57) **ABSTRACT**

A composite cooking apparatus having a body, a heating unit, an induction heating unit, and an insulating plate. The heating unit is positioned in the body to generate heat used to heat food. The induction heating unit is positioned adjacent to the heating unit to generate a magnetic field to cook the food by induction heating. The insulating plate is positioned between the heating unit and the induction heating unit to prevent heat generated from the heating unit from being transmitted to the induction heating unit. Further, the insulating plate is provided with at least one heat reflecting layer to reflect the heat generated from the heating unit.

20 Claims, 3 Drawing Sheets

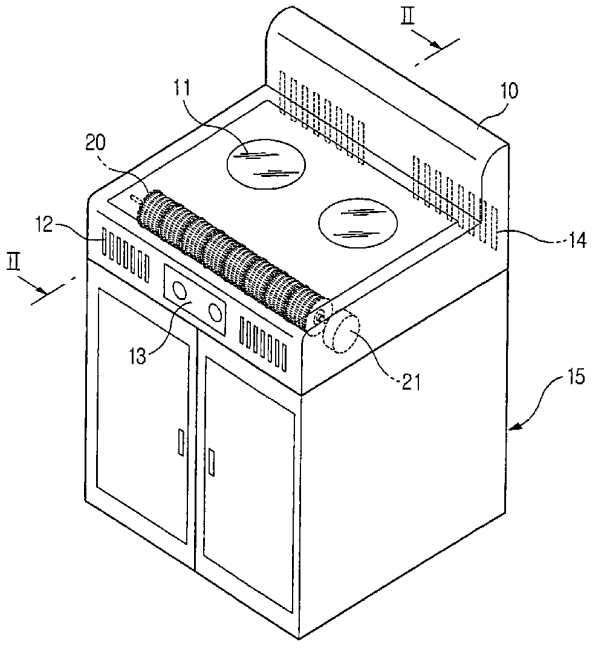


FIG 1

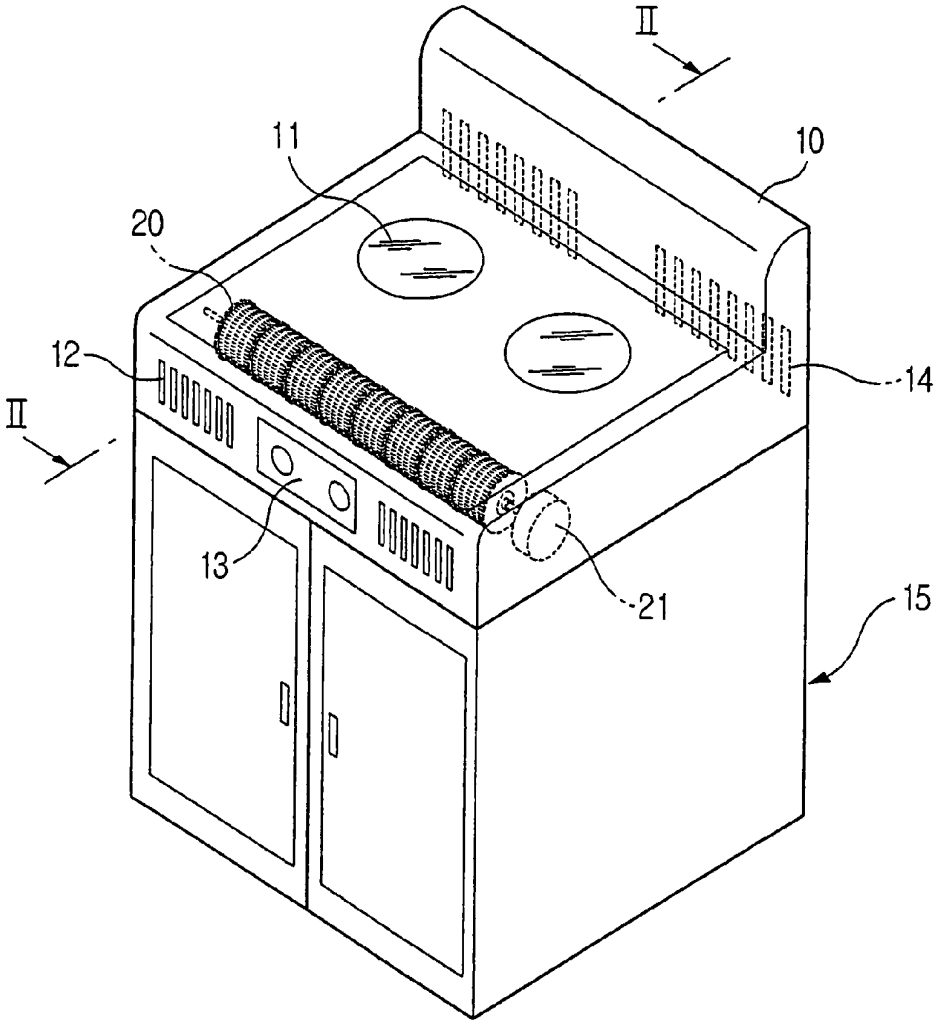


FIG 2

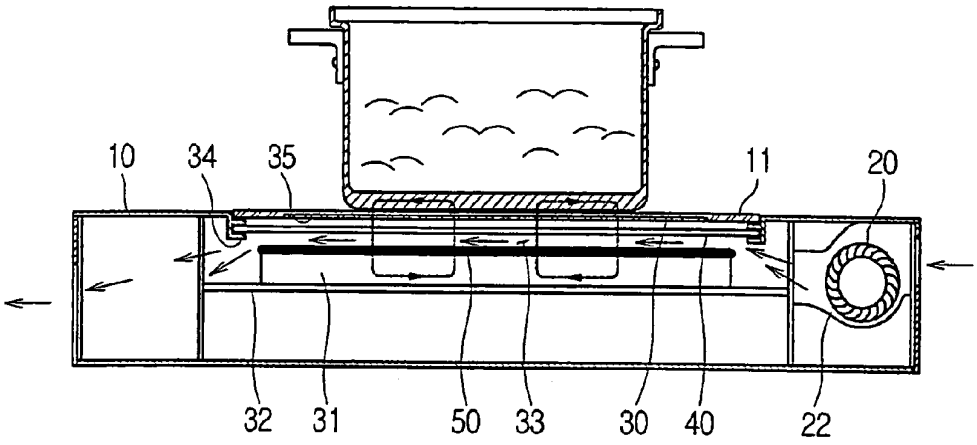
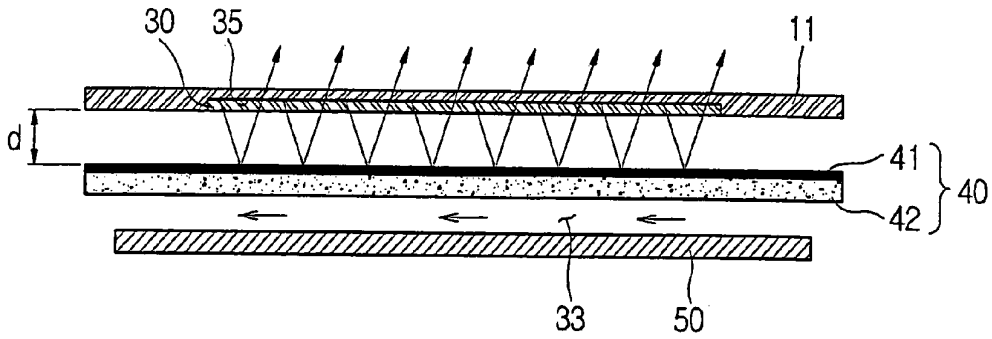


FIG 3



COMPOSITE COOKING APPARATUS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of Korean Patent Application No. 2003-85929, filed Nov. 29, 2003 in the Korean Intellectual Property Office, the disclosure of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates, in general, to composite cooking apparatuses, and more particularly, to a composite cooking apparatus that includes an insulating plate with a heat reflecting layer formed thereon is installed between a planar heating element and a work coil, thus improving an insulating effect.

2. Description of the Related Art

Generally, an electronic cooking apparatus that performs cooking using electromagnetic induction heating applies a magnetic force to a cooking container, and then performs cooking using heat generated from the cooking container due to the applied magnetic force. The electronic cooking apparatus generates heat using a magnetic field, so that it may perform cooking without generating air pollution. Further, the electronic cooking apparatus typically has thermal efficiency of about 80% or above, so that it is an excellent cooking machine in an aspect of energy efficiency.

A conventional electronic cooking apparatus typically includes a work coil, to which a current is supplied to generate a magnetic field, an upper plate placed on the work coil to allow a cooking container to be seated thereon, and a ferrite plate placed below the work coil to allow lines of a magnetic force to pass therethrough.

In the conventional electronic cooking apparatus having the above construction, when a current is supplied to the work coil, a magnetic field is formed around the work coil. At this time, magnetic force lines forming the magnetic field form a closed loop that connects the upper plate, an inside of a bottom of the iron cooking container and the ferrite plate.

When the magnetic force lines formed in this way pass through the inside of the bottom of the iron cooking container, an eddy current is generated in the cooking container, and heat is generated from the iron cooking container by an electrical resistance as the eddy current flows. Further, the heat generated from the iron cooking container is transmitted to food placed in the cooking container, and thus the food is cooked.

However, the conventional electronic cooking apparatus is problematic in that it performs cooking in an induction heating manner, so that only an iron container capable of executing induction heating can be used as a cooking container, and a non-iron container cannot be used as a cooking container.

Further, the conventional electronic cooking apparatus is problematic in that, when cooking is performed using only a work coil, a cooking time lengthens if an amount of food increases, so that the electronic cooking apparatus is not suitable for cooking a large amount of food.

SUMMARY OF THE INVENTION

Accordingly, it is an aspect of the present invention to provide a composite cooking apparatus that cooks by directly generating heat through a heating unit as well as by generating heat using induction heating, thus performing cooking regardless of materials of a cooking container.

It is another aspect of the present invention to provide a composite cooking apparatus, which simultaneously drives an induction heating unit and a heating unit when a large amount of food is cooked, thus quickly performing cooking.

It is a further aspect of the present invention to provide a composite cooking apparatus, in which a heat reflecting layer is positioned on an insulating plate to prevent the induction heating unit from being damaged due to heat generated from the heating unit, thus improving an insulating effect.

Additional aspects and/or advantages of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

The above and/or other aspects are achieved by providing a composite cooking apparatus, including a body, a heating unit positioned in the body to generate heat used to heat food, an induction heating unit positioned adjacent to the heating unit to generate a magnetic field used to cook the food by induction heating, and an insulating plate positioned between the heating unit and the induction heating unit to prevent heat generated from the heating unit from being transmitted to the induction heating unit.

The above and/or other aspects are also achieved by providing a composite cooking apparatus, including a body, a heating element placed in the body to generate heat used to heat food, a work coil disposed in the body to generate a magnetic field to cook the food by induction heating, an insulating plate disposed adjacent to the heating element to prevent heat generated from the heating element from being transmitted to the work coil, and a blowing fan to compulsorily move air through an air moving path positioned between the insulating plate and the work coil.

BRIEF DESCRIPTION OF THE DRAWINGS

These and/or other aspects and advantages of the invention will become apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompanying drawings, of which:

FIG. **1** is a perspective view showing an external shape of a composite cooking apparatus, according to an embodiment of the present invention;

FIG. **2** is a sectional view taken along line II—II of FIG. **1**; and

FIG. **3** is a sectional view showing an insulating plate of the composite cooking apparatus of FIG. **1**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference will now be made in detail to the embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to the like elements throughout. The embodiments are described below to explain the present invention by referring to the figures.

As is shown in FIG. **1**, a composite cooking apparatus, according to an embodiment of the present invention, includes a body **10** and heat resisting plates **11** placed on a portion of a top surface of the body **10** to allow various cooking containers to be seated thereon. An input unit **13** is placed on a center of a front surface of the body **10** to input operation commands to the composite cooking apparatus.

Inlets **12** are positioned in opposite sides of the input unit **13** to draw air used to disperse heat generated from a planar heating element (**30** of FIG. **2**), which will be described later, by allowing the air to move under an insulating plate (**40** of FIG. **2**), which will be described later.

A cylindrical blowing fan **20** is located in a front portion of an inside of the body **10** to compulsorily blow air drawn through the inlets **12** under the insulating plate (**40** of FIG. **2**). A fan motor **21** is provided at an end of the blowing fan **20** to rotate the blowing fan **20**.

Outlets **14** are positioned in a rear surface of the body **10** to discharge air flowing under the insulating plate (**40** of FIG. **2**) to an outside of the body **10**. An auxiliary cabinet **15**, in which a receiving space is formed, is placed below the body **10**.

The composite cooking apparatus of the present invention, constructed as shown in FIG. **2**, is provided with the planar heating element **30**, positioned below the heat resisting plate **11** while coming into contact with the heat resisting plate **11**. The planar heating element **30** is a product, in which high-technology ceramic materials composed of fine particles, and conductive special carbon particles are uniformly distributed on fiber fabric, and which has a uniform heating density and a low power consumption.

When a current is supplied to the planar heating element **30**, heat is generated from the planar heating element **30** and food is heated by the heat. In this way, the planar heating element **30** performs cooking by directly heating a cooking container.

The insulating plate **40** is placed below the planar heating element **30** to prevent the heat generated from the planar heating element **30** from being transmitted to a work coil **50**, which will be described later. According to one aspect, the insulating plate **40** contacts the planar heating element **30**. According to another aspect, the insulating plate **40** is spaced apart from the planar heating element **30** by a predetermined distance to improve an insulating effect. In this case, a spaced interval may be arbitrarily set in consideration of thermal efficiency and the insulating effect.

The insulating plate **40** is inserted into fixing members **34** extended from the top surface of the body **10**. The planar heating element **30** is inserted into a groove **35** positioned in a central lower portion of the heat resisting plate **11**, which is seated on tops of the fixing members **34**.

The work coil **50** is placed below the insulating plate **40**, spaced apart from the insulating plate **40** by a predetermined distance. In this case, the work coil **50** is formed in a shape in which a Litz wire is wound in a spiral form. Magnetic force lines generated from the work coil **50** pass through an inside of a bottom of the cooking container via the insulating plate **40** and the heat resisting plate **11**.

A large amount of eddy current is generated inside the bottom of the cooking container due to the magnetic force lines, and heat is generated by an electrical resistance of the cooking container to the eddy current. In this way, the work coil **50** cooks food in an induction heating manner. Because the eddy current should be generated to cook food in the induction heating manner, it is not possible to perform cooking in the induction heating manner with a non-iron cooking container incapable of generating the eddy current.

A ferrite plate **31** is positioned below the work coil **50** while coming into contact with the work coil **50**. Ferrite is a solid solution, in which impurities melt in iron having a body-centered cubic crystal structure, and which functions to shield the magnetic force lines generated from the work coil **50** by allowing the magnetic force lines to pass through the ferrite. Therefore, the magnetic force lines generated from the work coil **50** form a loop passing through the ferrite plate **31** placed below the work coil **50** after passing through the inside of the bottom of the cooking container via the insulating plate **40** and the heat resisting plate **11**. A support **32** is placed below the ferrite plate **31** to support both the work coil **50** and the ferrite plate **31**.

As noted previously, the insulating plate **40** and the work coil **50** are spaced apart from each other by the predetermined distance, so that an air insulating layer is formed in a space therebetween. In this case, to further improve an insulating effect, air is compulsorily moved through the air insulating layer. Therefore, according to one aspect the air insulating layer is mainly used as an air moving path **33**.

According to one aspect the blowing fan **20** is placed on a right side of the air moving path **33** (as shown in FIG. **2**), to compulsorily blow air into the air moving path **33**. According to one aspect the blowing fan **20** is a multi-blade cross-flow fan, which provides air drawn through the inlets **12** to the air moving path **33**. An air guiding member **22** is positioned around the blowing fan **20** to guide air blown by the blowing fan **20** to the air moving path **33**.

As is shown in FIG. **3**, the insulating plate **40** includes a base plate **42** and a heat reflecting layer **41** coated on a top surface of the base plate **42**. Further, the insulating plate **40** is installed to be spaced apart from the planar heating element **30** by a predetermined distance d to effectively isolate heat transmitted from the planar heating element **30** by heat conduction.

According to one aspect, the base plate **42** of the insulating plate **40** is made of a packing-type insulating material. According to one aspect, the packing-type insulating material has air bubbles. According to another aspect, the packing-type insulating material is made of glass fiber containing asbestos fiber. According to yet another aspect, the packing-type insulating material is made of fireproof brick. According to another aspect, the base plate **42** is made of a material in which boron nitride is added to heat resisting plastic.

According to one aspect, a material with excellent heat reflectance is coated on the heat reflecting layer **41**. Therefore, a material, such as a ceramic film, an aluminum oxide (Al203), or a beryllium oxide (BEO), may be used for the heat reflecting layer **41**. A ceramic is an inorganic non-metal material made through heat-processing at high temperatures, and has high surface luminance, excellent heat resistance and excellent rub resistance. Therefore, when radiation heat generated from the planar heating element **30** comes into contact with the ceramic film coated on the insulating plate **40**, the radiation heat is reflected due to the high surface luminance, so that it may be expected that the insulating effect be improved.

The aluminum oxide and the beryllium oxide are materials with high infrared reflectance. Even though the radiation heat generated from the planar heating element **30** is emitted in an infrared ray form, the radiation heat is reflected from an aluminum oxide layer or a beryllium oxide layer formed on the insulating plate **40**, so that the heat is scarcely transmitted to the work coil **50**. Moreover, infrared rays reflected from the aluminum oxide layer or the beryllium oxide layer are directed again to the cooking container. Therefore, although a same amount of energy is supplied, heat reaching the cooking container increases compared to a case where the aluminum oxide layer or the beryllium oxide layer is not used, thus obtaining additional effect, such as improvement of energy efficiency.

In this way, if the heat reflecting layer is positioned on the insulating plate, radiation heat is reflected close to total reflection even though the radiation heat is emitted from the

planar heating element **30** at high temperatures (typically, 500° C. or above), thus obtaining a considerable insulating effect.

One of the ceramic film, the aluminum oxide layer and the beryllium oxide layer having high heat reflectance may be coated on the base plate **42**. But according to one aspect, to obtain a superior insulating effect, a heat resisting plastic layer may be coated on the base plate **42** and a ceramic film layer may be positioned on the heat resisting plastic layer.

Further, it is also possible to coat a ceramic film layer on the base plate **42**, and form either an aluminum oxide layer or a beryllium oxide layer on the ceramic film layer.

Hereinafter, an operation of the composite cooking apparatus of the present invention is described.

A user places a cooking container on the heat resisting plate **11** and then inputs an operation command to the composite cooking apparatus through the input unit **13**. The operation command is then transmitted to a control unit (not shown). The control unit analyzes the operation command and then determines which of the planar heating element **30** and the work coil **50** to supply with a current.

If the input operation command requires operations of both the planar heating element **30** and the work coil **50**, the control unit controls an inverter (not shown) to supply a current to both the planar heating element **30** and the work coil **50**.

When the current is supplied to the planar heating element **30**, a temperature of approximately 500° C. or greater is generated from the planar heating element **30** due to a resistance thereof. The resulting heat is transmitted to the cooking container placed on the heat resisting plate **11**.

When a high-frequency current is supplied to the work coil **50**, a magnetic field is formed around the work coil **50**, so that an eddy current is formed in the cooking container due to the magnetic field. The eddy current generates heat according to an electrical resistance while passing through the cooking container. In this way, the heat generated from both the planar heating element **30** and the work coil **50** is transmitted to cook food.

A part of the heat generated from the planar heating element **30** is transmitted downward from the planar heating element **30** in a heat transmission manner using radiation. Heat radiant rays emitted downward from the planar heating element **30** reach the heat reflecting layer **41** of the insulating plate **40**, and are reflected from the heat reflecting layer **41** directed upward from the insulating plate **40**. Therefore, an insulating effect is further improved compared to a typical insulating plate.

While power is supplied to the planar heating element **30**, the control unit moves air through the air moving path **33** by rotating the blowing fan **20**, thus obtaining a superior heat isolating effect.

If sufficient heat is applied to the food and then the cooking has been completed, an OFF command is input by the user, and the controller receives the OFF command to shut off power supplied to both the planar heating element **30** and the work coil **50**, thus terminating the cooking operation.

Through the above process, the operation of the present invention is terminated.

As is apparent from the above description, the present invention provides a composite cooking apparatus that cooks food by directly generating heat through a heating unit as well as by generating heat using induction heating, thus performing cooking regardless of the materials of a cooking container and quickly cooking a large amount of food.

Further, the present invention is advantageous in that a heat reflecting layer is formed on an insulating plate, thus preventing an induction heating unit from being damaged due to heat generated from a heating unit.

Although an embodiment of the present invention has been shown and described, it would be appreciated by those skilled in the art that changes may be made in this embodiment without departing from the principles and spirit of the invention, the scope of which is defined in the claims and their equivalents.

What is claimed is:

1. A composite cooking apparatus, comprising:

a body;

a planar heating unit positioned in the body to generate heat used to heat food;

an induction heating unit positioned in the body adjacent to the planar heating unit to generate a magnetic field to cook the food by induction heating; and

an insulating plate positioned between the planar heating unit and the induction heating unit to prevent heat generated from the planar heating unit from being transmitted to the induction heating unit,

wherein the planar heating unit comprises a planar heating element including ceramic particles and carbon particles distributed on a fiber fabric.

2. The composite cooking apparatus according to claim **1**, wherein the insulating plate is provided with at least one heat reflecting layer to reflect the heat generated from the planar heating unit.

3. The composite cooking apparatus according to claim **2**, wherein the at least one heat reflecting layer comprises a ceramic layer.

4. The composite cooking apparatus according to claim **3**, wherein the at least one heat reflecting layer further comprises an aluminum oxide layer adjacent to the ceramic layer.

5. The composite cooking apparatus according to claim **3**, wherein the at least one heat reflecting layer further comprises a beryllium oxide layer adjacent to the ceramic layer.

6. The composite cooking apparatus according to claim **2**, wherein the at least one heat reflecting layer comprises a ceramic layer adjacent to a heat resisting plastic layer positioned on the insulating plate.

7. The composite cooking apparatus according to claim **1**, wherein the insulating plate is spaced apart from the planar heating unit by a predetermined distance.

8. A composite cooking apparatus, comprising:

a body;

a planar heating element placed in the body to generate heat used to heat food;

a work coil disposed in the body to generate a magnetic field to cook the food by induction heating;

an insulating plate disposed adjacent to the heating element to prevent heat generated from the planar heating element from being transmitted to the work coil; and

a blowing fan to compulsorily move air through an air moving path positioned between the insulating plate and the work coil,

wherein the planar heating element comprises ceramic particles and carbon particles distributed on a fiber fabric.

9. The composite cooking apparatus according to claim **8**, wherein the insulating plate is provided with at least one heat reflecting layer to reflect the heat generated from the planar heating element.

10. The composite cooking apparatus according to claim 9, wherein the at least one heat reflecting layer comprises a ceramic layer.

11. The composite cooking apparatus according to claim 10, wherein the at least one heat reflecting layer further comprises an aluminum oxide layer adjacent to the ceramic layer.

12. The composite cooking apparatus according to claim 10, wherein the at least one heat reflecting layer further comprises a beryllium oxide layer adjacent to the ceramic layer.

13. The composite cooking apparatus according to claim 9, wherein the at least one heat reflecting layer comprises a ceramic layer adjacent to a heat resisting plastic layer positioned on the insulating plate.

14. The composite cooking apparatus according to claim 8, wherein the insulating plate is spaced apart from the planar heating element by a predetermined distance.

15. The composite cooking apparatus according to claim 8, wherein the body is provided with at least one inlet to draw the air into the body and at least one outlet to discharge air moved through the air moving path to an outside of the body.

16. A composite cooking apparatus, comprising:

a first heating unit generating heat transferred to a cooking container; and

a second heating unit, selectively generating a magnetic field, magnetic force lines of which pass through a bottom of the cooking container; and

an insulating plate disposed between the first and second heating units to protect the second heating unit from the heat generated by the first heating unit,

wherein the first heating unit comprises a planar heating element and is disposed in a fixed position on top of the second heating unit, and

the planar heating element includes ceramic particles and carbon particles distributed on a fiber fabric.

17. The composite cooking apparatus according to claim 16, wherein the insulating plate comprises:

a base plate; and

at least one heat reflecting layer.

18. The composite cooking apparatus according to claim 17, wherein the at least one heat reflecting layer has a high surface luminance.

19. The composite cooking apparatus according to claim 17, wherein the at least one heat reflecting layer has a high infrared reflectance.

20. A composite cooking apparatus, comprising:

a conduction heating unit;

an induction heating unit, the conduction and induction heating units being driven simultaneously to speed cooking; and

an insulating plate disposed between the conduction and induction heating units to protect the induction heating unit from the heat generated by the conduction heating element,

wherein the conduction heating unit comprises a planar heating element including ceramic particles and carbon particles distributed on a fiber fabric.

* * * * *

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(54) FUSING DEVICE FOR AN ELECTROPHOTOGRAPHIC IMAGE FORMING APPARATUS

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Publication Classification

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(52) **U.S. Cl.** **399/328**; 432/60; 399/330

(57) **ABSTRACT**

A fusing device for an electrophotographic image forming apparatus. The fusing device includes a heat pipe, both ends of which are sealed and in which a predetermined amount of a working fluid is contained, a cylindrical roller which surrounds the heat pipe, and a heating element which is installed between the cylindrical roller and the heat pipe. The working fluid is supercooled at room temperature, and crystallizing and producing heat when acted on by a mechanical force, and at least one mechanical unit applies a mechanical force to the heat pipe and crystallizes the supercooled working fluid.

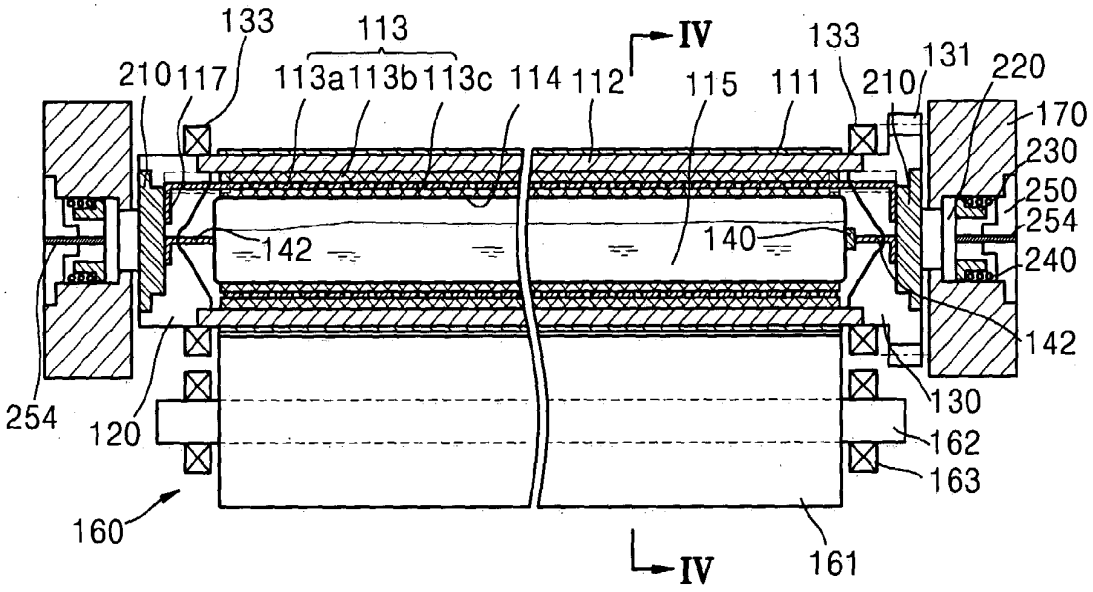


FIG. 1 (PRIOR ART)

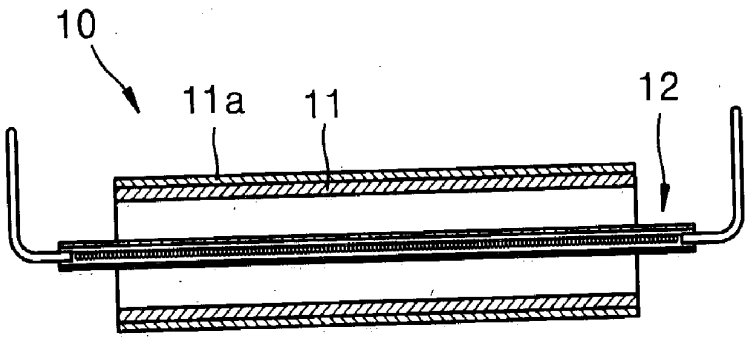


FIG. 2 (PRIOR ART)

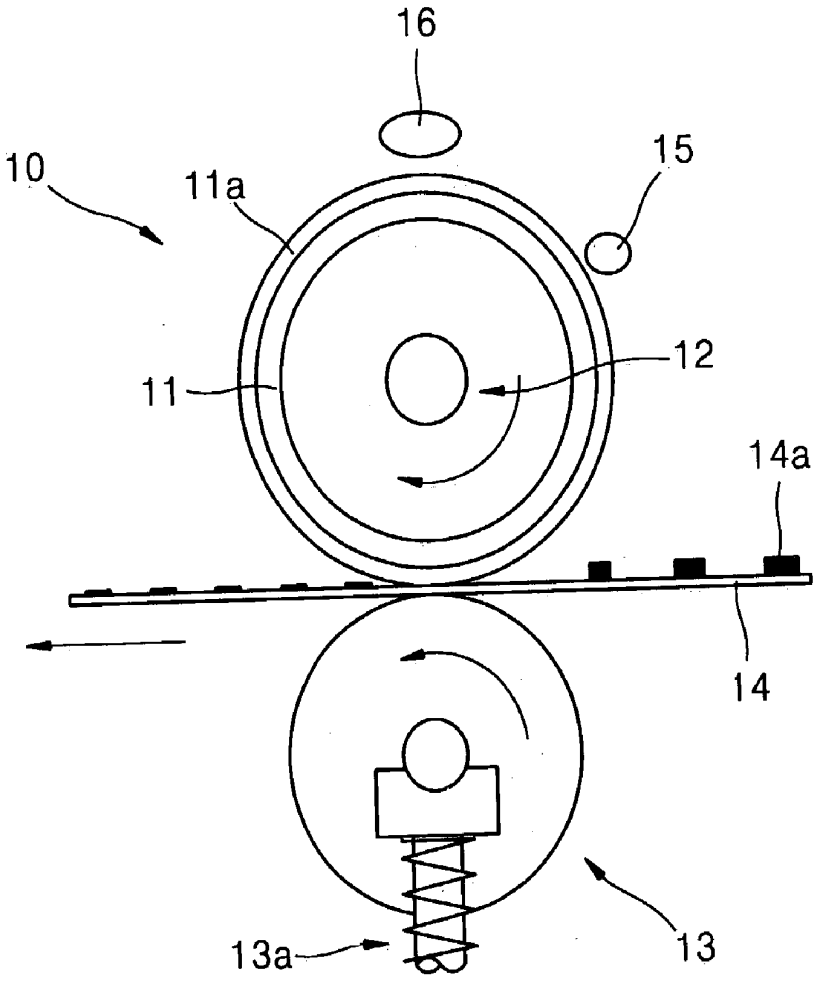
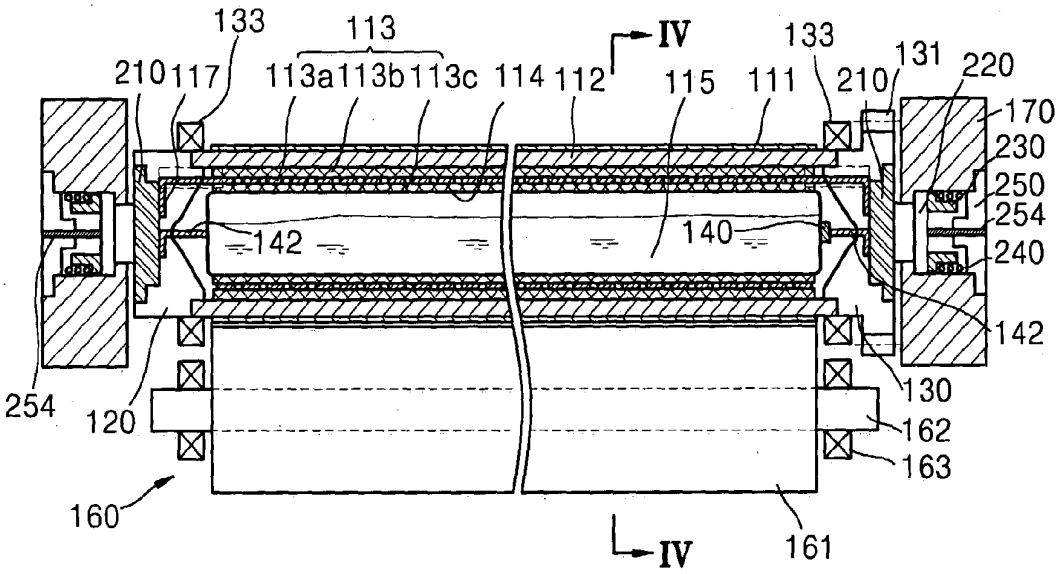


FIG. 3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113
IV
133
131
220
210
117
113a
113b
113c
114
112
115
111
210
170
230
250
254
240
142
140
142
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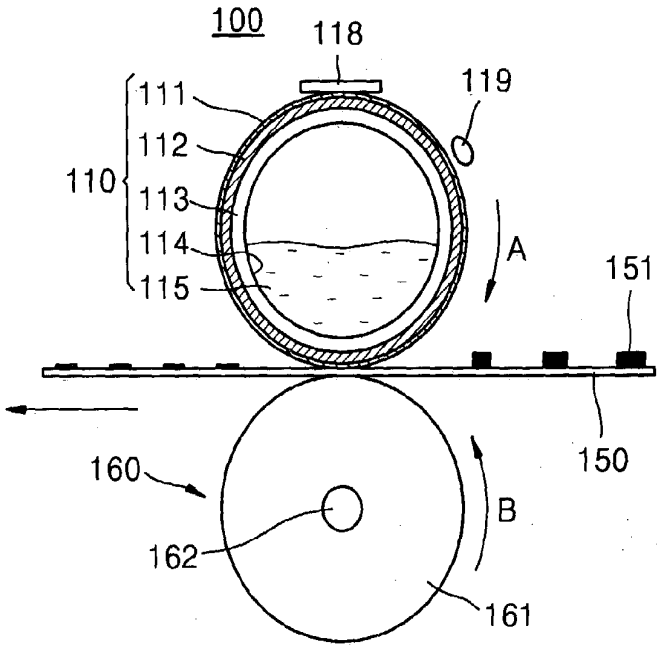
120
130
162
163
160
161
IV

FIG. 4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151
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B
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FIG. 5A

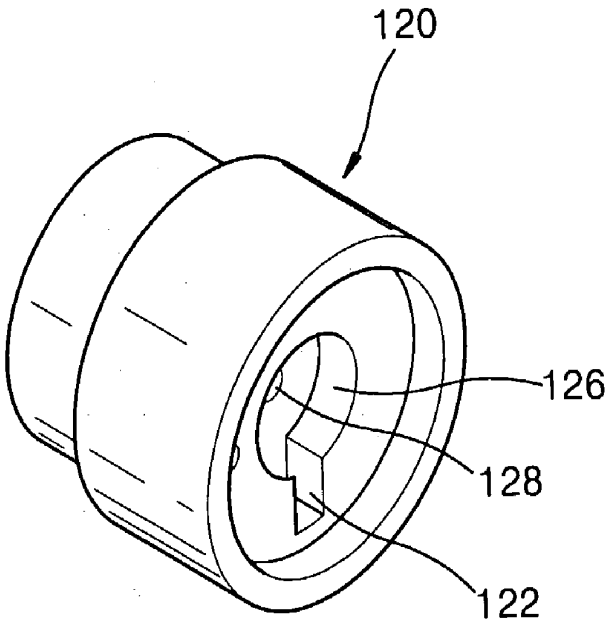


FIG. 5B

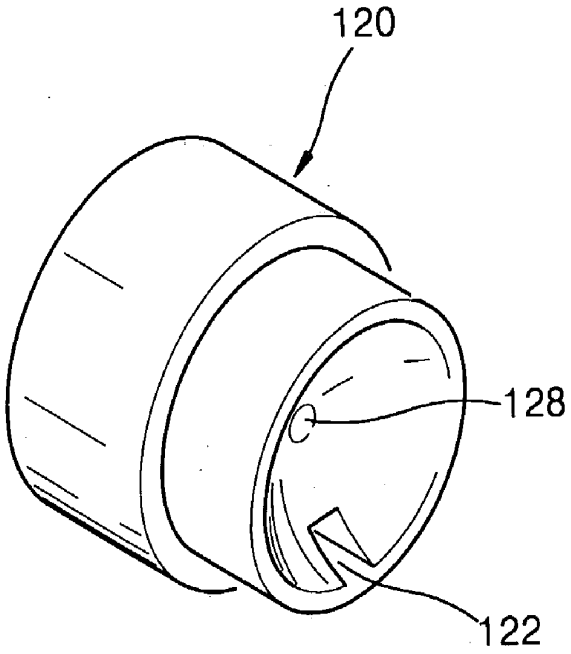


FIG. 6A

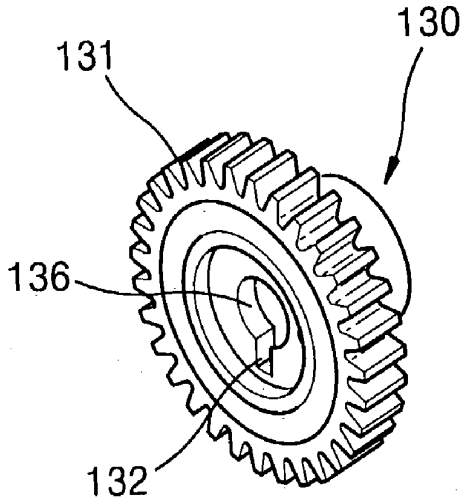


FIG. 6B

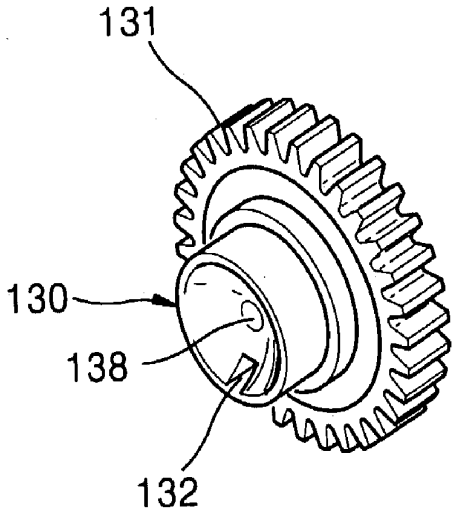
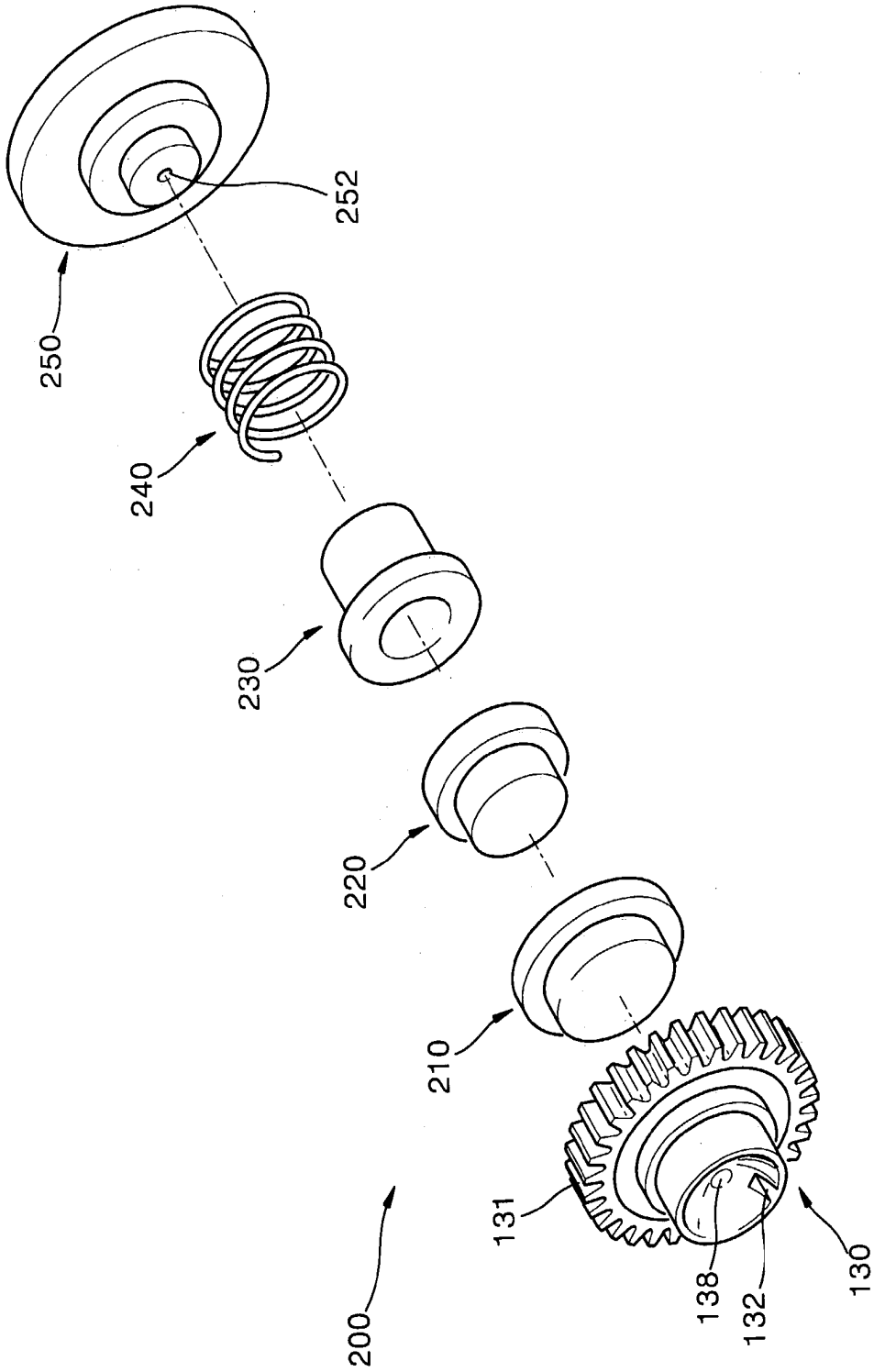


FIG. 7



FUSING DEVICE FOR AN ELECTROPHOTOGRAPHIC IMAGE FORMING APPARATUS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the priority of Korean Patent Application No. 2002-64545, filed on Oct. 22, 2002, in the Korean Intellectual Property Office, the disclosure of which is incorporated herein in its entirety by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to a fusing device for an electrophotographic image forming apparatus, and more particularly, to a fusing device for an electrophotographic image forming apparatus that uses heat generated when supercooled sodium acetate is crystallized, for an instant rising temperature of a fusing roller.

[0004] 2. Description of the Related Art

[0005] In general, an electrophotographic printer includes a fusing device which heats the paper onto which a toner image is transferred, melts the toner image in a powder state on the paper, and fuses the melted toner image on the paper. The fusing device includes a fusing roller which fuses toner onto the paper, and a pressing roller which pushes the paper against the fusing roller.

[0006] **FIG. 1** is a schematic profile cross-sectional view of a conventional fusing roller using a halogen lamp as a heat source, and **FIG. 2** is a schematic frontal cross-sectional view of a conventional fusing device using the fusing roller of **FIG. 1**. Referring to **FIG. 1, a** fusing roller **10** includes a cylindrical roller **11** and a halogen lamp **12** installed inside the cylindrical roller **11**. A TEFLON® coating layer **11***a* is formed on a circumference of the cylindrical roller **11**. The cylindrical roller **11** is heated by radiant heat generated from the halogen lamp **12**.

[0007] Referring to **FIG. 2, a** pressing roller **13** is placed under the fusing roller **10** to be opposite to the fusing roller **10**, and paper **14** is placed between the fusing roller **10** and the pressing roller **13**. The pressing roller **13** is elastically supported by a spring **13***a*. The pressing roller **13** closely adheres the paper **14**, which is passing between the fusing roller **10** and the pressing roller **13**, to the fusing roller **10** with a predetermined pressure. In this case, the toner image **14***a*, which is formed on the paper **14** in a powder state, is fused on the paper **14** due to the predetermined pressure and heat while passing between the fusing roller **10** and the pressing roller **13**.

[0008] A thermistor **15** and a thermostat **16** are installed at one side of the fusing roller **10**. The thermistor **15** measures a surface temperature of the fusing roller **10**, and the thermostat **16** cuts off power supplied to the halogen lamp **12** when the surface temperature of the fusing roller **10** exceeds a predetermined value. The thermistor **15** measures the surface temperature of the fusing roller **10** and transmits an electrical signal corresponding to the measured temperature to a controller (not shown) of a printer (not shown). The controller controls the power supplied to the halogen lamp **12** according to the measured temperature and maintains the surface temperature of the fusing roller **11** within a given range. When the temperature of the fusing roller **11** exceeds the predetermined set value because the controller fails in controlling the temperature of the fusing roller **11**, a contact (not shown) of the thermostat **16** becomes open to cut off the supply of power to the halogen lamp **12**.

[0009] Power consumption of a conventional fusing device using the halogen lamp **12** as a heat source is large. In particular, the conventional fusing device requires a fairly long warming-up time when power is supplied to the fusing device. Thus, a new fusing device having a short warming-up time is required.

SUMMARY OF THE INVENTION

[0010] The present invention provides a fusing device for an electrophotographic image forming apparatus that reduces a warming-up time by using melting heat of a supercooled working fluid during cold-start of the fusing device.

[0011] According to one aspect of the present invention, there is provided a fusing device for an electrophotographic image forming apparatus. The device includes a heat pipe, both ends of which are sealed and in which a predetermined amount of a supercooled working fluid capable of crystallizing and producing heat when acted on by a mechanical force is contained, a cylindrical roller which surrounds the heat pipe, and a heating element which is installed between the cylindrical roller and the heat pipe. At least one mechanical unit, which applies a mechanical force to the heat pipe and crystallizes the supercooled working fluid, is provided.

[0012] Also, the device may further include a cooling fan which supercools the working fluid.

[0013] Also, the mechanical unit may be a vibrator attached to one end side of the heat pipe.

[0014] Also, the vibrator may include a timer which operates the vibrator for several seconds only during cold-start.

[0015] Also, the vibrator may further include a motor, and the motor and the heating element may be connected in parallel to an external power supply.

[0016] Additional aspects and/or advantages of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] The above and/or other aspects and advantages of the present invention will become more apparent by describing in detail preferred embodiments thereof with reference to the attached drawings in which:

[0018] **FIG. 1** is a schematic profile cross-sectional view of a conventional fusing roller using a halogen lamp as a heat source;

[0019] **FIG. 2** is a schematic frontal cross-sectional view of a conventional fusing device using the fusing roller of **FIG. 1**.

[0020] **FIG. 3** is a schematic frontal cross-sectional view of a fusing device for an electrophotographic image forming apparatus according to an embodiment of the present invention;

[0021] **FIG. 4** is a cross-sectional view taken along line IV-IV of **FIG. 3**;

[0022] **FIGS. 5A and 5B** are perspective views of a first end cap of **FIG. 3**;

[0023] **FIGS. 6A and 6B** are perspective views of a second end cap of **FIG. 3**; and

[0024] **FIG. 7** is an exploded perspective view of a power connection unit of **FIG. 3**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0025] Reference will now be made in detail to the present preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to the like elements throughout. The embodiments are described below in order to explain the present invention by referring to the figures. Thicknesses of layers or regions shown in drawings are exaggerated for clarity of the specification.

[0026] **FIG. 3** is a schematic frontal cross-sectional view of a fusing device for an electrophotographic image forming apparatus according to a first embodiment of the present invention, and **FIG. 4** is a cross-sectional view taken along line IV-IV of **FIG. 3**. Referring to **FIGS. 3 and 4**, a fusing device **100** includes a fusing roller **110** having a cylindrical roller **112** which rotates in a direction in which a sheet of printer paper **150** having a toner image **151** thereon is ejected, i.e., in a direction indicated by an arrow A, and a pressing roller **160** which is installed to face the fusing roller **110** through the paper **150** therebetween and rotates in a direction indicated by an arrow B to be in a contact with the fusing roller **110**.

[0027] A toner protective layer **111** is formed of TEFLON® to a predetermined thickness, i.e., at a thickness of 20-30 μm, on the cylindrical roller **112**. A heater **113** is disposed on an inner surface of the cylindrical roller **112**, and a heat pipe **114**, both ends of which are sealed, is disposed on an inner surface of the heater **113**.

[0028] Meanwhile, a thermistor **118**, which measures a surface temperature of the fusing roller **110**, is installed on the toner protective layer **111**. Also, a thermostat **119** is installed at one side of the toner protective layer **111** and cuts off power supplied to the heater **113** and prevents overheating when the surface temperature of the fusing roller **110** is rapidly increased.

[0029] The heater **113** includes an Ni—Cr resistive coil **113***a* which generates heat by electricity supplied from an external power supply. Mica sheets **113***b* and **113***c*, which are insulating layers, are placed on and under the resistive coil **113***a*. The heater **113** includes a lead **117** which connects electricity to the resistive coil **113***a* formed on both ends of the heater **113**. A Cr—Fe coil may be used as the resistive coil **113***a* in one embodiment of the present invention.

[0030] The heat pipe **114** is formed in a tube shape, and both ends of the pipe are sealed. A predetermined amount of a working fluid **115** is contained in the heat pipe **114**. The working fluid **115** is a sodium acetate solvent and exists in a supercooled liquid state at a room temperature. In general, the sodium acetate solvent is used as a heat pack. The sodium acetate solvent is increased to a predetermined temperature, i.e., 54 C, when the sodium acetate is crystallized by an external shock. Also, if the temperature of the sodium acetate solvent exceeds 120 C due to heat generated in the heater **113**, water, which is mixed with the sodium acetate to form the sodium acetate solvent, is separated from the sodium acetate. The separated water, as well as water remaining in the sodium acetate solvent, is vaporized, and thus, the working fluid **115** serves as a thermal medium which transfers the heat to the cylindrical roller **112**, prevents a temperature deviation on the surface of the cylindrical roller **112**, and heats the overall cylindrical roller **112** within a short time.

[0031] If a sodium acetate solvent in which 10 g of sodium acetate mixed with 75 g of water is used as the working fluid **115**, and the sodium acetate solvent supercooled at a room temperature is stimulated, sodium acetate is crystallized, and the temperature of the sodium acetate solvent is increased to about 54 C. Here, if the percentage of sodium acetate in a sodium acetate solvent is increased, the temperature due to crystallization is increased, but the increase is very slight. Thus, preferably, the ratio of sodium acetate to water in the sodium acetate solvent is 100-150% by weight. The working fluid **115** takes a volume ratio of 5-70% with respect to the volume of the heat pipe **114**, preferably, 50-65%. A volume ratio of the working fluid **115** less than 5% is not preferable because a dry out is highly likely to occur.

[0032] Meanwhile, preferably, a cooling device, for example, a cooling fan (not shown), is provided at one side of the fusing roller **110**. When the image forming apparatus is off, the cooling fan may be used to supercool the sodium acetate solvent in the heat pipe **114**.

[0033] The heat pipe **114** is formed of copper (Cu), aluminum (Al), or aluminum alloy. The cylindrical roller **112** is heated by the heater **113** and by the vaporized heat generated from the working fluid **115** in the heat pipe **114**. The heat transferred to the cylindrical roller **12** then fuses the toner **151**, which is in a powder state formed on the paper **150**. The cylindrical roller **112** is formed of stainless steel, aluminum (Al), or copper (Cu)

[0034] A vibrator **140**, which is electrically driven, is attached to one end side of the heat pipe **114**. During a cold-start, an externally-controlled power is supplied to the vibrator **140**, and the vibrator **140** is driven by a timer for a predetermined amount of time. The vibrator **140** vibrates one end side of the heat pipe **114** to vibrate the sodium acetate solvent **115**, thereby solidifying the sodium acetate solvent **115**. Due to a heat generated in the solidifying process, the working fluid **115** is instantaneously increased to a predetermined temperature, for example, 54 C. Power connection to a motor of the vibrator **140** will be described later.

[0035] First and second end caps **120** and **130** are inserted in both ends of the cylindrical roller **112**. The structure of the second end cap **130** is substantially similar to the first end cap **120**, the significant difference being that a gear **131** is formed along an outer surface of the second end cap **130**. The gear on the outer surface of the second end cap **130** is engaged with a gear (not shown) of a motor (not shown), and is rotated by that motor's gear. Also, bearings **133** are installed at both ends of the fusing roller **110** to support the rotating fusing roller **110**.

[0036] **FIGS. 5A and 5B** are perspective views of a first end cap **120** of **FIG. 3**, and **FIGS. 6A and 6B** are perspec-

tive views of a second end cap **130** of **FIG. 3**. Referring to **FIGS. 5A through 6B**, lead holes **122** and **132**, through which a lead (**142** of **FIG. 3**) is connected to both ends of the resistive coil **113***a*, and lead holes **128** and **138**, through which a lead (**142** of **FIG. 3**) is connected to a motor (not shown) of the vibrator **140**, are formed in the first and second end caps **120** and **130**, respectively. One terminal of the motor of the vibrator **140** is connected to one end side of the heat pipe **114**, and is connected to external power through the lead **142** provided at the other end side of the heat pipe **114**. The other terminal of the motor of the vibrator **140** is connected to the external power through the lead **142**. Thus, the heater **113** and the motor of the vibrator **140** are connected in parallel to the external power, and a controlled power is supplied to the heater **113** and the motor of the vibrator **140**. Electrode grooves **126** and **136**, in which an electrode **210** is inserted, are formed at the center of the first and second end caps **120** and **130** opposite to the end of the heat pipe **114**. The electrode **210** supplies electricity to the leads **117** and **142** which pass through the lead holes **122**, **132**, **128**, and **138**, respectively.

[**0037**] **FIG. 7** is an exploded perspective view of a power connection unit **200** connected to the second end cap **130**. Referring to **FIG. 7**, the power connection unit **200** is installed in a frame (**170** of **FIG. 3**) and transfers external power to the heater **113**. The power connection unit **200** includes an electrode **210** inserted in the electrode grooves **126** and **136**, a brush **220** which contacts the electrode **210**, and an elastic element **240** which closely adheres the brush **220** to the electrode **210** for an electrical contact. The brush **220** is connected to a lead (**254** of **FIG. 3**) supplied from an external power supply and transfers electricity to the electrode **210**.

[**0038**] The elastic element **240** provides an elastic force to a spacer **230** so that the brush **220** is closely adhered to the electrode **210**. Even though thermal expansion or thermal contraction repeatedly occurs while the fusing roller **110** is operated, the elastic element **240** absorbs the resulting deformation to prevent the brush **220** from being isolated from the electrode **210**. Preferably, a compression spring is used as the elastic element **240**. In this embodiment, a lead (**254** of **FIG. 3**) from the external power supply is connected to the brush **220** through a lead hole **252**. In this embodiment, the lead **254** and the elastic element **240** could make incidental contact, and sparks could occur. Thus, the spacer **230** is installed between the brush **220** and the elastic element **240**, in order to prevent a spark and also to prevent the end cap **130** from contacting the frame **170** due to the drawn-back brush **220**.

[**0039**] An end of the elastic element **240** is confined in the frame **170** by an insulating plate **250**. The insulating plate **250** supports the elastic element **240**. Thus, the brush **220** is first installed in a through hole formed in the frame **170**. Then the spacer **230** and the elastic element **240** are installed in the through hole. Next, the insulating plate **250** is installed so that the elastic element **240** is not drawn back.

[**0040**] The first and second end caps **120** and **130** may be made of a resin, such as polyphenylene sulfide (PPS), in which a filler material such as glass fiber, having small thermal deformation even at a high temperature, is inserted. Poly butylene terephthalate (PBT) and nylon are other possible preferred materials for the first and second end caps **120** and **130**.

[**0041**] The pressing roller **160** includes an elastic roller **161**, which contacts the fusing roller **110** and forms a fusing nip therebetween, and a shaft **162** which supports the elastic roller **161**. Bearings **163**, disposed at the circumference of the end of the shaft **162**, support the pressing roller **160**.

[**0042**] A process of manufacturing the fusing device **110** of an electrophotographic image forming apparatus having the above structure according to the present invention will be described below.

[**0043**] One end of a nearly cylindrical tube, which will be used as the heat pipe **114**, is sealed. An injection hole is formed at the other end of the cylindrical tube, through which a compression medium supplied from outside, i.e., a compressed liquid, is injected. In this case, it is preferable that deformation is reduced during the enlarging process at both ends of the cylindrical tube by forging both the ends in advance to remove a ductility and to planarize. Next, a circumference of the cylindrical tube **114** is wound by a mica sheet **113***c*. Then the resistive coil **113***a* is wound around the mica sheet **113***c*. Subsequently, the circumference of the cylindrical tub **114** wound by the resistive coil **113***a* is again wound by a mica sheet **113***b*. Next, the cylindrical tube **114** is inserted inside the cylindrical roller **112**, an outer surface of which is coated with TEFLON®. Subsequently, the compression medium is injected into the cylindrical tube **114** through the injection hole at the end of the cylindrical tube **114** under a predetermined pressure, i.e., 150 bars, and thereby the cylindrical tube **114** is enlarged. As a result, the cylindrical tube **114** and the heater **113** are closely adhered to the inside of the cylindrical roller **112**. Therefore, the cylindrical tube **114** is enlarged, and an air gap is not formed between the heater **113** and the cylindrical roller **112**, thus improving heat transfer efficiency.

[**0044**] The operation of the fusing device for an electrophotographic image forming apparatus having the above structure according to the present invention will be described in detail with reference to the accompanying drawings.

[**0045**] First, a cold start of the fusing device, in which the heat pipe filled with a predetermined volume of a sodium acetate solvent in a supercooled state at a room teperature is installed, will be described. If a controlled power is supplied from the external lead **254**, this power is connected to the lead **117** of the heater **113** and the lead **142** of the motor of the vibrator **140** through the brush **220** and the electrode **210**. Then, the vibrator **140** is driven by the timer for a predetermined amount of time and vibrates part of the sodium acetate solvent **115** in the heat pipe **114**. Due to this vibration, part of the sodium acetate starts to be crystallized and heated such that the temperature of the working fluid **115** is increased to 54 C. As a result, the heat pipe **114** is increased to a predetermined temperature. Heat is also generated at the resistive coil **113***a*. Most of the heat generated at the heater **113** is transferred to the cylindrical roller **112**. As such, the fusing roller **110** is rapidly increased to a target temperature, i.e., 180 C.

[**0046**] Subsequently, heat generated at the heater **113** is transferred to the heat pipe **114**. Due to this heat, the temperature of the heat pipe **114** is increased. If the temperature of the heat pipe **114** is increased over 120 C, the water which was mixed with the sodium acetate in the heat pipe **114** is heated and vaporized, and the heat formed by

producing this steam is transferred to the cylindrical roller **112** through the heater **113** installed on the circumference of the heat pipe **114**. Heat generated at the heater **113** and heat generated at the working fluid **115** is transferred to the cylindrical roller **112** such that the fusing roller **110** is maintained at a predetermined temperature. In particular, a heat transfer rate of the steam in the heat pipe **114** is high. Thus, a temperature deviation on the surface of the fusing roller **110** can be greatly decreased, and printing quality of the fusing device **100** is improved.

[**0047**] Subsequently, in a printing mode, the toner **151** is transferred in a powder state onto the paper **150**, and the paper **150** passes between the fusing roller **110** and the pressing roller **160**, and the toner **151** is fused onto the paper **150** by the fusing roller **110** maintained at a predetermined temperature.

[**0048**] Meanwhile, as the fusing roller **110** fuses the paper **150**, the heat of the fusing roller **110** is taken to the paper **150**, and the steam inside the heat pipe **114** loses heat and is liquefied. Then, the working fluid **115**, to which heat is transferred by the heater **114**, is vaporized such that the surface temperature of the fusing roller **110** is maintained at a target temperature suitable for fusing the toner **151** onto the paper **150**. As such, the working fluid **115** in the heat pipe **114** serves as a thermal medium which repeatedly performs vaporization and liquefaction and maintains the fusing roller **110** at a predetermined temperature.

[**0049**] In general, a fusing temperature of a toner image is about 160-190 C. The fusing device **100** according to the present invention reaches the target temperature within about 12 seconds. The thermistor **118** measures the surface temperature of the fusing roller **110** and a controller (not shown) maintains the surface temperature of the fusing roller **110** within a predetermined range suitable for fusing the toner **151** onto the paper **150**. If adjustment of the surface temperature fails and the surface temperature of the fusing roller **110** rapidly increases, the thermostat **119** cuts off the power connection unit **200** connected to the thermostat **119** through a mechanical operation and prevents a rapid increase in the surface temperature of the fusing roller **110**. This power supply operation may be varied according to a set temperature, and may be performed using various controlling methods such as periodic on/off, pulse width modulation (PWM), or proportional and integral (PI).

[**0050**] Meanwhile, if an electrophotographic image forming apparatus having a fusing device according to the present invention is entered into a long-term standstill state, and the fusing device **100** stops, the cooling fan at one side of the image forming apparatus is operated such that the working fluid, including sodium acetate, is supercooled, and the supercooled sodium acetate solvent is again formed in the heat pipe **114**.

[**0051**] As described above, in the fusing device for an electrophotographic image forming apparatus according to the present invention, during a cold-start, a warming-up time can be reduced using a melting heat of a supercooled sodium acetate solvent, and in a printing mode, the surface temperature of a fusing roller can be uniformly maintained using a thermal medium in the heat pipe.

[**0052**] Although a few preferred embodiments of the present invention have been shown and described, it would be appreciated by those skilled in the art that changes may be made in this embodiment without departing from the principles and spirit of the invention, the scope of which is defined in the claims and their equivalents.

What is claimed is:

1. A fusing device for an electrophotographic image forming apparatus, the device comprising:

a heating pipe, both ends of which are sealed and in which a predetermined amount of a working fluid is contained, wherein the working fluid is supercooled at room temperature, and crystallizing and producing heat when acted on by a mechanical force;

a cylindrical roller which surrounds the heat pipe;

a heating element which is installed between the cylindrical roller and the heating pipe;

at least one mechanical unit which applies the mechanical force to the heating pipe and crystallizes the supercooled working fluid; and

a pressing roller which closely adheres to the fusing roller.

2. The device of claim 1, wherein the working fluid is a sodium acetate solvent.

3. The device of claim 2, wherein the sodium acetate solvent has a volume ratio of 50-65% with respect to the volume of the heating pipe.

4. The device of claim 2, wherein the ratio of sodium acetate to water in the sodium acetate solvent is 100-150% by weight.

5. The device of claim 1, further comprising a cooling fan which supercools the working fluid.

6. The device of claim 1, wherein the mechanical unit is attached to one end side of the heating pipe.

7. The device of claim 6, wherein the mechanical unit is a vibrator.

8. The device of claim 7, wherein the vibrator includes a timer which operates the vibrator for several seconds only during cold-start.

9. The device of claim 7, wherein the vibrator includes a motor, and the motor and the heating element are connected in parallel to an external power supply.

10. The device of claim 9, wherein one terminal of the motor is connected to one end side of the heat pipe, and the remaining side of the heat pipe and the remaining terminal of the motor are each connected to the external power supply.

* * * * *

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(54) COMPOSITE COOKING APPARATUS

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(57) **ABSTRACT**

A composite cooking apparatus having a body, a heating unit, an induction heating unit, and an insulating plate. The heating unit is positioned in the body to generate heat used to heat food. The induction heating unit is positioned adjacent to the heating unit to generate a magnetic field to cook the food by induction heating. The insulating plate is positioned between the heating unit and the induction heating unit to prevent heat generated from the heating unit from being transmitted to the induction heating unit. Further, the insulating plate is provided with at least one heat reflecting layer to reflect the heat generated from the heating unit.

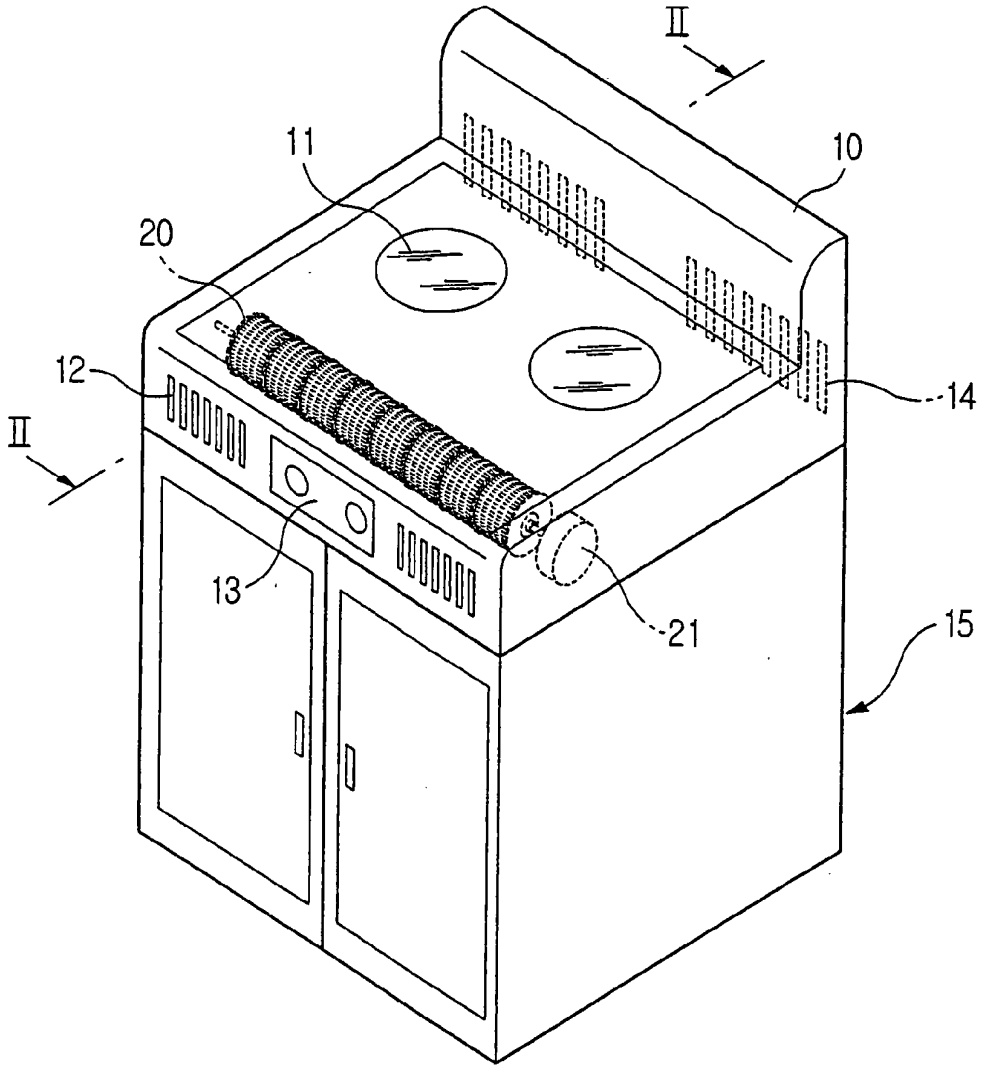


FIG 1

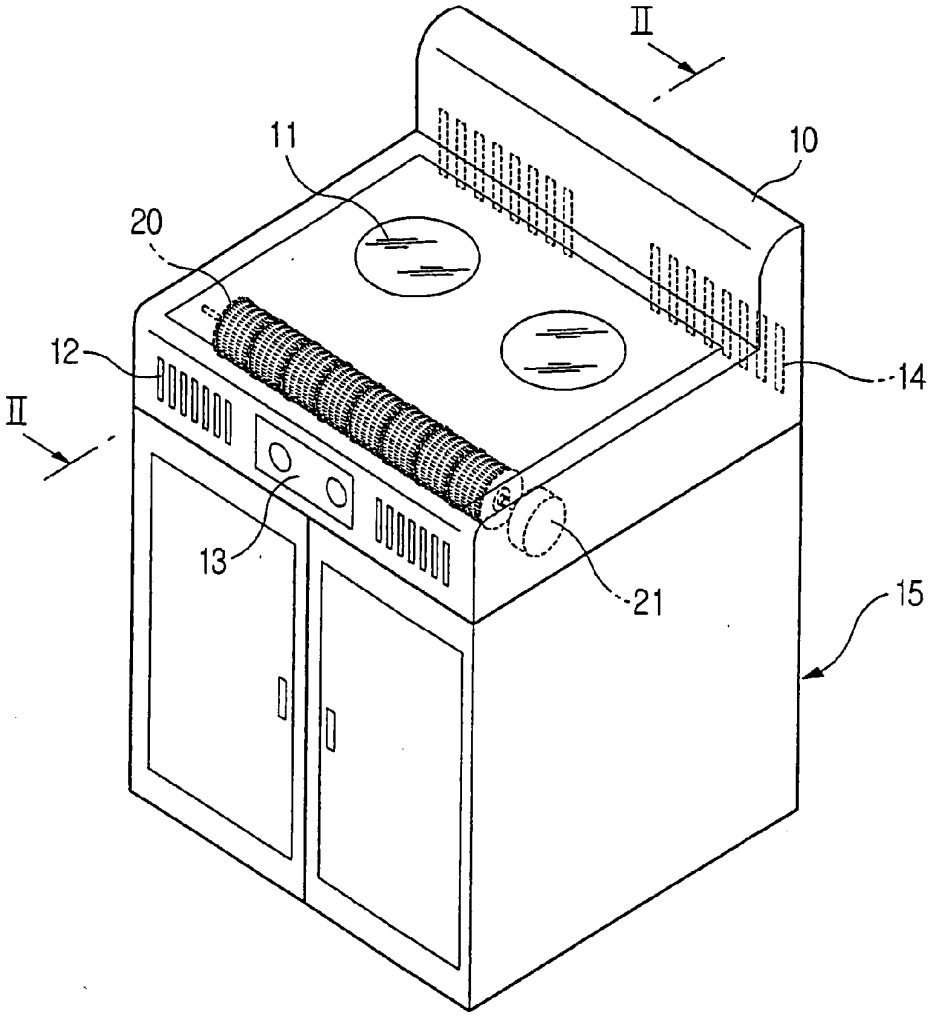


FIG 2

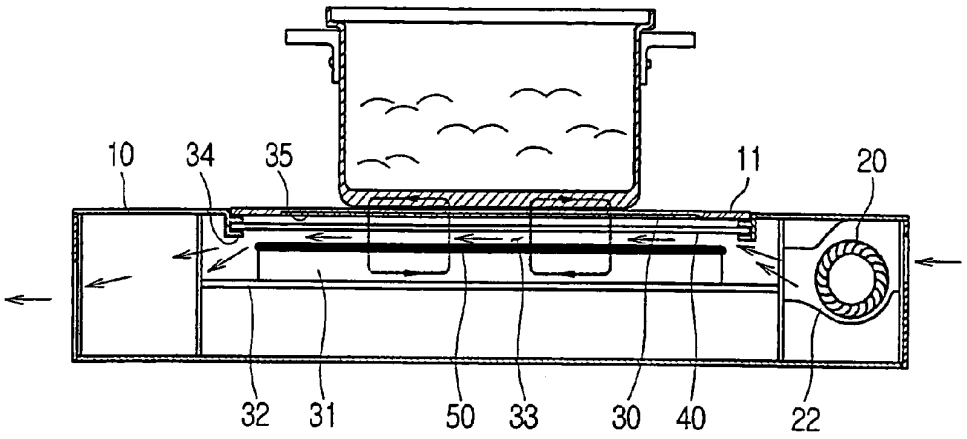
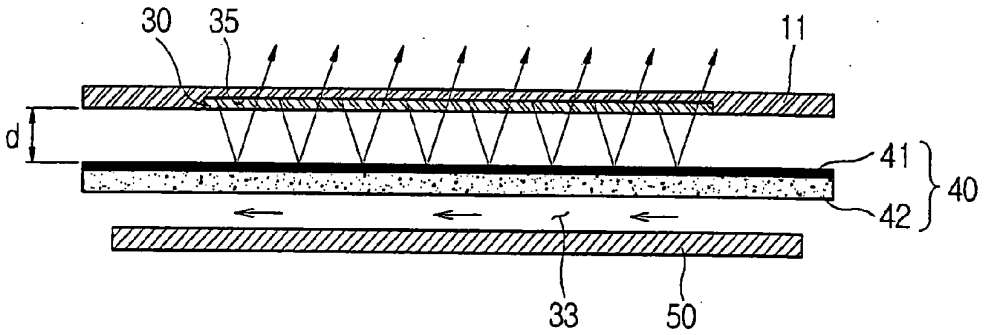


FIG 3



COMPOSITE COOKING APPARATUS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of Korean Patent Application No. 2003-85929, filed Nov. 29, 2003 in the Korean Intellectual Property Office, the disclosure of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates, in general, to composite cooking apparatuses, and more particularly, to a composite cooking apparatus that includes an insulating plate with a heat reflecting layer formed thereon is installed between a planar heating element and a work coil, thus improving an insulating effect.

[0004] 2. Description of the Related Art

[0005] Generally, an electronic cooking apparatus that performs cooking using electromagnetic induction heating applies a magnetic force to a cooking container, and then performs cooking using heat generated from the cooking container due to the applied magnetic force. The electronic cooking apparatus generates heat using a magnetic field, so that it may perform cooking without generating air pollution. Further, the electronic cooking apparatus typically has thermal efficiency of about 80% or above, so that it is an excellent cooking machine in an aspect of energy efficiency.

[0006] A conventional electronic cooking apparatus typically includes a work coil, to which a current is supplied to generate a magnetic field, an upper plate placed on the work coil to allow a cooking container to be seated thereon, and a ferrite plate placed below the work coil to allow lines of a magnetic force to pass therethrough.

[0007] In the conventional electronic cooking apparatus having the above construction, when a current is supplied to the work coil, a magnetic field is formed around the work coil. At this time, magnetic force lines forming the magnetic field form a closed loop that connects the upper plate, an inside of a bottom of the iron cooking container and the ferrite plate.

[0008] When the magnetic force lines formed in this way pass through the inside of the bottom of the iron cooking container, an eddy current is generated in the cooking container, and heat is generated from the iron cooking container by an electrical resistance as the eddy current flows. Further, the heat generated from the iron cooking container is transmitted to food placed in the cooking container, and thus the food is cooked.

[0009] However, the conventional electronic cooking apparatus is problematic in that it performs cooking in an induction heating manner, so that only an iron container capable of executing induction heating can be used as a cooking container, and a non-iron container cannot be used as a cooking container.

[0010] Further, the conventional electronic cooking apparatus is problematic in that, when cooking is performed using only a work coil, a cooking time lengthens if an amount of food increases, so that the electronic cooking apparatus is not suitable for cooking a large amount of food.

SUMMARY OF THE INVENTION

[0011] Accordingly, it is an aspect of the present invention to provide a composite cooking apparatus that cooks by directly generating heat through a heating unit as well as by generating heat using induction heating, thus performing cooking regardless of materials of a cooking container.

[0012] It is another aspect of the present invention to provide a composite cooking apparatus, which simultaneously drives an induction heating unit and a heating unit when a large amount of food is cooked, thus quickly performing cooking.

[0013] It is a further aspect of the present invention to provide a composite cooking apparatus, in which a heat reflecting layer is positioned on an insulating plate to prevent the induction heating unit from being damaged due to heat generated from the heating unit, thus improving an insulating effect.

[0014] Additional aspects and/or advantages of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

[0015] The above and/or other aspects are achieved by providing a composite cooking apparatus, including a body, a heating unit positioned in the body to generate heat used to heat food, an induction heating unit positioned adjacent to the heating unit to generate a magnetic field used to cook the food by induction heating, and an insulating plate positioned between the heating unit and the induction heating unit to prevent heat generated from the heating unit from being transmitted to the induction heating unit.

[0016] The above and/or other aspects are also achieved by providing a composite cooking apparatus, including a body, a heating element placed in the body to generate heat used to heat food, a work coil disposed in the body to generate a magnetic field to cook the food by induction heating, an insulating plate disposed adjacent to the heating element to prevent heat generated from the heating element from being transmitted to the work coil, and a blowing fan to compulsorily move air through an air moving path positioned between the insulating plate and the work coil.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] These and/or other aspects and advantages of the invention will become apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompanying drawings, of which:

[0018] **FIG. 1** is a perspective view showing an external shape of a composite cooking apparatus, according to an embodiment of the present invention;

[0019] **FIG. 2** is a sectional view taken along line II-II of **FIG. 1**; and

[0020] **FIG. 3** is a sectional view showing an insulating plate of the composite cooking apparatus of **FIG. 1**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0021] Reference will now be made in detail to the embodiments of the present invention, examples of which

are illustrated in the accompanying drawings, wherein like reference numerals refer to the like elements throughout. The embodiments are described below to explain the present invention by referring to the figures.

[0022] As is shown in **FIG. 1**, a composite cooking apparatus, according to an embodiment of the present invention, includes a body **10** and heat resisting plates **11** placed on a portion of a top surface of the body **10** to allow various cooking containers to be seated thereon. An input unit **13** is placed on a center of a front surface of the body **10** to input operation commands to the composite cooking apparatus. Inlets **12** are positioned in opposite sides of the input unit **13** to draw air used to disperse heat generated from a planar heating element (**30** of **FIG. 2**), which will be described later, by allowing the air to move under an insulating plate (**40** of **FIG. 2**), which will be described later.

[0023] A cylindrical blowing fan **20** is located in a front portion of an inside of the body **10** to compulsorily blow air drawn through the inlets **12** under the insulating plate (**40** of **FIG. 2**). A fan motor **21** is provided at an end of the blowing fan **20** to rotate the blowing fan **20**.

[0024] Outlets **14** are positioned in a rear surface of the body **10** to discharge air flowing under the insulating plate (**40** of **FIG. 2**) to an outside of the body **10**. An auxiliary cabinet **15**, in which a receiving space is formed, is placed below the body **10**.

[0025] The composite cooking apparatus of the present invention, constructed as shown in **FIG. 2**, is provided with the planar heating element **30**, positioned below the heat resisting plate **11** while coming into contact with the heat resisting plate **11**. The planar heating element **30** is a product, in which high-technology ceramic materials composed of fine particles, and conductive special carbon particles are uniformly distributed on fiber fabric, and which has a uniform heating density and a low power consumption.

[0026] When a current is supplied to the planar heating element **30**, heat is generated from the planar heating element **30** and food is heated by the heat. In this way, the planar heating element **30** performs cooking by directly heating a cooking container.

[0027] The insulating plate **40** is placed below the planar heating element **30** to prevent the heat generated from the planar heating element **30** from being transmitted to a work coil **50**, which will be described later. According to one aspect, the insulating plate **40** contacts the planar heating element **30**. According to another aspect, the insulating plate **40** is spaced apart from the planar heating element **30** by a predetermined distance to improve an insulating effect. In this case, a spaced interval may be arbitrarily set in consideration of thermal efficiency and the insulating effect.

[0028] The insulating plate **40** is inserted into fixing members **34** extended from the top surface of the body **10**. The planar heating element **30** is inserted into a groove **35** positioned in a central lower portion of the heat resisting plate **11**, which is seated on tops of the fixing members **34**.

[0029] The work coil **50** is placed below the insulating plate **40**, spaced apart from the insulating plate **40** by a predetermined distance. In this case, the work coil **50** is formed in a shape in which a Litz wire is wound in a spiral form. Magnetic force lines generated from the work coil **50** pass through an inside of a bottom of the cooking container via the insulating plate **40** and the heat resisting plate **11**.

[0030] A large amount of eddy current is generated inside the bottom of the cooking container due to the magnetic force lines, and heat is generated by an electrical resistance of the cooking container to the eddy current. In this way, the work coil **50** cooks food in an induction heating manner. Because the eddy current should be generated to cook food in the induction heating manner, it is not possible to perform cooking in the induction heating manner with a non-iron cooking container incapable of generating the eddy current.

[0031] A ferrite plate **31** is positioned below the work coil **50** while coming into contact with the work coil **50**. Ferrite is a solid solution, in which impurities melt in iron having a body-centered cubic crystal structure, and which functions to shield the magnetic force lines generated from the work coil **50** by allowing the magnetic force lines to pass through the ferrite. Therefore, the magnetic force lines generated from the work coil **50** form a loop passing through the ferrite plate **31** placed below the work coil **50** after passing through the inside of the bottom of the cooking container via the insulating plate **40** and the heat resisting plate **11**. A support **32** is placed below the ferrite plate **31** to support both the work coil **50** and the ferrite plate **31**.

[0032] As noted previously, the insulating plate **40** and the work coil **50** are spaced apart from each other by the predetermined distance, so that an air insulating layer is formed in a space therebetween. In this case, to further improve an insulating effect, air is compulsorily moved through the air insulating layer. Therefore, according to one aspect the air insulating layer is mainly used as an air moving path **33**.

[0033] According to one aspect the blowing fan **20** is placed on a right side of the air moving path **33** (as shown in **FIG. 2**), to compulsorily blow air into the air moving path **33**. According to one aspect the blowing fan **20** is a multi-blade cross-flow fan, which provides air drawn through the inlets **12** to the air moving path **33**. An air guiding member **22** is positioned around the blowing fan **20** to guide air blown by the blowing fan **20** to the air moving path **33**.

[0034] As is shown in **FIG. 3**, the insulating plate **40** includes a base plate **42** and a heat reflecting layer **41** coated on a top surface of the base plate **42**. Further, the insulating plate **40** is installed to be spaced apart from the planar heating element **30** by a predetermined distance d to effectively isolate heat transmitted from the planar heating element **30** by heat conduction.

[0035] According to one aspect, the base plate **42** of the insulating plate **40** is made of a packing-type insulating material. According to one aspect, the packing-type insulating material has air bubbles. According to another aspect, the packing-type insulating material is made of glass fiber containing asbestos fiber. According to yet another aspect, the packing-type insulating material is made of fireproof brick. According to another aspect, the base plate **42** is made of a material in which boron nitride is added to heat resisting plastic.

[0036] According to one aspect, a material with excellent heat reflectance is coated on the heat reflecting layer **41**. Therefore, a material, such as a ceramic film, an aluminum

oxide (Al203), or a beryllium oxide (BEO), may be used for the heat reflecting layer **41**. A ceramic is an inorganic non-metal material made through heat-processing at high temperatures, and has high surface luminance, excellent heat resistance and excellent rub resistance. Therefore, when radiation heat generated from the planar heating element **30** comes into contact with the ceramic film coated on the insulating plate **40**, the radiation heat is reflected due to the high surface luminance, so that it may be expected that the insulating effect be improved.

[**0037**] The aluminum oxide and the beryllium oxide are materials with high infrared reflectance. Even though the radiation heat generated from the planar heating element **30** is emitted in an infrared ray form, the radiation heat is reflected from an aluminum oxide layer or a beryllium oxide layer formed on the insulating plate **40**, so that the heat is scarcely transmitted to the work coil **50**. Moreover, infrared rays reflected from the aluminum oxide layer or the beryllium oxide layer are directed again to the cooking container. Therefore, although a same amount of energy is supplied, heat reaching the cooking container increases compared to a case where the aluminum oxide layer or the beryllium oxide layer is not used, thus obtaining additional effect, such as improvement of energy efficiency.

[**0038**] In this way, if the heat reflecting layer is positioned on the insulating plate, radiation heat is reflected close to total reflection even though the radiation heat is emitted from the planar heating element **30** at high temperatures (typically, 500° C. or above), thus obtaining a considerable insulating effect.

[**0039**] One of the ceramic film, the aluminum oxide layer and the beryllium oxide layer having high heat reflectance may be coated on the base plate **42**. But according to one aspect, to obtain a superior insulating effect, a heat resisting plastic layer may be coated on the base plate **42** and a ceramic film layer may be positioned on the heat resisting plastic layer.

[**0040**] Further, it is also possible to coat a ceramic film layer on the base plate **42**, and form either an aluminum oxide layer or a beryllium oxide layer on the ceramic film layer.

[**0041**] Hereinafter, an operation of the composite cooking apparatus of the present invention is described.

[**0042**] A user places a cooking container on the heat resisting plate **11** and then inputs an operation command to the composite cooking apparatus through the input unit **13**. The operation command is then transmitted to a control unit (not shown). The control unit analyzes the operation command and then determines which of the planar heating element **30** and the work coil **50** to supply with a current.

[**0043**] If the input operation command requires operations of both the planar heating element **30** and the work coil **50**, the control unit controls an inverter (not shown) to supply a current to both the planar heating element **30** and the work coil **50**.

[**0044**] When the current is supplied to the planar heating element **30**, a temperature of approximately 500° C. or greater is generated from the planar heating element **30** due to a resistance thereof. The resulting heat is transmitted to the cooking container placed on the heat resisting plate **11**.

[**0045**] When a high-frequency current is supplied to the work coil **50**, a magnetic field is formed around the work coil **50**, so that an eddy current is formed in the cooking container due to the magnetic field. The eddy current generates heat according to an electrical resistance while passing through the cooking container. In this way, the heat generated from both the planar heating element **30** and the work coil **50** is transmitted to cook food.

[**0046**] A part of the heat generated from the planar heating element **30** is transmitted downward from the planar heating element **30** in a heat transmission manner using radiation. Heat radiant rays emitted downward from the planar heating element **30** reach the heat reflecting layer **41** of the insulating plate **40**, and are reflected from the heat reflecting layer **41** directed upward from the insulating plate **40**. Therefore, an insulating effect is further improved compared to a typical insulating plate.

[**0047**] While power is supplied to the planar heating element **30**, the control unit moves air through the air moving path **33** by rotating the blowing fan **20**, thus obtaining a superior heat isolating effect.

[**0048**] If sufficient heat is applied to the food and then the cooking has been completed, an OFF command is input by the user, and the controller receives the OFF command to shut off power supplied to both the planar heating element **30** and the work coil **50**, thus terminating the cooking operation.

[**0049**] Through the above process, the operation of the present invention is terminated.

[**0050**] As is apparent from the above description, the present invention provides a composite cooking apparatus that cooks food by directly generating heat through a heating unit as well as by generating heat using induction heating, thus performing cooking regardless of the materials of a cooking container and quickly cooking a large amount of food.

[**0051**] Further, the present invention is advantageous in that a heat reflecting layer is formed on an insulating plate, thus preventing an induction heating unit from being damaged due to heat generated from a heating unit.

[**0052**] Although an embodiment of the present invention has been shown and described, it would be appreciated by those skilled in the art that changes may be made in this embodiment without departing from the principles and spirit of the invention, the scope of which is defined in the claims and their equivalents.

What is claimed is:

1. A composite cooking apparatus, comprising:

a body;

a heating unit positioned in the body to generate heat used to heat food;

an induction heating unit positioned adjacent to the heating unit to generate a magnetic field to cook the food by induction heating; and

an insulating plate positioned between the heating unit and the induction heating unit to prevent heat generated from the heating unit from being transmitted to the induction heating unit.

2. The composite cooking apparatus according to claim 1, wherein the insulating plate is provided with at least one heat reflecting layer to reflect the heat generated from the heating unit.

3. The composite cooking apparatus according to claim 2, wherein the at least one heat reflecting layer comprises a ceramic layer.

4. The composite cooking apparatus according to claim 3, wherein the at least one heat reflecting layer further comprises an aluminum oxide layer adjacent to the ceramic layer.

5. The composite cooking apparatus according to claim 3, wherein the at least one heat reflecting layer further is comprises a beryllium oxide layer adjacent to the ceramic layer.

6. The composite cooking apparatus according to claim 2, wherein the at least one heat reflecting layer comprises a ceramic layer adjacent to a heat resisting plastic layer positioned on the insulating plate.

7. The composite cooking apparatus according to claim 1, wherein the insulating plate is spaced apart from the heating unit by a predetermined distance.

8. A composite cooking apparatus, comprising:

a body;

a heating element placed in the body to generate heat used to heat food;

a work coil disposed in the body to generate a magnetic field to cook the food by induction heating;

an insulating plate disposed adjacent to the heating element to prevent heat generated from the heating element from being transmitted to the work coil; and

a blowing fan to compulsorily move air through an air moving path positioned between the insulating plate and the work coil.

9. The composite cooking apparatus according to claim 8, wherein the insulating plate is provided with at least one heat reflecting layer to reflect the heat generated from the heating element.

10. The composite cooking apparatus according to claim 9, wherein the at least one heat reflecting layer comprises a ceramic layer.

11. The composite cooking apparatus according to claim 10, wherein the at least one heat reflecting layer further comprises an aluminum oxide layer adjacent to the ceramic layer.

12. The composite cooking apparatus according to claim 10, wherein the at least one heat reflecting layer further comprises a beryllium oxide layer adjacent to the ceramic layer.

13. The composite cooking apparatus according to claim 9, wherein the at least one heat reflecting layer comprises a ceramic layer adjacent to a heat resisting plastic layer positioned on the insulating plate.

14. The composite cooking apparatus according to claim 8, wherein the insulating plate is spaced apart from the heating element by a predetermined distance.

15. The composite cooking apparatus according to claim 8, wherein the body is provided with at least one inlet to draw the air into the body and at least one outlet to discharge air moved through the air moving path to an outside of the body.

16. A composite cooking apparatus, comprising:

a first heating unit generating heat transferred to a cooking container; and

a second heating unit, selectively generating a magnetic field, magnetic force lines of which pass through a bottom of the cooking container; and

an insulating plate disposed between the first and second heating units to protect the second heating unit from the heat generated by the first heating unit.

17. The composite cooking apparatus according to claim 16, wherein the insulating plate comprises:

a base plate; and

at least one heat reflecting layer.

18. The composite cooking apparatus according to claim 17, wherein the at least one heat reflecting layer has a high surface luminance.

19. The composite cooking apparatus according to claim 17, wherein the at least one heat reflecting layer has a high infrared reflectance.

20. A composite cooking apparatus, comprising:

a conduction heating unit;

an induction heating unit, the conduction and induction heating units being driven simultaneously to speed cooking; and

an insulating plate disposed between the conduction and induction heating units to protect the induction heating unit from the heat generated by the conduction heating element.

* * * * *

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(54) COMPOSITE COOKING APPARATUS

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(57) **ABSTRACT**

A composite cooking apparatus having a body, a heating unit, and an induction heating unit. The heating unit is positioned in the body to generate heat used to heat food. The induction heating unit is positioned adjacent to the heating unit to generate a magnetic field to cook the food by induction heating. The induction heating unit has at least one wire, a coating of which is exposed to an electron beam to strengthen a heat resistance thereof.

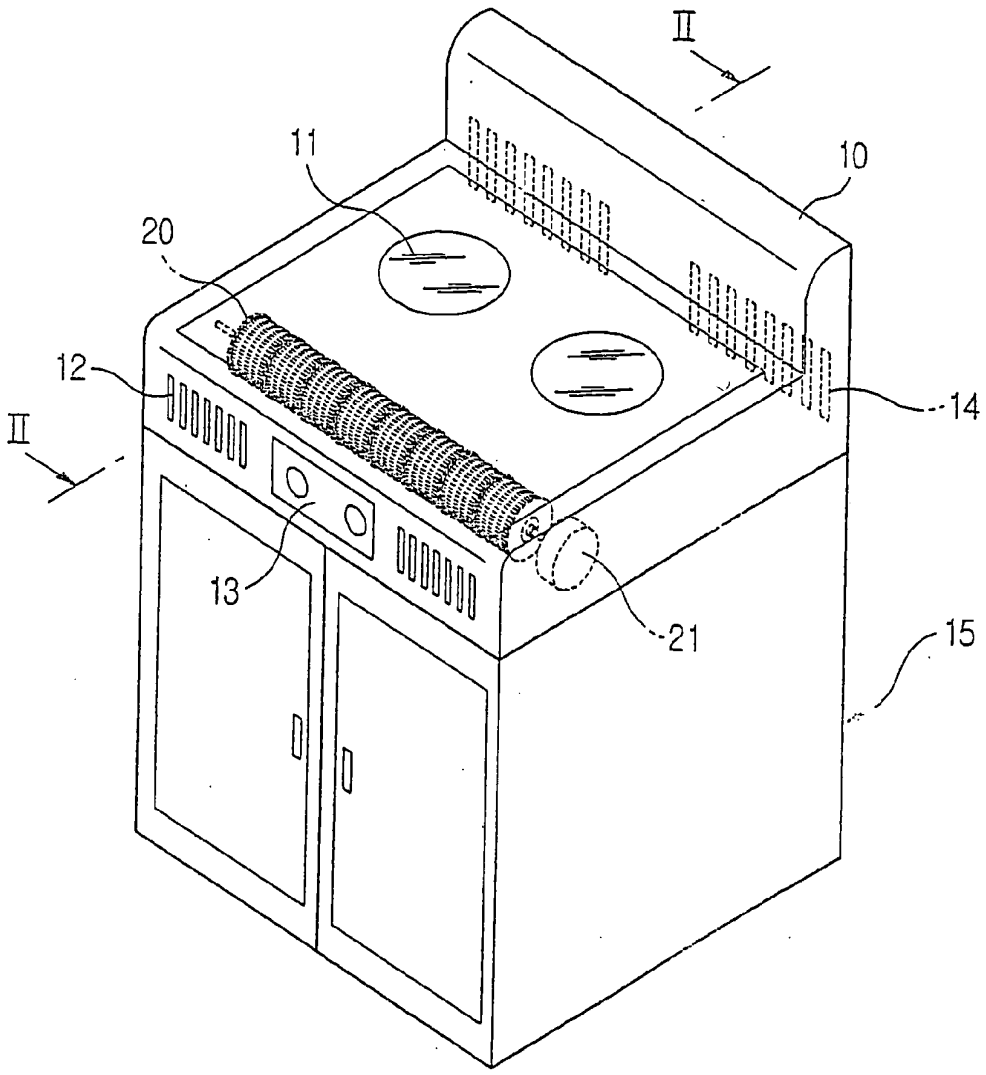


FIG. 1

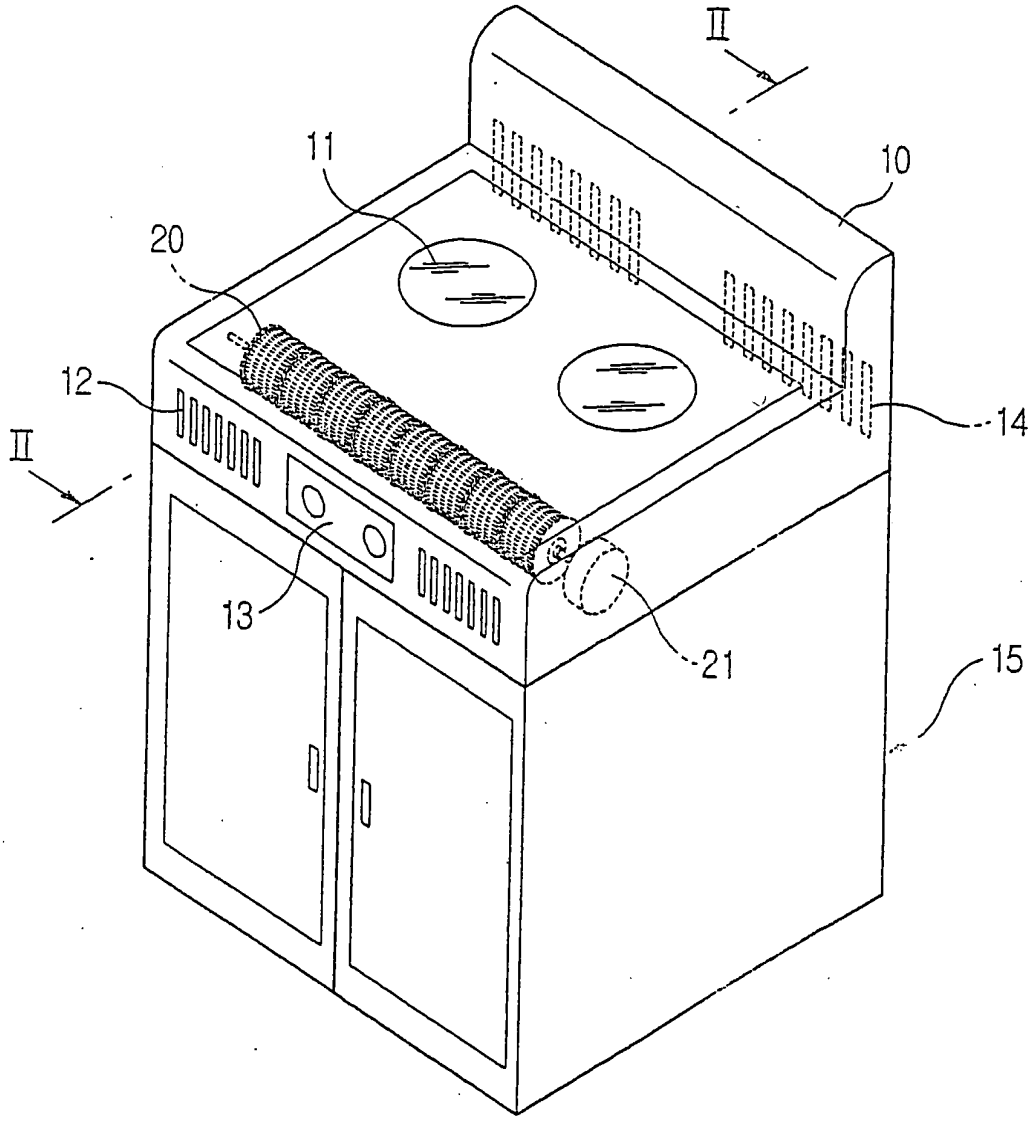


FIG. 2

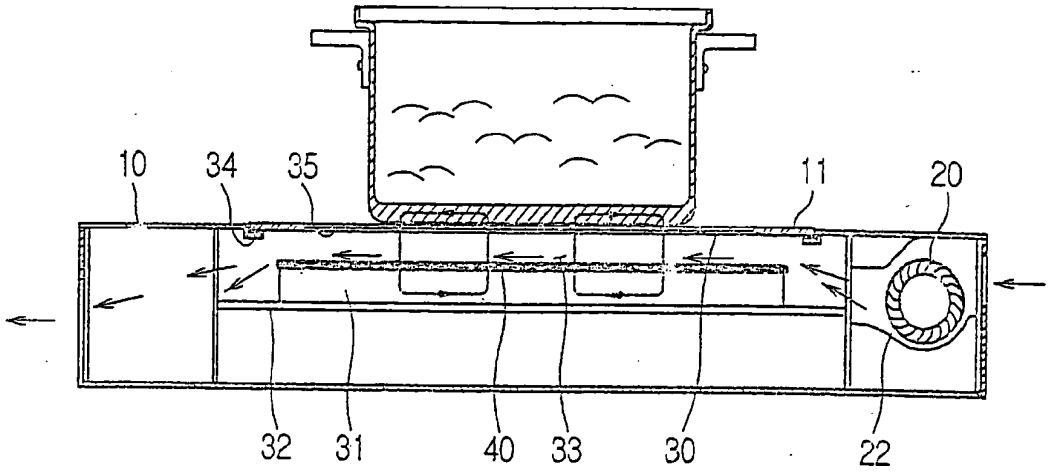


FIG. 3

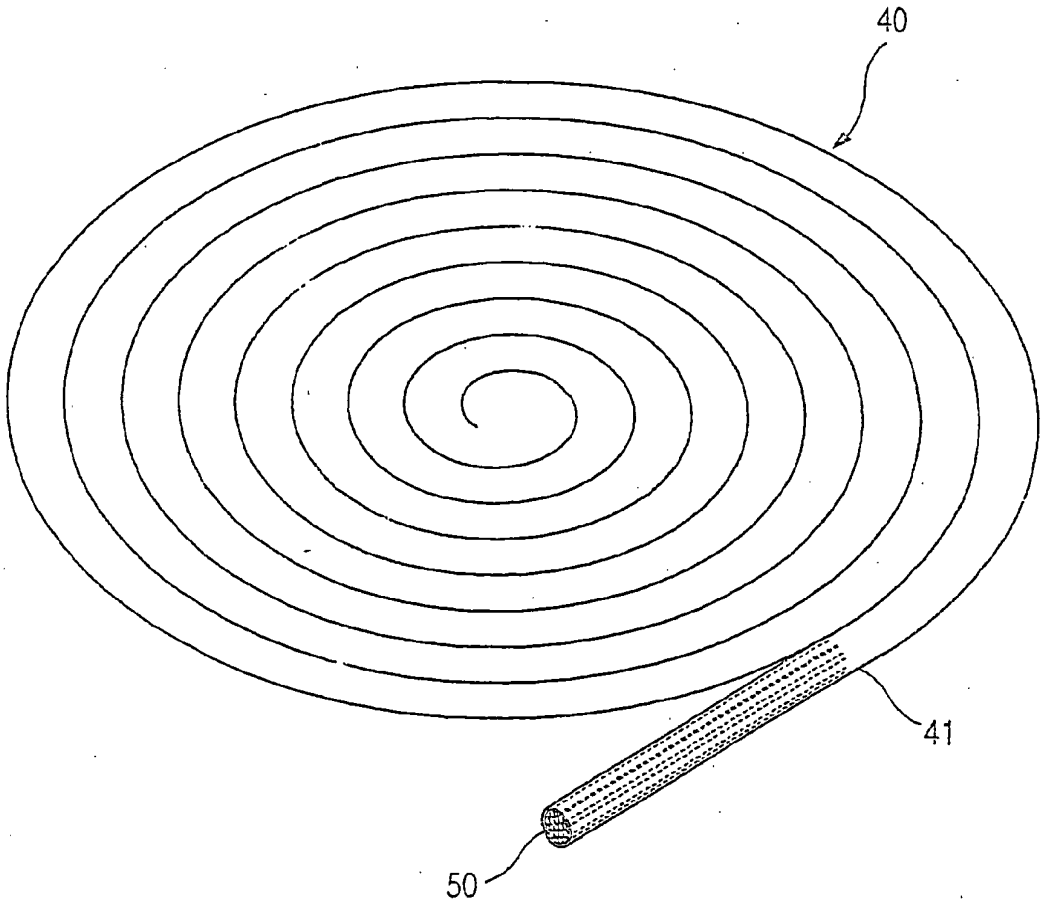
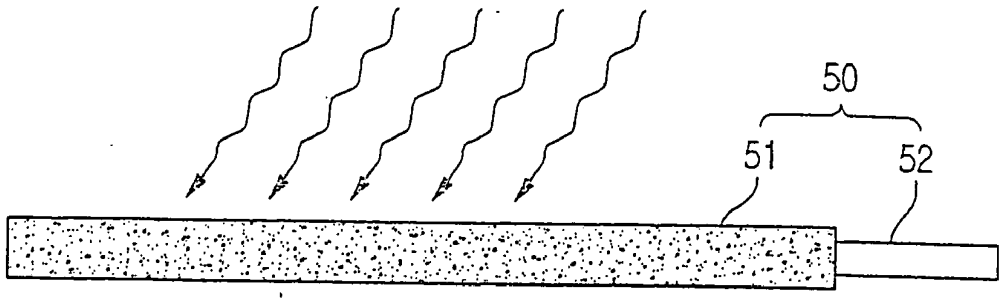


FIG. 4



COMPOSITE COOKING APPARATUS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of Korean Patent Application No. 2003-85930, filed Nov. 29, 2003 in the Korean Intellectual Property Office, the disclosure of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates, in general, to composite cooking apparatuses, and more particularly, to a composite cooking apparatus that radiates electron beams to coatings of element wires forming a work coil, which is an induction heating unit, thus strengthening heat resistance.

[0004] 2. Description of the Related Art

[0005] Generally, an electronic cooking apparatus that performs cooking using electromagnetic induction heating applies a magnetic force to a cooking container, and then performs cooking using heat generated from the cooking container due to the applied magnetic force. The electronic cooking apparatus generates heat using a magnetic field, so that it may perform cooking without generating air pollution. Further, the electronic cooking apparatus typically has thermal efficiency of about 80% or above, so that it is an excellent cooking machine in an aspect of energy efficiency.

[0006] A conventional electronic cooking apparatus typically includes a work coil, to which a current is supplied to generate a magnetic field, an upper plate placed on the work coil to allow a cooking container to be seated thereon, and a ferrite plate placed below the work coil to allow lines of a magnetic force to pass therethrough.

[0007] In the conventional electronic cooking apparatus having the above construction, when a current is supplied to the work coil, a magnetic field is formed around the work coil. At this time, magnetic force lines forming the magnetic field form a closed loop that connects the upper plate, an inside of a bottom of the iron cooking container and the ferrite plate.

[0008] When the magnetic force lines formed in this way pass through the inside of the bottom of the iron cooking container, an eddy current is generated in the cooking container, and heat is generated from the iron cooking container by an electrical resistance as the eddy current flows. Further, the heat generated from the iron cooking container is transmitted to food placed in the cooking container, and thus the food is cooked.

[0009] However, the conventional electronic cooking apparatus is problematic in that it performs cooking in an induction heating manner, so that only an iron container capable of executing induction heating can be used as a cooking container, and a non-iron container cannot be used as a cooking container.

[0010] Further, the conventional electronic cooking apparatus is problematic in that, when cooking is performed using only a work coil, a cooking time lengthens if an amount of food increases, so that the electronic cooking apparatus is not suitable for cooking a large amount of food.

SUMMARY OF THE INVENTION

[0011] Accordingly, it is an aspect of the present invention to provide a composite cooking apparatus, which cooks by directly generating heat through a heating unit as well as by generating heat using induction heating, thus performing cooking regardless of materials of a cooking container.

[0012] It is another aspect of the present invention to provide a composite cooking apparatus, which simultaneously drives an induction heating unit and a heating unit when a large amount of food is cooked, thus quickly performing cooking.

[0013] It is a further aspect of the present invention to provide a composite cooking apparatus having a heating unit and an induction heating unit with a work coil having a wire, in which a coating of the wire is radiated with electron beams to strengthen a heat resistance of the induction heating unit, to prevent the induction heating unit from being damaged due to heat generated from the heating unit.

[0014] Additional aspects and/or advantages of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

[0015] The above and/or other aspects are also achieved by providing a composite cooking apparatus, including a body, a heating unit positioned in the body to generate heat used to heat food, and an induction heating unit positioned adjacent to the heating unit to generate a magnetic field to cook the food by induction heating, the induction heating unit having at least one wire, a coating of which is exposed to an electron beam to strengthen heat resistance thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] These and/or other aspects and advantages of the invention will become apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompanying drawings, of which:

[0017] **FIG. 1** is a perspective view showing an external shape of a composite cooking apparatus, according to an embodiment of the present invention;

[0018] **FIG. 2** is a sectional view taken along line II-II of **FIG. 1**;

[0019] **FIG. 3** is a sectional view showing a work coil of the composite cooking apparatus of **FIG. 1**; and

[0020] **FIG. 4** is a front view showing an element wire (magnet wire) forming the work coil of the composite cooking apparatus of **FIG. 1**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0021] Reference will now be made in detail to the embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to the like elements throughout. The embodiments are described below to explain the present invention by referring to the figures.

[0022] As is shown in **FIG. 1**, a composite cooking apparatus, according to an embodiment of the present inven-

tion, includes a body **10** and heat resisting plates **11** placed on a portion of a top surface of the body **10** to allow various cooking containers to be seated thereon. An input unit **13** is placed on a center of a front surface of the body **10** to input operation commands to the composite cooking apparatus. Inlets **12** are positioned in opposite sides of the input unit **13** to draw air used to disperse heat generated from a planar heating element (**30** of **FIG. 2**), which will be described later, by allowing the air to move under the planar heating element (**30** of **FIG. 2**).

[**0023**] A cylindrical blowing fan **20** is located in a front portion of an inside of the body **10** to compulsorily blow air drawn through the inlets **12** under the planar heating element (**30** of **FIG. 2**). A fan motor **21** is provided at an end of the blowing fan **20** to rotate the blowing fan **20**. Outlets **14** are positioned in a rear surface of the body **10** to discharge air flowing under the planar heating element (**30** of **FIG. 2**) to an outside of the body **10**. An auxiliary cabinet **15**, in which a receiving space is formed, is placed below the body **10**.

[**0024**] The composite cooking apparatus of the present invention, constructed as shown in **FIG. 2**, is provided with the planar heating element **30**, positioned below the heat resisting plate **11** while coming into contact with the heat resisting plate **11**. The planar heating element **30** is a product, in which high-technology ceramic materials composed of fine particles, and conductive special carbon particles are uniformly distributed on fiber fabric, and which has a uniform heating density and a low power consumption.

[**0025**] When a current is supplied to the planar heating element **30**, heat is generated from the planar heating element **30** and food is heated by the heat. In this way, the planar heating element **30** performs cooking by directly heating a cooking container. The planar heating element **30** is inserted into a groove **35** positioned in a central lower portion of the heat resisting plate **11**, which is seated on top of fixing members **34**.

[**0026**] A work coil **40** is placed below the planar heating element **30**, spaced apart from the planar heating element **30** by a predetermined distance. In this case, the work coil **40** is formed in a shape in which a Litz wire **41** (see **FIG. 3**) is wound in a spiral form. Magnetic force lines generated from the work coil **40** pass through an inside of a bottom of the cooking container via the heat resisting plate **11**.

[**0027**] If variations occur in the magnetic force lines passing through the cooking container, a large amount of eddy current is generated inside a bottom of the cooking container, and heat is generated due to an electrical resistance of the cooking container to the eddy current. In this way, the work coil **40** cooks food in an induction heating manner. Because the eddy current should be generated to cook food in the induction heating manner, it is not possible to perform cooking in the induction heating manner with a cooking container made of a non-iron material, because it is incapable of generating the eddy current.

[**0028**] A ferrite plate **31** is positioned below the work coil **40** while coming into contact with the work coil **40**. Ferrite is a solid solution, in which impurities melt in iron having a body-centered cubic crystal structure, and which functions to shield the magnetic force lines generated from the work coil **40** by allowing the magnetic force lines to pass through the ferrite. Therefore, the magnetic force lines generated from the work coil **40** form a loop passing through the ferrite plate **31** placed below the work coil **40** after passing through the inside of the bottom of the cooking container via the heat resisting plate **11**. A support **32** is placed below the ferrite plate **31** to support both the work coil **40** and the ferrite plate **31**.

[**0029**] As noted previously, the planar heating element **30** and the work coil **40** are spaced apart from each other by the predetermined distance, so that an air insulating layer is formed in a space therebetween. In this case, to further improve an insulating effect, air is compulsorily moved through the air insulating layer. Therefore, according to one aspect, the air insulating layer is mainly used as an air moving path **33**.

[**0030**] According to one aspect, the blowing fan **20** is placed on a right side of the air moving path **33** (as is shown in **FIG. 2**), to compulsorily blow air into the air moving path **33**. According to one aspect, the blowing fan **20** is a multi-blade cross-flow fan, which provides air drawn through the inlets **12** to the air moving path **33**. An air guiding member **22** is positioned around the blowing fan **20** to guide air blown by the blowing fan **20** to the air moving path **33**.

[**0031**] As is shown in **FIGS. 3 and 4**, the work coil **40** of the composite cooking apparatus of the present invention is formed so that the Litz wire **41** is arranged in the spiral form. The Litz wire **41** is formed by binding a plurality of element wires (magnet wires) **50**, in which copper wires or aluminum wires with high electrical conductivity are applied with coatings formed at high temperatures.

[**0032**] Further, each of the element wires **50** of the Litz wire **41** used in the composite cooking apparatus is manufactured in such a way that an inner conductor **52** is covered with a coating **51** made of a high molecular weight compound (for example, polyester) and then an electron beam is radiated onto the coating **51**. When the electron beam is radiated onto the coating **51**, a molecular structure of the coating **51** is changed from an initial linear structure to a mesh structure by a cross linkage phenomenon.

[**0033**] In the cross linkage phenomenon, chemical bonds are formed as in the case where a bridge is placed between any two atoms of a plurality of linearly bound atoms. In this case, covalent bonds are generally formed.

[**0034**] A high molecular weight compound forming chemical bonds by the cross linkage forms a three-dimensional mesh structure. There are at least two methods of: adding a crosslinking agent, and radiating an electron beam.

[**0035**] If the coating **51** of each of the element wires **50** is changed to a mesh structure due to the radiation of the electron beam, mechanical characteristics, heat resistance, chemical resistance, internal stress resistance, and the like are improved compared to the coating with the initial linear structure. Therefore, if the electron beam is radiated onto the coating **51** of each of the element wires **50** forming the work coil **40**, to prevent the work coil **40** from being damaged due to the heat generated from the planar heating element **30**, an internal structure of the coating **51** is changed to strengthen heat resistance, thus effectively isolating radiation heat transmitted to the work coil **40** without installing a separate insulating plate.

[0036] According to one aspect, the element wires **50** of the work coil **40** used in the present invention are manufactured so that the coatings **51** of the element wires **50**, onto which electron beams are radiated and which are made of high molecular weight compounds, are covered with magnetic viscosity layers (not shown). Viscosity of the magnetic viscosity layers is low at normal temperatures, and increases if the temperature increases above a predetermined level, so that bonds between the element wires **50** forming the Litz wire **41** are secured.

[0037] Hereinafter, an operation of the composite cooking apparatus of the present invention is described.

[0038] A user places a cooking container on the heat resisting plate **11** and then inputs an operation command to the composite cooking apparatus through the input unit **13**. The operation command is then transmitted to a control unit (not shown). The control unit analyzes the operation command and then determines which of the planar heating element **30** and the work coil **40** to supply with a current.

[0039] If the input operation command requires operations of both the planar heating element **30** and the work coil **40**, the control unit controls an inverter (not shown) to supply a current to both the planar heating element **30** and the work coil **40**.

[0040] When the current is supplied to the planar heating element **30**, a temperature of approximately 500° C. or greater is generated from the planar heating element **30** due to a resistance thereof. The resulting heat is transmitted to the cooking container placed on the heat resisting plate **11**.

[0041] When a high-frequency current is supplied to the work coil **40**, a magnetic field is formed around the work coil **40**, so that an eddy current is formed in the cooking container due to the magnetic field. The eddy current generates heat according to an electrical resistance while passing through the cooking container. In this way, the heat generated from both the planar heating element **30** and the work coil **40** is transmitted to cook food.

[0042] A part of the heat generated from the planar heating element **30** is transmitted downward from the planar heating element **30** in a heat transmission manner using radiation. The heat emitted downward from the planar heating element **30** reaches the work coil **40**. The bonds between the respective element wires **50** of the Litz wire **41** forming the work coil **40** are further secured due to the radiation of electron beams thereby strengthening heat resistance of the work coil **40**. Thus, the work coil **40** is safely protected against the heat generated from the planar heating element **30**.

[0043] While power is supplied to the planar heating element **30**, the control unit moves air through the air moving path **33** by rotating the blowing fan **20**, thus obtaining a superior heat isolating effect.

[0044] If sufficient heat is applied to the food and then the cooking has been completed, an OFF command is input by the user, and the controller receives the OFF command to shut off power supplied to both the planar heating element **30** and the work coil **40**, thus terminating the cooking operation.

[0045] Through the above process, the operation of the present invention is terminated.

[0046] As is apparent from the above description, the present invention provides a composite cooking apparatus that cooks food by directly generating heat through a heating unit as well as by generating heat using induction heating, thus performing cooking regardless of the materials of a cooking container and quickly cooking a large amount of food.

[0047] Further, the present invention is advantageous in that it radiates electron beams to coatings of element wires forming a work coil, which is an induction heating unit, to strengthen heat resistance of the coatings, thus preventing the induction heating unit from being damaged due to heat generated from a heating unit without installing a separate insulating plate.

[0048] Although an embodiment of the present invention has been shown and described, it would be appreciated by those skilled in the art that changes may be made in this embodiment without departing from the principles and spirit of the invention, the scope of which is defined in the claims and their equivalents.

What is claimed is:

1. A composite cooking apparatus, comprising:

a body;

a heating unit positioned in the body to generate heat used to heat food; and

an induction heating unit positioned adjacent to the heating unit to generate a magnetic field to cook the food by induction heating, the induction heating unit having at least one wire, a coating of which is exposed to an electron beam to strengthen a heat resistance thereof.

2. The composite cooking apparatus according to claim 1, wherein when the coating is exposed to the electron beam, a molecular structure of the coating is changed, to strengthen the heat resistance thereof.

3. The composite cooking apparatus according to claim 2, wherein the molecular structure of the coating is changed from an initial linear structure to a mesh structure after the coating is exposed to the electron beam.

4. The composite cooking apparatus according to claim 1, wherein the induction heating unit is wound in a spiral.

5. The composite cooking apparatus according to claim 1, wherein the at least one wire comprises a magnetic viscosity layer.

6. A composite cooking apparatus, comprising:

a body;

a heating element placed in the body to generate heat used to heat food; and

a work coil placed below the heating element to generate a magnetic field to cook the food by induction heating, the work coil being provided with a coating, which is exposed to an electron beam to strengthen a heat resistance thereof.

7. The composite cooking apparatus according to claim 6, wherein when the coating of the work coil is exposed to the electron beam, a molecular structure of the coating is changed, to strengthen the heat resistance thereof.

8. The composite cooking apparatus according to claim 7, wherein the molecular structure of the coating is changed from an initial linear structure to a mesh structure after the coating is exposed to the electron beam.

9. The composite cooking apparatus according to claim 6, wherein the work coil is wound in a spiral.

10. A composite cooking apparatus, comprising:

a first heating unit generating heat transferred to a cooking container; and

a second heating unit, comprising a wire with a coating exposed to an electron beam to strengthen a heat resistance of the coating, and selectively generating a magnetic field, magnetic force lines of which pass through a bottom of the cooking container.

11. The composite cooking apparatus according to claim 10, wherein:

the second heating unit is adjacent to the first heating unit and separated from the first heating unit by a predetermined space; and

the composite cooking apparatus further comprises a fan moving air through the predetermined space.

12. The composite cooking apparatus according to claim 11, further comprising:

a body having an inlet and an outlet,

wherein an air moving path is defined between inlet and the outlet to guide air moved by the fan, and includes the predetermined space.

13. The composite cooking apparatus according to claim 10, wherein when the coating is exposed to the electron beam, linearly bound atoms of the coating form covalent bonds therebetween.

14. The composite cooking apparatus according to claim 10, wherein the induction heating unit comprises a Litz wire wound in a spiral.

15. A composite cooking apparatus, comprising:

a body having a cooking surface and air inlets and outlets defining respective ends of an air moving path;

a heat resisting plate disposed on the cooking surface;

a planar heating element, contacting the heat resisting plate, and comprising a fiber fabric having finely particulated ceramic materials and conductive carbon particles uniformly distributed thereon;

an induction heating unit adjacent to the planar heating element and separated from the heating element by a predetermined space, the induction unit comprising a wire with a coating exposed to an electron beam to strengthen a heat resistance thereof; and

a fan forcing air through the air moving path, the predetermined space being included in the air moving path

16. A composite cooking apparatus, comprising:

a conduction heating unit; and

an induction heating unit, the conduction and induction heating units being driven simultaneously to speed cooking.

17. An induction heating unit of a composite cooking apparatus having a conduction heating unit, the induction heating unit comprising:

at least one wire with a coating exposed to an electron beam to strengthen a heat resistance thereof.

* * * * *

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	H05B	6/36	B	

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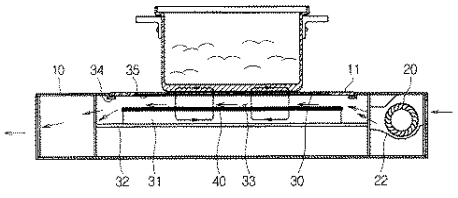
最終頁に続く

(54)【発明の名称】複合調理器

(57)【要約】
【課題】　誘導加熱調理装置であるワークコイルを構成する素線の被覆に電子線を照射して耐熱性を強めた複合調理器を提供すること。
【解決手段】　本体と、前記本体内部に設置されて調理物を加熱調理するための熱を発生する発熱装置と、前記発熱装置に隣接設置されて前記調理物を誘導加熱調理するための磁場を生成する誘導加熱装置と、を含むものにおいて、前記誘導加熱装置は、電子線に晒されて被覆の耐熱性が強化されたワイヤを持つことを特徴とする複合調理器を提供する。
【選択図】　図２



【特許請求の範囲】
【請求項1】
本体と、前記本体の内部に設置されて調理物を加熱調理するための熱を発生する発熱装置と、前記発熱装置に隣接設置されて前記調理物を誘導加熱調理するための磁場を生成する誘導加熱装置と、を含むものにおいて、
前記誘導加熱装置は、電子線に晒されて被覆の耐熱性が強化された少なくとも１本のワイヤを持つことを特徴とする複合調理器。
【請求項2】
前記被覆は、前記電子線に晒されると分子構造が変化して耐熱性が強化されることを特徴とする請求項１に記載の複合調理器。
【請求項3】
前記被覆の分子構造は、前記電子線に晒されることによって最初の線状構造から網状構造に変化することを特徴とする請求項２に記載の複合調理器。
【請求項4】
前記誘導加熱装置は、渦巻状に巻回されてなることを特徴とする請求項１に記載の複合調理器。
【請求項5】
前記ワイヤは、磁気粘性層をさらに含むことを特徴とする請求項１に記載の複合調理器
【請求項6】
本体と、前記本体内部に設置されて調理物を加熱調理するための熱を発生する発熱体と、前記発熱体の下部に設置されて前記調理物を誘導加熱調理するための磁場を生成するワークコイルと、を含むものみおいて、
前記ワークコイルは電子線に晒されて耐熱性が強化された被覆を持つことを特徴とする複合調理器。
【請求項7】
前記ワークコイルの被覆は、前記電子線に晒されると分子構造が変化して耐熱性が強化されることを特徴とする請求項６に記載の複合調理器。
【請求項8】
前記被覆の分子構造は、前記電子線に晒されることによって最初線状構造から網状構造に変化することを特徴とする請求項７に記載の複合調理器
【請求項9】
前記ワークコイルは、渦巻状に巻回されてなることを特徴とする請求項６に記載の複合調理器。
【請求項10】
調理容器に伝えられる熱を発生させる第１発熱装置と、
電子線に晒されて被覆の耐熱性が強化されたワイヤから構成され、前記調理容器の床を通過する磁力線が形成された磁場を選択的に発生させる第２発熱装置と、を含むことを特徴とする複合調理器。
【請求項11】
前記第２発熱装置は、前記第１発熱装置と所定の空間をおいて隣接設置され、前記空間へ空気を移動させる送風ファンがさらに設けられることを特徴とする請求項１０に記載の複合調理器。
【請求項12】
吸入口と排出口とを有する本体をさらに含み、前記吸入口と排出口との間が空気移動通路として限定され、前記送風ファンにより移動された空気が、前記所定の空間が含まれた前記空気移動通路に案内されることを特徴とする請求項１１に記載の複合調理器。
【請求項13】
前記被覆が電子線に晒されると、線状に結合している原子同士に共有結合がなされることを特徴とする請求項１０に記載の複合調理器。

【請求項14】
前記第２発熱装置は、渦巻状に巻回されたリッツ線で構成されることを特徴とする請求項１０に記載の複合調理器。
【請求項15】
調理面と、
それぞれ空気移動通路の端部となる吸入口及び排出口とを有する本体と、
前記調理面上に配設される耐熱プレートと、
前記耐熱プレートと触れる状態に設けられ、繊維織布に微細な粒子からなるセラミックと導電性カーボン粒子が均一に分散されてなる面状発熱体と、
前記面状発熱体と所定の空間をおいて隣接設置され、被覆が電子線に晒されて耐熱性が強化されたワイヤから構成される誘導加熱装置と、
前記所定の空間が含まれた前記空気移動通路に空気を強制送風させる送風ファンと、を含むことを特徴とする複合調理器。
【請求項16】
誘導加熱装置と伝導性加熱装置とを含み、これら誘導加熱装置と伝導性加熱装置とが同時に駆動して高速調理を行うことを特徴とする複合調理器。
【請求項17】
電子線に晒されて耐熱性が強化された被覆を有する少なくとも1本のワイヤから構成されることを特徴とする、伝導性加熱装置を有する複合調理器の誘導加熱装置。

【発明の詳細な説明】
【技術分野】
【0001】
本発明は、複合調理器に関し、さらに詳細には、誘導加熱調理装置であるワークコイルを構成する素線の被覆に電子線を照射して耐熱性を強めた複合調理器に関する。
【背景技術】
【0002】
一般に、電子調理器は、電子誘導方式を利用して調理を行う装置であり、調理容器に磁力を加え、加えられた磁力により調理容器から発生する熱を利用して調理を行う。かかる電子調理器は磁場を利用して熱を生じさせるため空気を汚れることなく調理ができるし、通常、熱効率が約８０％以上となるためエネルギー効率の面からも優れた調理機具である。
【0003】
従来の電子調理器は、通常、電流が印加されることによって磁場が発生するワークコイルと、ワークコイルの上部に配設されて調理容器が置かれる上部プレートと、ワークコイルの下部に配設されて磁力線が通過するフェライト板と、から構成される。
【0004】
このように構成された従来の電子調理器においてワークコイルに電流が供給されると、ワークコイルの周りに磁場が形成される。このとき磁場を形成する磁力線は、上部プレート及び鉄製調理容器の床の内部及びフェライト板を連結する閉路を形成するようになる。
【0005】
このように形成された磁力線が鉄製調理容器の床の内部を通過すると鉄製調理容器に渦電流が発生し、渦電流が流れると鉄製調理容器では電気抵抗により熱が発生する。そして鉄製調理容器から発生した熱は調理容器内にある食べ物に伝えられ食べ物の調理が行われる。
【0006】
しかし、このような従来の電子調理器は誘導加熱方式で調理を行うことから、調理容器として誘導加熱可能な鉄製容器しか使用できず、非鉄製容器は使用できないという問題点があった。
【0007】
また、従来の電子調理器は、ワークコイルだけで調理を行う場合、食べ物の量が増加す

るにつれて調理時間が延び、大容量の調理には不向きだった。
【発明の開示】
【発明が解決しようとする課題】
【0008】
本発明は、上記の問題点に鑑みてされたものであり、その目的は、誘導加熱方式にて熱を発生させるだけでなく発熱装置により、直接、熱を発生させ食べ物を調理することによって調理容器の材質にかかわらずに調理が行える複合調理器を提供することである。
【0009】
本発明の他の目的は、調理する食べ物の量が多い場合、誘導加熱装置と発熱装置を同時に駆動して速かに調理できる複合調理器を提供することである。
【0010】
本発明のさらに他の目的は、発熱装置から発生した熱によって誘導加熱装置が損なわれるのを防ぐべく、ワークコイルを構成する素線の被覆に電子線を照射して耐熱性を強めた複合調理器を提供することである。
【課題を解決するための手段】
【0011】
上記の目的を達成するべく、本発明に係る複合調理器は、本体と、該本体内部に設置されて調理物を加熱調理するための熱を発生する発熱装置と、前記発熱装置に隣接設置されて前記調理物を誘導加熱調理するための磁場を生成する誘導加熱装置と、を含むものにおいて、前記誘導加熱装置は、電子線に晒されて被覆の耐熱性が強化された少なくとも一本のワイヤを持つことを特徴とする。
【発明の効果】
【0012】
上述のように構成される本発明は、誘導加熱方式にて熱を発生させるだけでなく発熱装置から直接熱を発生させて食べ物を調理するため、調理容器の材質にかかわらずに調理ができ、且つ、大容量の食べ物を短時間で調理できる。
【0013】
また、ワークコイルを構成する各素線の被覆に電子線を照射して被覆の耐熱性を強化したため、別途の断熱板を設置しなくとも発熱装置から発生した熱により誘導加熱装置が損傷するのを防ぐことができる。
【発明を実施するための最良の形態】
【0014】
以下、本発明の好ましい実施例を添付図面を参照しつつ詳細に説明する。図面中、同一の構成要素には可能な限り同一の参照番号及び符号を共通使用するものとする。
【0015】
図１に示すように、本発明の一実施例による複合調理器は、本体１０と、本体１０の上面の一部に配設され、その上に各種の調理容器が置かれる耐熱プレート１１と、を備える。本体１０の前面中央には複合調理器に動作命令を入力するための入力部１３が設けられ、入力部１３の両側面には、後述する面状発熱体(図２の３０)の下部を移動して面状発熱体(図２の３０)から発生した熱を分散させるための空気を吸入する吸入口１２が開けられる。
【0016】
本体１０内の前側部分には吸入口１２から吸い込んだ空気を面状発熱体(図２の３０)の下部に強制的に送風する円筒形の送風ファン２０が取り付けられ、送風ファン２０の一端には送風ファン２０を回転させるためのファンモータ２１が備えられる。本体１０の後面には面状発熱体(図２の３０)の下部を通過した空気を本体１０外へ排出するための排出口１４が開けられ、本体１０より下には内部に受容空間が画成された補助テーブル１５を備える。
【0017】
図２に示すように、本発明の一実施例による複合調理器は、耐熱プレート１１の下部に

おいて、耐熱プレート１１と触れる状態に設けられた面状発熱体３０を備える。面状発熱体３０は、繊維織布に、微細な粒子からなる先端素材のセラミックと導電性特殊カーボン粒子とを均一に分散した製品であり、発熱密度が均一で、消費電力が小さい。

【0018】

面状発熱体３０に電流が供給されるとその面状発熱体３０では熱が発生し、この熱により食べ物が加熱される。このように面状発熱体３０は調理容器を、直接、加熱する方式にて調理を行う装置である。面状発熱体３０は、固定部材３４の上部に載置される耐熱プレート１１の中央下部に形成された溝３５に挿入設置される。

【0019】

面状発熱体３０の下部においては面状発熱体から所定の間隔だけ離れてワークコイル４０が設けられる。ここで、ワークコイル４０は、リッツ線(LITZ wire)(図３の４１)が渦巻状に巻回されてなり、ワークコイル４０から発生した磁力線は耐熱プレート１１を介して調理容器の床の内部を通過するようになる。

【0020】

調理容器を通る磁力線に変化が生じると、調理容器の床の内部に多くの渦電流が生成され、渦電流に対する調理容器の電気抵抗により熱が発生する。このようにワークコイル４０は誘導加熱方式により食べ物を調理するための装置である。誘導加熱方式で調理をするには渦電流が必ず生成されねばならず、したがって、渦電流が発生しない非鉄製調理容器では誘導加熱方式による調理が不可能になる。

【0021】

フェライト板３１は、ワークコイル４０と触れる状態にワークコイル４０の下面に設けられる。フェライトは体心立方結晶構造の鉄に不純物が溶けている固溶体であり、ワークコイル４０から発生した磁力線を内部に通らせて磁力線を遮蔽する役割を果たす。したがって、ワークコイル４０から発生した磁力線は、耐熱プレート１１を経て調理容器の床の内部を通過した後ワークコイル４０の下に設けられたフェライト板３１を通るループを形成する。フェライト板３１の下にはワークコイル４０とフェライト板３１を支持するための受け台３２が備えられる。

【0022】

一方、面状発熱体３０とワークコイル４０は所定の距離だけ離れて設けられ、これによる空間に空気断熱層を形成するが、この場合、断熱効果をより増大するために前記空間へ空気を強制的に移動させる。このため、前記空間は主として空気移動通路３３として利用される。

【0023】

空気移動通路３３の右側には空気移動通路３３に空気を強制的に送風する送風ファン２０が取り付けられる。送風ファン２０は多翼型横流ファンであり、吸入口１２から吸い込まれた空気を空気移動通路３３に供給する。送風ファン２０の周りには送風ファン２０から送風された空気を空気移動通路３３まで案内する空気案内部材２２が設けられる。

【0024】

図３及び図４に示すように、本発明の一実施例による複合調理器に使用されるワークコイル４０は、リッツ線４１が渦巻状に配されてなる。リッツ線４１は、電気伝導性に優れた銅線やアルミニウム線に被膜処理を施し高温で数回成形した素線(マグネットワイヤ)５０を複数本結合して構成する。

【0025】

さらに、本発明の複合調理器に使用されるリッツ線４１の素線５０は、内部の導体５２に高分子化合物(例えば、ポリエステル)の被覆５１を形成した後、その被覆５１に電子線(electron beam)を照射して作製する。高分子化合物の被覆５１に電子線を照射すると、被覆５１の分子構造は、架橋現象により最初の線状構造から網状構造に変わる。

【0026】

架橋現象とは、線状に結合している原子のうち任意の２つの原子同士に橋がかけられるように化学結合がなされる現象であり、この場合、一般に共有結合がなされる。

【0027】
架橋により化学結合を形成する高分子化合物は３次元網状構造を形成するが、このような架橋現象を起こさせる方法には、架橋剤を添加する方法や電子線を照射する方法などがある。
【0028】
素線５０の被覆５１が電子線の照射により網状構造に変われば、最初線状構造を有する被覆に比べて機械的特性、耐熱性、耐薬品性、耐応力性などが向上する。したがって面状発熱体３０から発生した熱によりワークコイル４０が損傷するのを避けるべく、ワークコイル４０を構成するそれぞれの素線５０の被覆５１に電子線を照射すると内部構造が変化し耐熱性が強化され、したがって、別途の断熱板を設置しなくともワークコイル４０に伝えられる輻射熱を効果的に遮断することができる。
【0029】
一方、本発明に使用されるワークコイル４０の素線５０は、電子線の照射された高分子化合物の被覆５１に磁気粘性層(図示せず)を覆う。磁気粘性層は、常温では粘性が小さいが一定の温度以上になれば粘性が大きくなるため、リッツ線４１を構成する素線５０同士の結合を堅固にする。
【0030】
次に、本発明の一実施例による複合調理器の動作について説明する。
【0031】
使用者が調理容器を耐熱プレート１１上に置いた後、入力部１３を介して複合調理器へ作動命令を入力すれば、この作動命令は制御部(図示せず)に伝えられる。制御部は入力された作動命令を分析し面状発熱体３０とワークコイル４０のうちいずれかの装置に電流を供給すべきか決定する。
【0032】
仮に、入力された作動命令が面状発熱体３０及びワークコイル４０両方の駆動を要求すると、制御部は、インバータ(図示せず)が面状発熱体３０及びワークコイル４０の両方へ電流を供給するように制御する。
【0033】
面状発熱体３０に電流が供給されると面状発熱体３０の自己抵抗により面状発熱体３０では約５００℃以上の熱が発生する。この熱は耐熱プレート１１に置かれている調理容器に伝えられる。
【0034】
一方、ワークコイル４０に高周波電流が供給されるとワークコイル４０の周りに磁場が形成され、この磁場により調理容器に渦電流が形成される。渦電流は、調理容器に流れつつ電気抵抗による熱を発生させる。このように面状発熱体３０とワークコイル４０により発生した熱は食べ物に伝えられ、調理が行われる。
【0035】
一方、面状発熱体３０から発生した熱の一部は、輻射による熱伝達方式にて面状発熱体３０より下に伝えられる。面状発熱体３０より下へ放射された熱はワークコイル４０に到達するが、ワークコイル４０を構成するリッツ線４１の各素線５０は電子線の照射により一層堅固に相互結合され耐熱性が強化されるため、面状発熱体３０から発生した熱よりワークコイル４０を効果的に保護できる。
【0036】
面状発熱体３０に電源が供給されている間、制御部は送風ファン２０を回転させ空気移動通路３３を介して空気を移動させることによって、より大きい熱遮断効果が得られる。
【0037】
食べ物に充分な熱が加えられて調理が完了すると使用者はオフ命令を入力し、制御部は入力されたオフ命令に応じて面状発熱体３０とワークコイル４０に供給される電源を遮断し、調理動作を完了する。
【0038】

以上の過程で本発明による動作は全て終了する。

【図面の簡単な説明】

【0039】

【図1】本発明の一実施例による複合調理器の外観を示す斜視図である。

【図2】図１のＩＩ－ＩＩ線で切った断面図である。

【図3】図１に示した複合調理器のワークコイルを示す斜視図である。

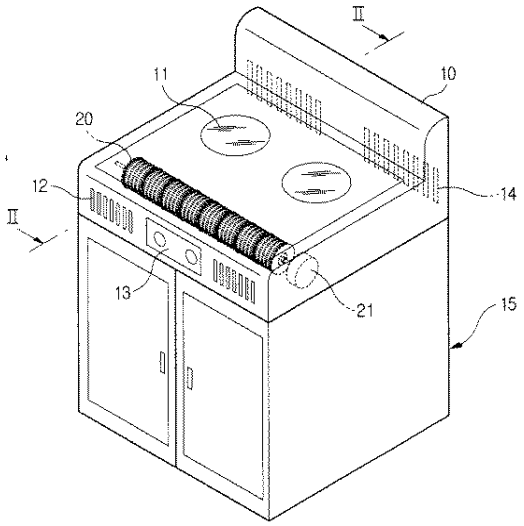
【図4】図１に示した複合調理器のワークコイルを構成する素線(マグネットワイヤ)を示す正面図である。

【符号の説明】

【0040】

１０　本体
１１　耐熱プレート
１２　吸入口
１３　入力部
１４　排出口
１５　補助テーブル
２０　送風ファン
２１　ファンモータ
２２　空気案内部材
３０　面状発熱体
３１　フェライト板
３２　受け台
３３　空気移動通路
３４　固定部材
３５　溝
４０　ワークコイル
４１　リッツ線
５０　素線
５１　被覆
５２　導体

【図1】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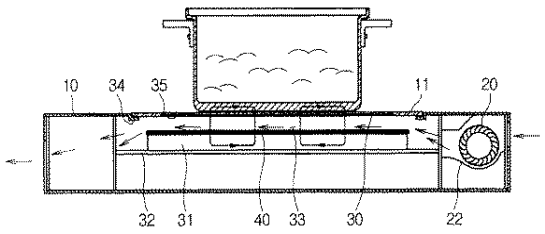
【図2】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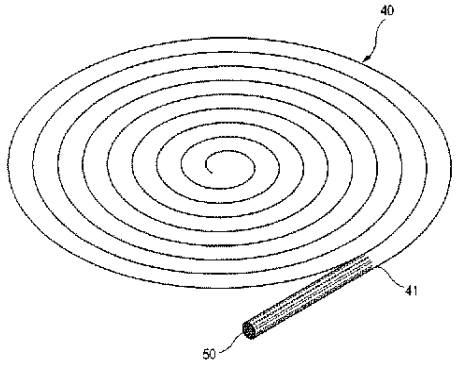
【図3】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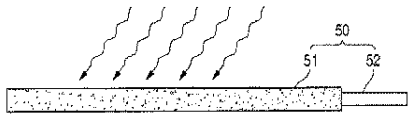
【図4】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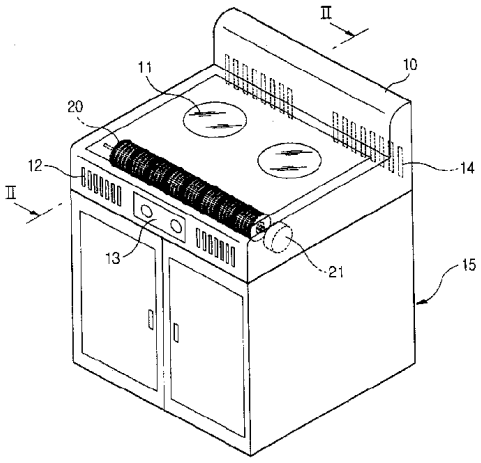
权利要求书 3 页 说明书 7 页 附图 3 页

[54] 发明名称 复合烹调装置

[57] 摘要

一种复合烹调装置，具有主体、加热单元、感应加热单元和绝热板。该加热单元设置在主体内以产生用于加热食物的热量。该感应加热单元邻接加热单元设置，用于产生磁场，以通过感应加热烹调食物。该绝热板设置在加热单元和感应加热单元之间，用于防止从加热单元产生的热量被传输到感应加热单元。进一步地，该绝热板设有至少一个热反射层，以反射从加热单元产生的热量。



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1．一种复合烹调装置，包括：

主体；

设置在所述主体内以产生用于加热食物的热量的加热单元；

邻接加热单元设置的感应加热单元，用于产生磁场，以通过感应加热烹调食物；以及

设置在加热单元和感应加热单元之间绝热板，用于防止从加热单元产生的热量被传输到感应加热单元。

2．如权利要求 1 所述的复合烹调装置，其中所述绝热板设有至少一个热反射层，以反射从加热单元产生的热量。

3．如权利要求 2 所述的复合烹调装置，其中所述至少一层热反射层包括陶瓷层。

4．如权利要求 3 所述的复合烹调装置，其中所述至少一层热反射层进一步包括邻接所述陶瓷层的氧化铝层。

5．如权利要求 3 所述的复合烹调装置，其中所述至少一层热反射层进一步包括邻接所述陶瓷层的氧化铍层。

6．如权利要求 2 所述的复合烹调装置，其中所述至少一层热反射层进一步包括邻接设置在所述绝热板上的阻热塑料层的陶瓷层。

7．如权利要求 1 所述的复合烹调装置，其中所述的绝热板与加热单元隔开预定距离。

8．一种复合烹调装置，包括：

主体；

设置在所述主体内以产生用于加热食物的热量的加热单元；

设置在所述主体内的工作线圈，用于产生磁场，以通过感应加热而烹调食物；

邻接加热单元设置的绝热板，用于防止从加热单元产生的热量被传输到工作线圈；以及

鼓风扇，所述鼓风扇用于强制地使空气穿过设置于绝热板和工作线圈

之间的空气流动通道流动。

9．如权利要求 8 所述的复合烹调装置，其中所述绝热板设有至少一个热反射层，以反射从加热单元产生的热量。

10．如权利要求 9 所述的复合烹调装置，其中所述至少一层热反射层包括陶瓷层。

11．如权利要求 10 所述的复合烹调装置，其中所述至少一层热反射层进一步包括邻接所述陶瓷层的氧化铝层。

12．如权利要求 10 所述的复合烹调装置，其中所述至少一层热反射层进一步包括邻接所述陶瓷层的氧化铍层。

13．如权利要求 9 所述的复合烹调装置，其中所述至少一层热反射层进一步包括邻接设置在所述绝热板上的阻热塑料层的陶瓷层。

14．如权利要求 8 所述的复合烹调装置，其中所述的绝热板与加热部件隔开预定距离。

15．如权利要求 8 所述的复合烹调装置，其中所述主体设有用于把空气吸入主体中的至少一个入口、以及用于把穿过空气流动通道流动的空气排放到主体外部的至少一个出口。

16．一种复合烹调装置，包括：

第一加热单元，用于产生被传输到烹调容器的热量；以及

第二加热单元，用于有选择地产生磁场，该磁场的磁力线穿过烹调容器的底部；以及

设置在第一和第二加热单元之间的绝热板，用于保护第二加热单元免受从第一加热第一产生的热量加热。

17．如权利要求 16 所述的复合烹调装置，其中所述绝热板包括：

基板；以及

至少一层热反射层。

18．如权利要求 17 所述的复合烹调装置，其中所述至少一层热反射层具有高表面亮度。

19．如权利要求 17 所述的复合烹调装置，其中所述至少一层热反射层具有高红外反射系数。

20．一种复合烹调装置，包括：

传导加热单元；

感应加热单元，该传导加热单元和感应加热单元被同时驱动，以快速进行烹调；以及

设置在传导加热单元和感应加热单元之间的绝热板，用于保护感应加热单元免受从感应加热单元产生的热量加热。

复合烹调装置

技术领域

本发明总体上涉及一种复合烹调装置，更具体地说，涉及一种包括绝热板的复合烹调装置，其上形成有热反射层的绝热板安装在平面加热部件和工作线圈之间，从而提高绝热效果。

背景技术

一般来说，利用电磁感应加热进行烹调的电烹调装置把电磁力施加到烹调容器，并随后利用由于所施加的磁力而从烹调容器产生的热量进行烹调。该电烹调装置利用磁场产生热量，从而可进行烹调，而不会发生空气污染。此外，电烹调装置通常具有大约 80％或者更高的热效率，因此在能量效率方面，电烹调装置是一种良好的烹调设备。

传统电烹调装置通常包括工作线圈，电流作用在工作线圈上以产生磁场；上板，所述上板放置在工作线圈上，以使烹调容器可被坐落在其上；以及铁氧体板，所述铁氧体板放置在工作线圈之下，以使磁力线可从此穿过。

在具有上述结构的传统电烹调装置中，当电流作用到工作线圈上时，环绕工作线圈形成磁场。此时，形成磁场的磁力线形成连接上板、铁制烹调容器底部的内侧和铁氧体板的闭环。

当以这种方式形成的磁力线穿过铁制烹调容器的底部的内侧时，在烹调容器中产生涡流，并且随着涡流流动，利用电阻从铁制烹调容器中产生热量。进一步地，从铁制烹调容器产生的热量被传输到设置在烹调容器中的食物，并进而对食物进行烹调。

但是，传统电烹调装置的问题在于，该电烹调装置以感应加热的方式进行烹调，因此只能是能够执行感应加热的铁制容器才能用作烹调容器，

而非铁制容器不能用作烹调容器。

进一步地，传统电烹调装置的问题在于，当只利用工作线圈进行烹调时，如果食物量增加，烹调时间就会延长，因此该电烹调装置不适于烹调大量的食物。

发明内容

因此，本发明的一个方面是提供一种复合烹调装置，其既可以通过利用加热单元直接产生热量而进行烹调，也可以利用感应加热产生热量而进行烹调，从而不管烹调容器的材料如何都可以进行烹调。

本发明的另一方面是提供一种复合烹调装置，在烹调大量食物时，该烹调装置同时驱动感应加热单元和加热单元。

本发明的进一步方面是提供一种复合烹调装置，其中在绝热板上设置加热反射层，以防止感应加热单元由于从加热单元产生的热量而被损坏，从而提供绝热效果。

本发明的附加方面和/或优点将在以下的描述中部分得到阐述，部分从说明书中可以得到显而易见的了解，或者可以通过实施本发明而获得教导。

通过提供一种复合烹调装置可实现上述和/或其它方面，该复合烹调装置包括：主体；设置在所述主体内以产生用于加热食物的热量的加热单元；邻接加热单元设置的感应加热单元，用于产生磁场，以通过感应加热烹调食物；以及设置在加热单元和感应加热单元之间的绝热板，用于防止从加热单元产生的热量被传输到感应加热单元。

通过提供一种复合烹调装置可实现上述和/或其它方面，该复合烹调装置包括：主体；设置在所述主体内以产生用于加热食物的热量的加热单元；设置在所述主体内的工作线圈，用于产生磁场，以通过感应加热而烹调食物；邻接加热单元设置的绝热板，用于防止从加热单元产生的热量被传输到工作线圈；以及鼓风扇，所述鼓风扇用于强制地使空气穿过设置于绝热板和工作线圈之间的空气流动通道流动。

附图说明

参照附图，通过对本发明实施例进行描述，本发明的上述和/或其他方面内容和优点将变得更加清楚和易于理解，其中：

图 1 是示出根据本发明的实施例所述的复合烹调装置的外部形状的透视图；

图 2 是沿图 1 所示的线 II－II 截取的剖视图；以及

图 3 是显示图 1 所示的复合烹调装置的绝热板的剖视图。

具体实施方式

下面将详细描述本发明的实施例，本发明的例子示出在附图中，全文中相同的标号指示相同的元件。以下描述的实施例旨在通过参照附图解释本发明。

如图 1 所示，根据本发明的实施例所述的复合烹调装置包括主体 10 以及阻热板 11，该阻热板设置在主体 10 的顶表面的一部分上，以在其上放置各种烹调容器。输入单元 13 设置在主体 10 的前表面中心，以向复合烹调装置输入操作命令。入口 12 设置在输入单元 13 的相对侧，以通过使空气流动到绝热板（图 2 中的附图标号 40，将在下面说明）下部而吸引用于耗散从平面加热元件（图 2 中的附图标号 30，将的下面说明）产生的热量的空气。

圆柱形鼓风扇 20 设置在主体 10 的内侧前部，以强制地吹动通过位于绝热板（图 2 中的 40）下部的入口 12 吸入的空气。风扇电机 21 设置在鼓风扇 20 的一端，以转动鼓风扇 20。

出口 14 位于主体 10 的后表面，以将在绝热板（图 2 中的 40）下部流动的空气排放到主体 10 的外部。其内形成容纳空间的辅助盒体 15 设置在主体 10 下部。

构成为如图 2 所示的本发明所述的该复合烹调装置设有平面加热部件 30，该加热部件 30 设置在阻热板 11 下部并与阻热板 11 保持接触。平面加热部件 30 是这样一种产品，即其中由精细颗粒组成的高技术陶瓷材料以及导电的特殊碳颗粒均匀分布在纤维织物上，而且该加热部件 30 具有均匀的加热密度和低能耗。

当电流施加在平面加热部件 30 上时，从平面加热部件 30 产生热量，

并由这种热量加热食物。采用这种方式，平面加热部件 30 利用直接加热烹调容器的方式进行烹调。

绝热板 40 放置在平面加热部件 30 下部，以防止从平面加热部件 30 产生的热量被传递到工作线圈 50，该线圈 50 下面将要说明。根据一个方面，绝热板 40 接触平面加热部件 30。根据另一方面，绝热板 40 与平面加热部件 30 分开预定距离，以提高绝热效果。在此情况下，可在考虑到热效率和绝热效果的情况而任意设定间隔距离。

绝热板 40 插入从主体 10 的顶部表面延伸的固定部件 34。平面绝热部件 30 插入设置在阻热板 11 的中心下部的凹槽 35 中，该阻热板 11 安装在固定部件 34 的顶部。

工作线圈 50 设置在绝热板 40 下部，与绝热板 40 隔开预定距离。在此情况下，工作线圈 50 形成其内的绞合线（litz wire）缠绕成螺旋结构的形状。从工作线圈 50 产生的磁力线通过绝热板 40 和阻热板 11 穿经烹调容器的底部的内侧。

由于磁力线，在烹调容器的底部的内侧产生大量的涡流，而且由烹调容器对涡流的电阻产生热量。采用这种方式，工作线圈 50 以感应加热的方式烹调食物。由于将产生涡流以感应加热的方式烹调食物，因此不可能利用不能够产生涡流的非铁制烹调容器以感应加热的方式进行烹调。

铁氧体板 31 放置在工作线圈 50 的下部并与工作线圈 50 保持接触。铁氧体是一种固溶体，其中熔化在铁中的杂质具有以基体为中心的立体晶体结构，而且其通过允许磁力线穿过铁氧体而起到屏蔽从工作线圈 50 产生的磁力线的作用。因此，从工作线圈 50 产生的磁力线形成在通过绝热板 40 和阻热板 11 穿经烹调容器的底部内侧之后，穿过置于工作线圈 50 下部的铁氧体板 31 的环路。支撑件 32 设置在铁氧体板 31 下部，用于支撑工作线圈 50 和铁氧体板 31。

正如先前所指出的，绝热板 40 和工作线圈 50 以预定距离相互隔开，由此在它们之间的空间内形成空气绝热层。在此情况下，为进一步提高绝热效果，强制空气穿过该空气绝热层流动。因此，根据一方面，空气绝热层主要用作空气流动通道 33。

根据本发明的一个方面，鼓风扇 20 放置在空气流动通道 33 的右侧（如

图 2 所示），以强制空气吹入空气流动通道 33。根据本发明的一个方面，鼓风扇 20 是一种多叶片横向流动（cross-flow）的风扇，可把通过入口 12 吸入的空气提供到空气流动通道 33。空气引导件 22 环绕鼓风扇 20 设置，以把由鼓风扇 20 吸入的空气引导至空气流动通道 33。

如图 3 和 4 所示，绝热板 40 包括基板 42 和覆盖在基板 42 的顶部表面上的热反射层 41。进一步地，绝热板 40 安装成与平面绝热部件 30 以预定距离 d 隔开，以有效地隔离利用热传导方式从平面加热部件 30 传输的热量。

根据一个方面，绝热板 40 的基板 42 由包装式绝热材料制成。根据一个方面，包装式（packing-type）绝热材料具有气泡。根据另一方面，包装式绝热材料由含有石棉纤维的玻璃纤维制成。还根据另一方面，包装式绝热材料由防火砖制成。根据另一方面，基板 42 由把氮化硼加入阻热塑料的材料制成。

根据一个方面，具有良好热反射系数的材料涂覆在热反射层 41 上。因此，可把诸如陶瓷膜、氧化铝（Al_2O_3）或者氧化铍（BeO）之类的材料用作热反射层 41。陶瓷是一种通过高温热处理工艺制成的无机非金属材料，并具有很高的表面亮度、良好的热阻和良好的摩擦阻力。因此，当从平面加热部件 30 传输的辐射热量与涂覆在绝热板 40 上的陶瓷膜接触时，辐射热量由于高表面亮度而被反射，从而可以预见，提高了绝热效果。

氧化铝和氧化铍都是具有高红外反射系数的材料。即便从平面绝热部件 30 传输的辐射热量以红外线的形式被发射，也会从形成在绝热板 40 上的氧化铝层或者氧化铍层发射辐射热量，因此热量几乎不会传输到工作线圈 50。而且，从氧化铝层或氧化铍层反射的红外线再次入射到烹调容器。因此，尽管提供了同样的热量，但与不使用氧化铝层或氧化铍层的情况相比较，到达烹调容器的热量增加，这样就可获得例如提高能量效率的附加效果。

采用这种方式，如果热反射层设置在绝热板上，即便辐射热量在高温（一般为 500°C）下从平面加热部件 30 发射，辐射热量也会以接近全反射的方式被反射，因此获得显著地绝热效果。

具有高热组的陶瓷膜、氧化铝层和氧化铍层中的其中一种涂覆在基板

42 上。但是根据一个方面，为获得优良的绝热效果，可把热阻塑料层涂覆在基板 42 上，并在该热阻塑料层上设置陶瓷膜层。

进一步地，还有可能在基板 42 上涂覆陶瓷膜层，并在陶瓷膜层上形成氧化铝层或者氧化铍层。

下面说明本发明所述的复合烹调装置的操作过程。

用户把烹调容器放置在阻热板 11 上，并随后通过输入单元 13 把操作命令输入到复合烹调装置。随后把操作命令传输到控制单元（未示出）。控制单元分析操作命令，并随后确定平面加热部件 30 和工作线圈 50 中的哪一个要施加电流。

如果输入操作命令要求平面加热部件 30 和工作线圈 50 都进行操作，控制单元就控制逆变器（未示出）把电流施加到平面加热部件 30 和工作线圈 50。

当电流施加到平面加热部件30时，就会由于平面加热部件30的电阻，而从平面加热部件 30 产生大约 500℃ 或者更高的温度。产生的热量传输到放置在阻热板 11 上面的烹调容器。

当把高频电流施加到工作线圈 50 时，环绕工作线圈 50 形成磁场，从而由于该磁场而在烹调容器中形成涡流。在涡流穿过烹调容器的同时，涡流还基于电阻产生热量。在此方式中，从平面加热部件 30 和工作线圈 50 产生的热量被传输到烹调食物。

从平面加热部件 30 产生的热量的一部分利用辐射以热传导的方式从平面加热部件 30 向下传导。从平面加热部件 30 向下发射的热量辐射线到达绝热板 40 的热反射层 41，并从由绝热板 40 向上引导的热反射层 41 反射。因此，与一般的绝热板相比，进一步提高了加热效果。

在把能量提供到平面加热部件 30 的同时，控制单元通过转动鼓风扇 20 而使空气穿过空气流动通道 33 流动，从而获得优良的绝热效果。

如果把足够的热量提供到食物，并随后完成烹调，用户就输入 OFF 命令，而且控制器接收 OFF 命令，以切断提供到平面绝热部件 30 和工作线圈 50 的电能，从而结束烹调操作。

通过上述过程，就结束了本发明的操作过程。

从上面的说明中可以清楚地看出，本发明提供一种复合烹调装置，可

通过利用加热单元直接产生热量以及通过采用感应加热方式产生热量而烹调食物，这样不管烹调容器的材料如何都可执行烹调，并快速烹调大量的食物。

进一步地，本发明的优点在于，热反射层形成在绝热板上，这样可防止感应加热单元由于从加热单元产生的热量而损坏。

尽管对本发明的一些优选实施例进行了展示和描述，但本领域技术人员将会理解在不偏离本发明的原理和实质的情况下，可对这些实施例进行改变，其保护范围限定在本发明的权利要求及其等同物内。

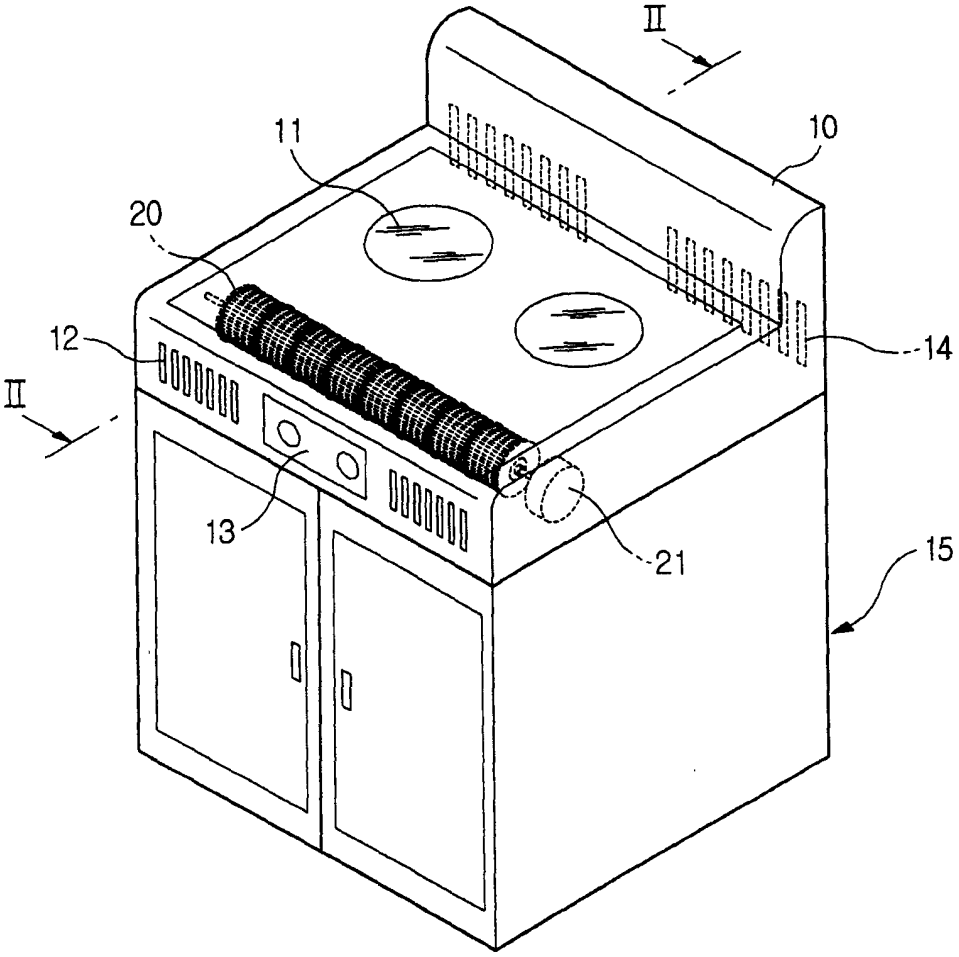

图 1

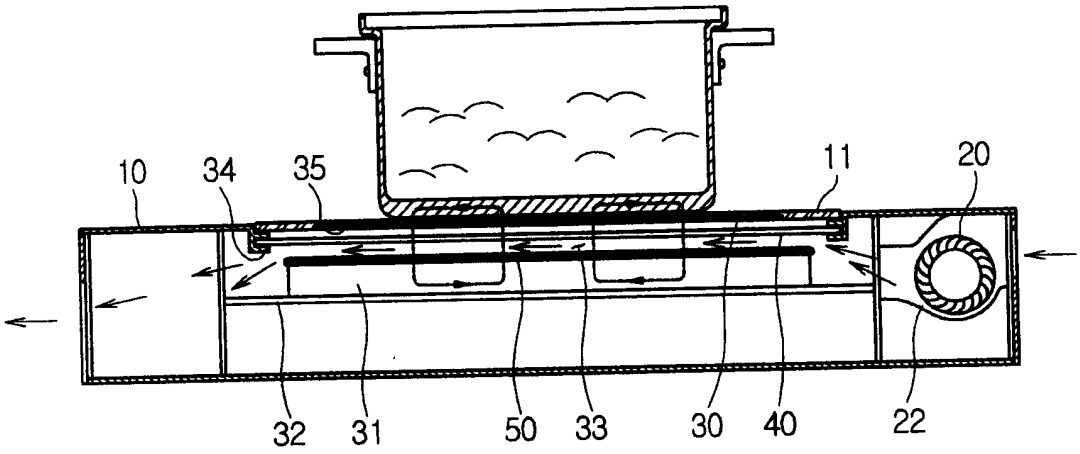

图 2

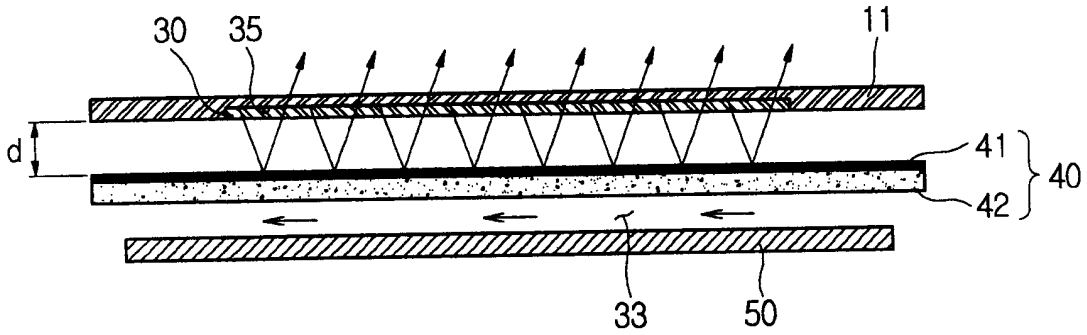

图 3

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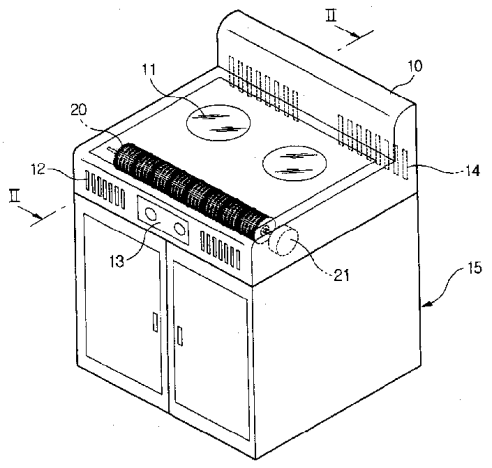
权利要求书 3 页 说明书 6 页 附图 4 页

[54] 发明名称 复合烹调装置

[57] 摘要

一种复合烹调装置，具有主体、加热单元以及感应加热单元。该加热单元设置在所述主体内以产生用于加热食物的热量。感应加热单元邻接加热单元设置，用于产生磁场，以通过感应加热烹调食物。所述感应加热单元具有至少一根导线，所述导线的包层暴露于电子束以增强其热阻。



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1. 一种复合烹调装置，包括：

主体；

设置在所述主体内以产生用于加热食物的热量的加热单元；以及

邻接加热单元设置的感应加热单元，用于产生磁场，以通过感应加热烹调食物，所述感应加热单元具有至少一根导线，所述导线的包层暴露于电子束以增强包层的热阻。

2. 如权利要求 1 所述复合烹调装置，其中当所述包层暴露于电子束时，包层的分子结构改变、以增强其热阻。

3. 如权利要求 2 所述的复合烹调装置，其中在所述包层暴露于电子束之后，所述包层的分子结构从初始线性结构变成网格结构。

4. 如权利要求 1 所述的复合烹调装置，其中所述感应加热单元缠绕成螺旋。

5. 如权利要求 1 所述的复合烹调装置，其中至少一根导线包括磁性粘质层。

6. 一种复合烹调装置，包括：

主体；

设置在所述主体内以产生用于加热食物的热量的加热部件；以及

设置在加热部件之下的工作线圈，用于产生磁场，以通过感应加热烹调食物，所述工作线圈设有包层，所述包层暴露于电子束以增强包层的热阻。

7. 如权利要求 6 所述复合烹调装置，其中当所述工作线圈的包层暴露于电子束时，包层的分子结构改变以增强其热阻。

8. 如权利要求 7 所述的复合烹调装置，其中在所述包层暴露于电子束之后，所述包层的分子结构从初始线性结构变成网格结构。

9. 如权利要求 6 所述的复合烹调装置，其中所述工作线圈缠绕成螺旋。

10. 一种复合烹调装置，包括：

第一加热单元，用于产生被传输到烹调容器的热量；以及

第二加热单元，包括具有包层的导线，所述包层暴露于电子束以增强包层的热阻，该第二加热单元还选择性地产生磁场，该磁场的磁力线穿过烹调容器的底部。

11．如权利要求 10 所述复合烹调装置，其中：

所述第二加热单元邻接所述第一加热单元并与第一加热单元隔开预定空间；而且

所述复合烹调装置进一步包括将空气穿过该预定空间流动的风扇。

12．如权利要求 11 所述的复合烹调装置，其中进一步包括：

具有入口和出口的主体，

其中在所述入口和出口之间限定空气流动通道以引导利用风扇流动的空气，该空气流动通道包括预定空间。

13．如权利要求 10 所述的复合烹调装置，其中当所述包层暴露于电子束时，包层的线性结合的原子在其之间形成共价键。

14．如权利要求 10 所述的复合烹调装置，其中所述感应加热单元包括缠绕成螺旋的绞合线。

15．一种复合烹调装置，包括：

主体，其具有烹调表面和限定空气流动通道的各个端部的进口和出口；

设置在烹调表面上的阻热板；

平面加热部件，所述平面加热部件与阻热板接触、并包括纤维织物，所述纤维织物具有均匀分布在其上的精细微粒化陶瓷材料和导电碳颗粒；

邻接平面加热部件并与加热部件隔开预定空间的感应加热单元，所述感应加热单元包括导线，所述导线具有暴露于电子束以增强其热阻的包层；以及

把空气强制穿过空气流动通道的风扇，该空气流动通道中包括预定空间。

16．一种复合烹调装置，包括：

传导加热单元；以及

感应加热单元，所述传导加热单元和感应加热单元被同时驱动，以快

速烹调。

17. 一种具有传导加热单元的复合烹调装置的感应加热单元，所述感应加热单元包括：

具有包层的至少一根导线，所述包层暴露于电子束以增强其热阻。

5

复合烹调装置

技术领域

本发明总体上涉及一种复合烹调装置，更具体地说，涉及一种向用于形成作为感应加热单元的工作线圈的元件导线的包层辐射电子束，从而增强热阻的复合烹调装置。

背景技术

一般来说，利用电磁感应加热进行烹调的电烹调装置把电磁力施加到烹调容器，并随后利用由于所施加的磁力而从烹调容器产生的热量进行烹调。该电烹调装置利用磁场产生热量，从而可进行烹调，而不会发生空气污染。此外，电烹调装置通常具有大约80%或者更高的热效率，因此在能量效率方面，电烹调装置是一种良好的烹调设备。

传统电烹调装置通常包括工作线圈，电流作用在工作线圈上以产生磁场；上板，所述上板放置在工作线圈上，以使烹调容器可被坐落在其上；以及铁氧体板，所述铁氧体板放置在工作线圈之下，以使磁力线可从此穿过。

在具有上述结构的传统电烹调装置中，当电流输送到工作线圈上时，环绕工作线圈形成磁场。此时，形成磁场的磁力线形成连接上板、铁制烹调容器的底部的内侧和铁氧体板的闭环。

当以这种方式形成的磁力线穿过铁制烹调容器的底部内侧时，在烹调容器中产生涡流，并且随着涡流流动，基于电阻从铁制烹调容器产生热量。进一步地，从铁制烹调容器产生的热量被传输到设置在烹调容器中的食物，并进而对食物进行烹调。

但是，传统电烹调装置的问题在于，该电烹调装置以感应加热的方式进行烹调，因此只能是能够执行感应加热的铁制容器才能用作烹调容器，

而且非铁制容器不能用作烹调容器。

进一步地，传统电烹调装置的问题在于，当只利用工作线圈进行烹调时，如果食物量增加，烹调时间就会延长，因此该电烹调装置不适于烹调大量的食物。

发明内容

因此，本发明的一个方面是提供一种复合烹调装置，其既可以通过利用加热单元直接产生热量而进行烹调，也可以利用感应加热产生热量而进行烹调，从而不管烹调容器的材料如何都进行烹调。

本发明的另一方面是提供一种复合烹调装置，在烹调大量食物时，该烹调装置同时驱动感应加热单元和加热单元。

本发明的进一步方面是提供一种复合烹调装置，该复合烹调装置具有加热单元和感应加热单元，该感应加热单元设有具有导线的工作线圈，其中导线的包层被电子束辐射，以增加感应加热单元的热阻，从而防止感应加热单元由于从加热单元产生的热量而被损坏。

本发明的附加方面和/或优点将在以下的描述中部分得到阐述，部分从说明书中可以得到显而易见的了解，或者可以通过实施本发明而获得教导。

通过提供一种复合烹调装置可也可实现上述和/或其它方面，该复合烹调装置包括：主体；设置在所述主体内以产生用于加热食物的热量的加热单元；以及邻接加热单元设置的感应加热单元，用于产生磁场，以通过感应加热烹调食物。所述感应加热单元具有至少一根导线，所述导线的包层暴露于电子束以增强其热阻。

附图说明

参照附图，通过对本发明实施例进行描述，本发明的上述和/或其他方面内容和优点将变得更加清楚和易于理解，其中：

图 1 是示出根据本发明的实施例所述的复合烹调装置的外部形状的透视图；

图 2 是沿图 1 中的 II—II 线截取的剖视图；

图 3 是示出图 1 所示的复合烹调装置的工作线圈的剖视图；以及

图 4 是示出用于形成图 1 所示的复合烹调装置的工作线圈的元件导线（磁体导线）的主视图。

具体实施方式

下面将详细描述本发明的实施例，本发明的例子示出在附图中，其中相同的标号指示相同的元件。以下描述的实施例旨在通过参照附图解释本发明。

如图 1 所示，根据本发明的实施例所示的复合烹调装置包括主体 10 以及阻热板 11，该阻热板设置在主体 10 的顶表面的一部分上，以在其上放置各种烹调容器。输入单元 13 设置在主体 10 的前表面中心，以向复合烹调装置输入操作命令。入口 12 设置在输入单元 13 的相对侧，以通过使空气流动到平面加热部件（图 2 中的 30）下部，而吸引用于耗散从平面加热元件（图 2 中的 30）产生的热量的空气。

圆柱形鼓风扇 20 设置在主体 10 的内侧的前部，以强制地吹动通过位于平面加热部件（图 2 中的 30）下部的入口 12 吸入的空气。风扇电机 21 设置在鼓风扇 20 的一端，以转动鼓风扇 20。出口 14 位于主体 10 的后表面，以将在平面加热部件（图 2 中的 30）下部流动的空气排放到主体 10 的外部。其内形成容纳空间的辅助盒体 15 设置在主体 10 下部。

构成为如图2所示的本发明所述的该复合烹调装置设有平面加热部件 30，该加热部件 30 设置在阻热板 11 下部并与阻热板 11 保持接触。平面加热部件 30 是这样一种产品，即其中由精细颗粒组成的高技术陶瓷材料以及导电的特殊碳颗粒均匀分布在纤维织物上，而且该加热部件 30 具有均匀的加热密度和低能耗。

当电流施加在平面加热部件 30 上时，从平面加热部件 30 产生热量，并由这种热量加热食物。采用这种方式，平面加热部件 30 利用直接加热烹调容器的方式进行烹调。平面加热部件 30 插入设置在阻热板 11 中心下部的凹槽 35 中，该阻热板 11 安装在固定部件 34 的顶部。

工作线圈 40 放置在平面加热部件 30 下部，与平面加热部件 30 隔开预定距离。在此情况下，工作线圈 40 形成其内的绞合线（litz wire）（参见

图 3）缠绕成螺旋结构的形状。从工作线圈 40 产生的磁力线通过阻热板 11 穿经烹调容器的底部的内侧。

如果穿过烹调容器的磁力线发生变化，就在烹调容器的底部内侧产生大量的涡流，而且由烹调容器对涡流的电阻产生热量。采用这种方式，工作线圈 40 以感应加热的方式烹调食物。由于将要产生的涡流以感应加热的方式烹调食物，因此不可能利用由非铁材料制成的烹调容器以感应加热的方式进行烹调。

铁氧体板 31 放置在工作线圈 40 的下部并与工作线圈 40 保持接触。铁氧体是一种固溶体，其中熔化在铁中的杂质具有以基体为中心的立体晶体结构，而且其通过允许磁力线穿过铁氧体而起到屏蔽从工作线圈 40 产生的磁力线的作用。因此，从工作线圈 40 产生的磁力线形成在通过阻热板 11 穿经烹调容器的底部的内侧之后，穿过置于工作线圈 40 下部的铁氧体板 31 的环路。支撑件 32 设置在铁氧体板 31 下部，用于支撑工作线圈 40 和铁氧体板 31。

正如先前所指出的，平面加热部件 30 和工作线圈 50 以预定距离相互隔开，由此在它们之间的空间内形成空气绝热层。在此情况下，为进一步提高绝热效果，强制空气穿过该空气绝热层流动。因此，根据一方面，空气绝热层主要用作空气流动通道 33。

根据本发明的一个方面，鼓风扇 20 放置在空气流动通道 33 的右侧（如图 2 所示），以强制空气吹入空气流动通道 33。根据本发明的一个方面，鼓风扇 20 是一种多叶片横向流动（cross-flow）的风扇，可把通过入口 12 吸入的空气提供到空气流动通道 33。空气引导件 22 环绕鼓风扇 20 设置，以把由鼓风扇 20 吸入的空气引导至空气流动通道 33。

进一步地，该复合烹调装置中使用的绞合线 41 的每一元件导线 50 是以下述方式制成的，即利用由高分子量化合物（例如聚酯）制成的包层 51 包覆内部导体 52，并随后把电子束辐射在包层 51 上。当电子束辐射在包层 51 上时，包层 51 的分子结构就利用交联（cross linkage）现象从初始线性结构变成网格结构。

在这种交联现象中，在多个线性结合的原子中的至少两个原子之间设置桥的情况下，形成化学键。在这种情况下，通常形成共价键。

用于通过交联形成化学键的高分子量化合物构成三维网格结构。至少有两种方法：即添加交联剂、以及辐射电子束。

如果每一元件导线 50 的包层 51 由于辐射电子束而变成网格结构，与包覆初始线性结构相比较，提高了化学性质、热阻、化学稳定性（chemical resistance）、抗内部应力等等特性。因此，为防止工作线圈由于从平面加热部件 30 产生的热量而受到破坏，如果电子束辐射到用于形成工作线圈 40 的每一元件导线 50 的包层 51 上，包层 51 的内部结构产生改变以增强热阻，这样不必安装独立的绝热板，就可有效地隔绝传输到工作线圈 40 的辐射热量。

根据一个方面，用于本发明的工作线圈 40 的元件导线 50 制作成使元件导线 50 的包层 51 包覆磁性粘质层（未示出），其中该包层 51 上辐射电子束，而且该包层由高分子量化合物制成。在正常温度下，磁性粘质层的粘度很低，而且如果温度上升到预定水平之上，其粘度就增加，从而加固了应用于形成绞合线 41 的元件导线 50 之间的结合。

下面说明本发明所述复合烹调装置的操作过程。

用户把烹调容器放置在阻热板 11 上，并随后通过输入单元 13 把操作命令输入到复合烹调装置。随后把操作命令传输到控制单元（未示出）。控制单元分析操作命令，并随后确定平面加热部件 30 和工作线圈 40 中的哪一个输送电流。

如果输入操作命令要求平面加热部件 30 和工作线圈 40 都操作，控制单元就控制逆变器（未示出）把电流施加到平面加热部件 30 和工作线圈 40。

当电流施加到平面加热部件 30 时，就会由于平面加热部件 30 的电阻而从平面加热部件 30 产生大约 500℃ 或者更高的温度。产生的热量传输到放置在阻热板 11 上面的烹调容器。

当把高频电流施加到工作线圈 40 时，环绕工作线圈 40 形成磁场，从而基于该磁场而在烹调容器中形成涡流。在涡流穿过烹调容器的同时，涡流还根据电阻产生热量。在此方式中，从平面加热部件 30 和工作线圈 40 产生的热量被传输到烹调食物。

从平面加热部件 30 产生的热量的一部分利用辐射以热传导的方式从

平面加热部件 30 向下传导。从平面加热部件 30 向下发射的热量到达工作线圈 40。由于形成工作线圈 40 的绞合线 41 的各个元件导线 50 之间的键由于辐射电子束而进一步加固，从而增强工作线圈 40 的热阻。因此，工作线圈 40 安全地保护免受从平面加热部件 30 产生的热量的加热。

在把能量提供到平面加热部件 30 的同时，控制单元通过转动鼓风扇 20 而使空气穿过空气流动通道 33 流动，从而获得优良的绝热效果。

如果把足够的热量提供到食物，并随后完成烹调，用户就输入 OFF 命令，而且控制器接收 OFF 命令，以切断提供到平面绝热部件 30 和工作线圈 40 的电能，从而结束烹调操作。

通过上述过程，就结束了本发明的操作过程。

从上面的说明中可以清楚地看出，本发明提供一种复合烹调装置，可通过利用加热单元直接产生热量以及通过采用感应加热方式产生热量而烹调食物，这样不管烹调容器的材料如何都可执行烹调，并快速烹调大量的食物。

进一步地，本发明的优点在于，把电子束辐射到形成作为感应加热单元的工作线圈的元件导线的包层，以增强包层的热阻，从而不必安装独立的绝热板，就可防止感应加热部件由于从加热单元产生的热量而损坏。

尽管对本发明的一些优选实施例进行了展示和描述，但本领域技术人员将会理解在不偏离本发明的原理和实质的情况下，可对这些实施例进行改变，其保护范围限定在本发明的权利要求及其等同物内。

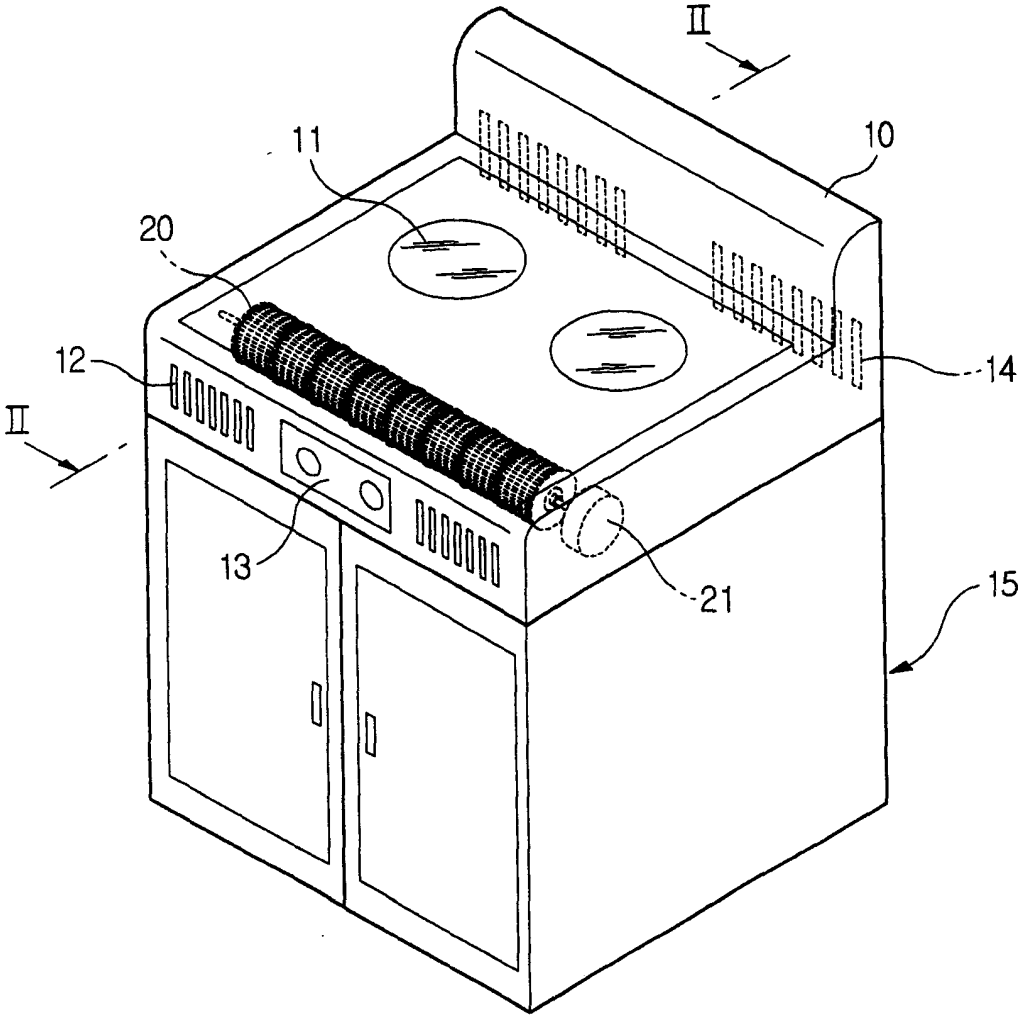

图 1

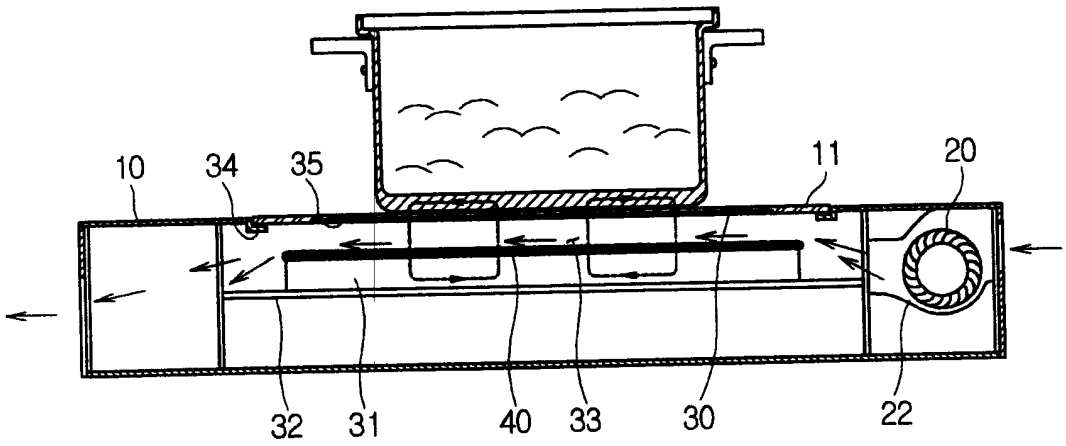

图 2

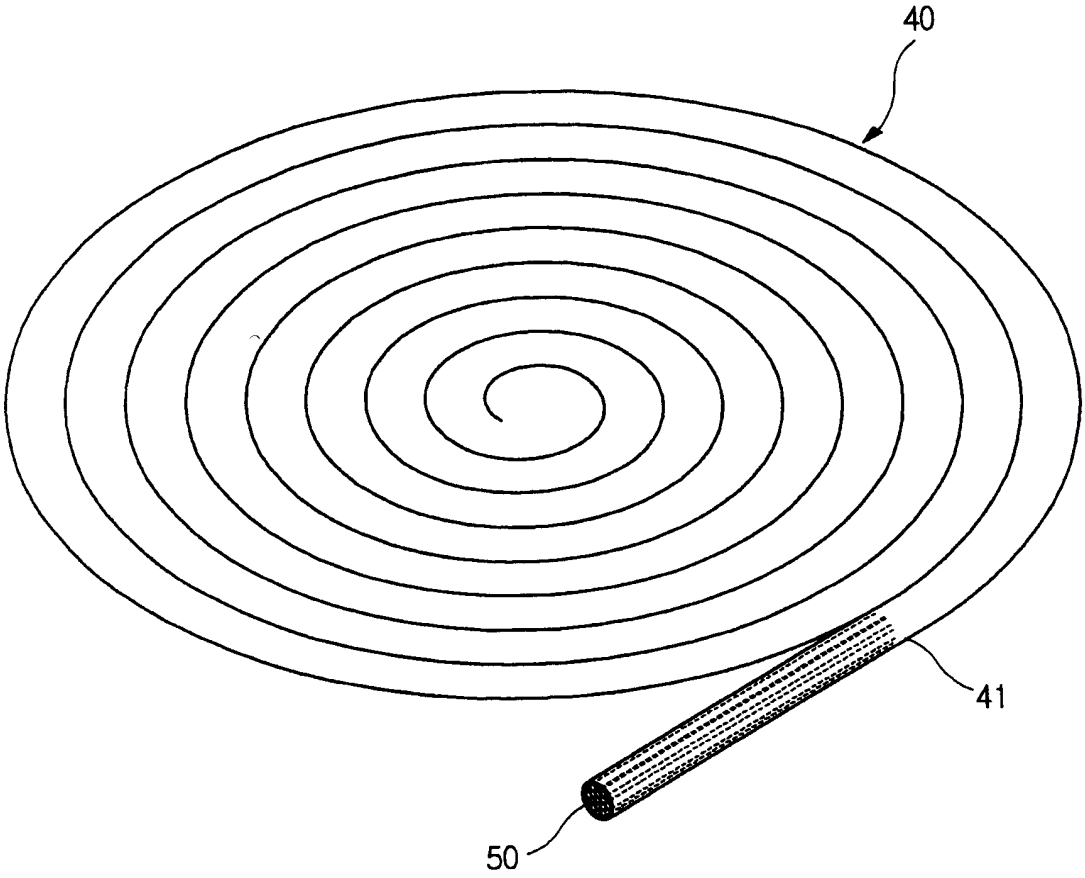

图 3

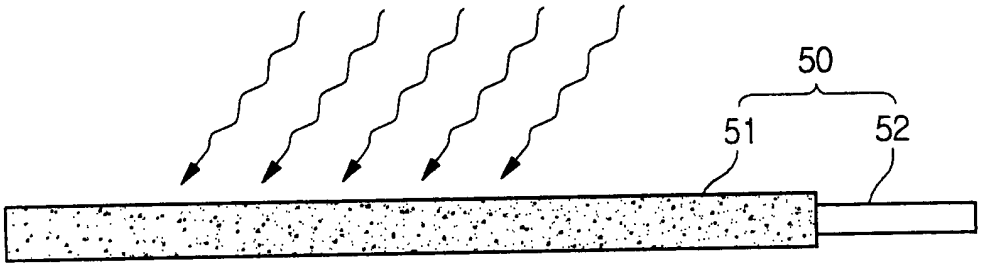

图 4

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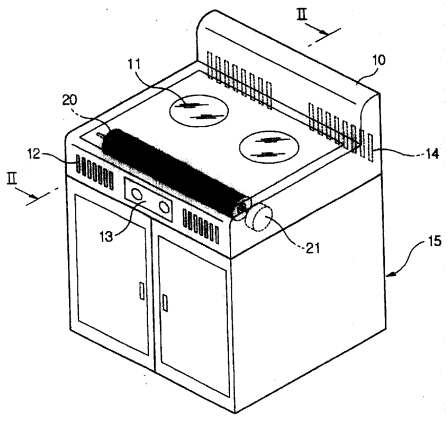
权利要求书 3 页 说明书 7 页 附图 4 页

[54] 发明名称

复合烹调装置

[57] 摘要

本发明公开了一种复合烹调装置，具有主体、加热单元以及感应加热单元。该加热单元设置在所述主体内以产生用于加热食物的热量。感应加热单元邻接加热单元设置，用于产生磁场，以通过感应加热烹调食物。所述感应加热单元具有至少一根导线，所述导线的包层暴露于电子束以增强其热阻，其中所述至少一根导线包括磁性粘质层。



1. 一种复合烹调装置，包括：

主体；

设置在所述主体内以产生用于加热食物的热量的加热单元；以及

邻接加热单元设置的感应加热单元，用于产生磁场，以通过感应加热烹调食物，所述感应加热单元具有至少一根导线，所述导线的包层暴露于电子束以增强包层的热阻，

其中所述至少一根导线包括磁性粘质层。

2. 如权利要求 1 所述复合烹调装置，其中当所述包层暴露于电子束时，包层的分子结构改变以增强其热阻。

3. 如权利要求 2 所述的复合烹调装置，其中在所述包层暴露于电子束之后，所述包层的分子结构从初始线性结构变成网格结构。

4. 如权利要求 1 所述的复合烹调装置，其中所述感应加热单元缠绕成螺旋。

5. 一种复合烹调装置，包括：

主体；

设置在所述主体内以产生用于加热食物的热量的加热部件；以及

设置在加热部件之下的工作线圈，用于产生磁场，以通过感应加热烹调食物，所述工作线圈设有包层，所述包层暴露于电子束以增强包层的热阻，

其中所述工作线圈包括导线，所述导线包括磁性粘质层。

6. 如权利要求 5 所述复合烹调装置，其中当所述工作线圈的包层暴露于电子束时，包层的分子结构改变以增强其热阻。

7. 如权利要求 6 所述的复合烹调装置，其中在所述包层暴露于电子束之后，所述包层的分子结构从初始线性结构变成网格结构。

8. 如权利要求 5 所述的复合烹调装置，其中所述工作线圈缠绕成螺旋。

9. 一种复合烹调装置，包括：

第一加热单元，用于产生被传输到烹调容器的热量；以及

第二加热单元，包括具有包层的导线，所述包层暴露于电子束以增强包层的热阻，该第二加热单元在用户的选择下产生磁场，该磁场的磁力线穿过烹调容器的底部，

其中所述导线包括磁性粘质层。

10．如权利要求9所述复合烹调装置，其中：

所述第二加热单元邻接所述第一加热单元并与第一加热单元隔开预定空间；而且

所述复合烹调装置进一步包括将空气穿过该预定空间流动的风扇。

11．如权利要求10所述的复合烹调装置，其中进一步包括：

具有入口和出口的主体，

其中在所述入口和出口之间限定空气流动通道以引导利用风扇流动的空气，该空气流动通道包括所述预定空间。

12．如权利要求9所述的复合烹调装置，其中当所述包层暴露于电子束时，包层的线性结合的原子在其之间形成共价键。

13．如权利要求9所述的复合烹调装置，其中所述感应加热单元包括缠绕成螺旋的绞合线。

14．一种复合烹调装置，包括：

主体，其具有烹调表面和限定空气流动通道的各个端部的进口和出口；

设置在烹调表面上的阻热板；

平面加热部件，所述平面加热部件与阻热板接触、并包括纤维织物，所述纤维织物具有均匀分布在其上的精细微粒化陶瓷材料和导电碳颗粒；

邻接平面加热部件并与所述平面加热部件隔开预定空间的感应加热单元，所述感应加热单元包括导线，所述导线具有暴露于电子束以增强其热阻的包层；以及

把空气强制穿过空气流动通道的风扇，所述预定空间包括在该空气流动通道中，

其中所述导线包括磁性粘质层。

15．一种具有传导加热单元的复合烹调装置的感应加热单元，所述感应加热单元包括：

具有包层的至少一根导线，所述包层暴露于电子束以增强其热阻，其中所述至少一根导线包括磁性粘质层。

复合烹调装置

技术领域

本发明总体上涉及一种复合烹调装置，更具体地说，涉及一种向用于形成作为感应加热单元的工作线圈的元件导线的包层辐射电子束，从而增强热阻的复合烹调装置。

背景技术

一般来说，利用电磁感应加热进行烹调的电烹调装置把电磁力施加到烹调容器，并随后利用由于所施加的磁力而从烹调容器产生的热量进行烹调。该电烹调装置利用磁场产生热量，从而可进行烹调，而不会发生空气污染。此外，电烹调装置通常具有大约80%或者更高的热效率，因此在能量效率方面，电烹调装置是一种良好的烹调设备。

传统电烹调装置通常包括工作线圈，电流作用在工作线圈上以产生磁场；上板，所述上板放置在工作线圈上，以使烹调容器可被坐落在其上；以及铁氧体板，所述铁氧体板放置在工作线圈之下，以使磁力线可从此穿过。

在具有上述结构的传统电烹调装置中，当电流输送到工作线圈上时，环绕工作线圈形成磁场。此时，形成磁场的磁力线形成连接上板、铁制烹调容器的底部的内侧和铁氧体板的闭环。

当以这种方式形成的磁力线穿过铁制烹调容器的底部内侧时，在烹调容器中产生涡流，并且随着涡流流动，基于电阻从铁制烹调容器产生热量。进一步地，从铁制烹调容器产生的热量被传输到设置在烹调容器中的食物，并进而对食物进行烹调。

但是，传统电烹调装置的问题在于，该电烹调装置以感应加热的方式进行烹调，因此只能是能够执行感应加热的铁制容器才能用作烹调容器，

而且非铁制容器不能用作烹调容器。

进一步地，传统电烹调装置的问题在于，当只利用工作线圈进行烹调时，如果食物量增加，烹调时间就会延长，因此该电烹调装置不适于烹调大量的食物。

发明内容

因此，本发明的一个方面是提供一种复合烹调装置，其既可以通过利用加热单元直接产生热量而进行烹调，也可以利用感应加热产生热量而进行烹调，从而不管烹调容器的材料如何都进行烹调。

本发明的另一方面是提供一种复合烹调装置，在烹调大量食物时，该烹调装置同时驱动感应加热单元和加热单元。

本发明的进一步方面是提供一种复合烹调装置，该复合烹调装置具有加热单元和感应加热单元，该感应加热单元设有具有导线的工作线圈，其中导线的包层被电子束辐射，以增加感应加热单元的热阻，从而防止感应加热单元由于从加热单元产生的热量而被损坏。

本发明的附加方面和/或优点将在以下的描述中部分得到阐述，部分从说明书中可以得到显而易见的了解，或者可以通过实施本发明而获得教导。

根据本发明的一个方面，其提供一种复合烹调装置，包括：主体；设置在所述主体内以产生用于加热食物的热量的加热单元；以及邻接加热单元设置的感应加热单元，用于产生磁场，以通过感应加热烹调食物，所述感应加热单元具有至少一根导线，所述导线的包层暴露于电子束以增强包层的热阻，其中所述至少一根导线包括磁性粘质层。

根据本发明的再一方面，其提供一种复合烹调装置，包括：主体；设置在所述主体内以产生用于加热食物的热量的加热部件；以及设置在加热部件之下的工作线圈，用于产生磁场，以通过感应加热烹调食物，所述工作线圈设有包层，所述包层暴露于电子束以增强包层的热阻，其中所述工

作线圈包括磁性粘质层。

根据本发明的另一方面，其提供一种复合烹调装置，包括：第一加热单元，用于产生被传输到烹调容器的热量；以及第二加热单元，包括具有包层的导线，所述包层暴露于电子束以增强包层的热阻，该第二加热单元在用户的选择下产生磁场，该磁场的磁力线穿过烹调容器的底部，其中所述导线包括磁性粘质层。

根据本发明的又一方面，其提供一种复合烹调装置，包括：主体，其具有烹调表面和限定空气流动通道的各个端部的进口和出口；设置在烹调表面上的阻热板；平面加热部件，所述平面加热部件与阻热板接触、并包括纤维织物，所述纤维织物具有均匀分布在其上的精细微粒化陶瓷材料和导电碳颗粒；邻接平面加热部件并与所述平面加热部件隔开预定空间的感应加热单元，所述感应加热单元包括导线，所述导线具有暴露于电子束以增强其热阻的包层；以及把空气强制穿过空气流动通道的风扇，所述预定空间包括在该空气流动通道中，其中所述导线包括磁性粘质层。

根据本发明的再一方面，其提供一种具有传导加热单元的复合烹调装置的感应加热单元，所述感应加热单元包括：具有包层的至少一根导线，所述包层暴露于电子束以增强其热阻，其中所述至少一根导线包括磁性粘质层。

附图说明

参照附图，通过对本发明实施例进行描述，本发明的上述和/或其他方面内容和优点将变得更加清楚和易于理解，其中：

图 1 是示出根据本发明的实施例所述的复合烹调装置的外部形状的透视图；

图 2 是沿图 1 中的 II－II 线截取的剖视图；

图 3 是示出图 1 所示的复合烹调装置的工作线圈的剖视图；以及

图 4 是示出用于形成图 1 所示的复合烹调装置的工作线圈的元件导线

（磁体导线）的主视图。

具体实施方式

下面将详细描述本发明的实施例，本发明的例子示出在附图中，其中相同的标号指示相同的元件。以下描述的实施例旨在通过参照附图解释本发明。

如图 1 所示，根据本发明的实施例所示的复合烹调装置包括主体 10 以及阻热板 11，该阻热板设置在主体 10 的顶表面的一部分上，以在其上放置各种烹调容器。输入单元 13 设置在主体 10 的前表面中心，以向复合烹调装置输入操作命令。入口 12 设置在输入单元 13 的相对侧，以通过使空气流动到平面加热部件（图 2 中的 30）下部，而吸引用于耗散从平面加热元件（图 2 中的 30）产生的热量的空气。

圆柱形鼓风扇 20 设置在主体 10 的内侧的前部，以强制地吹动通过位于平面加热部件（图 2 中的 30）下部的入口 12 吸入的空气。风扇电机 21 设置在鼓风扇 20 的一端，以转动鼓风扇 20。出口 14 位于主体 10 的后表面，以将在平面加热部件（图 2 中的 30）下部流动的空气排放到主体 10 的外部。其内形成容纳空间的辅助盒体 15 设置在主体 10 下部。

构成为如图2所示的本发明所述的该复合烹调装置设有平面加热部件 30，该加热部件 30 设置在阻热板 11 下部并与阻热板 11 保持接触。平面加热部件 30 是这样一种产品，即其中由精细颗粒组成的高技术陶瓷材料以及导电的特殊碳颗粒均匀分布在纤维织物上，而且该加热部件 30 具有均匀的加热密度和低能耗。

当电流施加在平面加热部件 30 上时，从平面加热部件 30 产生热量，并由这种热量加热食物。采用这种方式，平面加热部件 30 利用直接加热烹调容器的方式进行烹调。平面加热部件 30 插入设置在阻热板 11 中心下部的凹槽 35 中，该阻热板 11 安装在固定部件 34 的顶部。

工作线圈 40 放置在平面加热部件 30 下部，与平面加热部件 30 隔开预定距离。在此情况下，工作线圈 40 形成其内的绞合线（litz wire）（参见

图 3）缠绕成螺旋结构的形状。从工作线圈 40 产生的磁力线通过阻热板 11 穿经烹调容器的底部的内侧。

如果穿过烹调容器的磁力线发生变化，就在烹调容器的底部内侧产生大量的涡流，而且由烹调容器对涡流的电阻产生热量。采用这种方式，工作线圈 40 以感应加热的方式烹调食物。由于将要产生的涡流以感应加热的方式烹调食物，因此不可能利用由非铁材料制成的烹调容器以感应加热的方式进行烹调。

铁氧体板 31 放置在工作线圈 40 的下部并与工作线圈 40 保持接触。铁氧体是一种固溶体，其中熔化在铁中的杂质具有以基体为中心的立体晶体结构，而且其通过允许磁力线穿过铁氧体而起到屏蔽从工作线圈 40 产生的磁力线的作用。因此，从工作线圈 40 产生的磁力线形成在通过阻热板 11 穿经烹调容器的底部的内侧之后，穿过置于工作线圈 40 下部的铁氧体板 31 的环路。支撑件 32 设置在铁氧体板 31 下部，用于支撑工作线圈 40 和铁氧体板 31。

正如先前所指出的，平面加热部件 30 和工作线圈 50 以预定距离相互隔开，由此在它们之间的空间内形成空气绝热层。在此情况下，为进一步提高绝热效果，强制空气穿过该空气绝热层流动。因此，根据一方面，空气绝热层主要用作空气流动通道 33。

根据本发明的一个方面，鼓风扇 20 放置在空气流动通道 33 的右侧（如图 2 所示），以强制空气吹入空气流动通道 33。根据本发明的一个方面，鼓风扇 20 是一种多叶片横向流动（cross-flow）的风扇，可把通过入口 12 吸入的空气提供到空气流动通道 33。空气引导件 22 环绕鼓风扇 20 设置，以把由鼓风扇 20 吸入的空气引导至空气流动通道 33。

进一步地，该复合烹调装置中使用的绞合线 41 的每一元件导线 50 是以下述方式制成的，即利用由高分子量化合物（例如聚酯）制成的包层 51 包覆内部导体 52，并随后把电子束辐射在包层 51 上。当电子束辐射在包层 51 上时，包层 51 的分子结构就利用交联（cross linkage）现象从初始线性结构变成网格结构。

在这种交联现象中，在多个线性结合的原子中的至少两个原子之间设置桥的情况下，形成化学键。在这种情况下，通常形成共价键。

用于通过交联形成化学键的高分子量化合物构成三维网格结构。至少有两种方法：即添加交联剂、以及辐射电子束。

如果每一元件导线 50 的包层 51 由于辐射电子束而变成网格结构，与包覆初始线性结构相比较，提高了化学性质、热阻、化学稳定性（chemical resistance）、抗内部应力等等特性。因此，为防止工作线圈由于从平面加热部件 30 产生的热量而受到破坏，如果电子束辐射到用于形成工作线圈 40 的每一元件导线 50 的包层 51 上，包层 51 的内部结构产生改变以增强热阻，这样不必安装独立的绝热板，就可有效地隔绝传输到工作线圈 40 的辐射热量。

根据一个方面，用于本发明的工作线圈 40 的元件导线 50 制作成使元件导线 50 的包层 51 包覆磁性粘质层（未示出），其中该包层 51 上辐射电子束，而且该包层由高分子量化合物制成。在正常温度下，磁性粘质层的粘度很低，而且如果温度上升到预定水平之上，其粘度就增加，从而加固了应用于形成绞合线 41 的元件导线 50 之间的结合。

下面说明本发明所述复合烹调装置的操作过程。

用户把烹调容器放置在阻热板 11 上，并随后通过输入单元 13 把操作命令输入到复合烹调装置。随后把操作命令传输到控制单元（未示出）。控制单元分析操作命令，并随后确定平面加热部件 30 和工作线圈 40 中的哪一个输送电流。

如果输入操作命令要求平面加热部件 30 和工作线圈 40 都操作，控制单元就控制逆变器（未示出）把电流施加到平面加热部件 30 和工作线圈 40。

当电流施加到平面加热部件 30 时，就会由于平面加热部件 30 的电阻而从平面加热部件 30 产生大约 500°C 或者更高的温度。产生的热量传输到放置在阻热板 11 上面的烹调容器。

当把高频电流施加到工作线圈 40 时，环绕工作线圈 40 形成磁场，从而基于该磁场而在烹调容器中形成涡流。在涡流穿过烹调容器的同时，涡流还根据电阻产生热量。在此方式中，从平面加热部件 30 和工作线圈 40 产生的热量被传输到烹调食物。

从平面加热部件 30 产生的热量的一部分利用辐射以热传导的方式从

平面加热部件 30 向下传导。从平面加热部件 30 向下发射的热量到达工作线圈 40。由于形成工作线圈 40 的绞合线 41 的各个元件导线 50 之间的键由于辐射电子束而进一步加固，从而增强工作线圈 40 的热阻。因此，工作线圈 40 安全地保护免受从平面加热部件 30 产生的热量的加热。

在把能量提供到平面加热部件 30 的同时，控制单元通过转动鼓风扇 20 而使空气穿过空气流动通道 33 流动，从而获得优良的绝热效果。

如果把足够的热量提供到食物，并随后完成烹调，用户就输入 OFF 命令，而且控制器接收 OFF 命令，以切断提供到平面绝热部件 30 和工作线圈 40 的电能，从而结束烹调操作。

通过上述过程，就结束了本发明的操作过程。

从上面的说明中可以清楚地看出，本发明提供一种复合烹调装置，可通过利用加热单元直接产生热量以及通过采用感应加热方式产生热量而烹调食物，这样不管烹调容器的材料如何都可执行烹调，并快速烹调大量的食物。

进一步地，本发明的优点在于，把电子束辐射到形成作为感应加热单元的工作线圈的元件导线的包层，以增强包层的热阻，从而不必安装独立的绝热板，就可防止感应加热部件由于从加热单元产生的热量而损坏。

尽管对本发明的一些优选实施例进行了展示和描述，但本领域技术人员将会理解在不偏离本发明的原理和实质的情况下，可对这些实施例进行改变，其保护范围限定在本发明的权利要求及其等同物内。

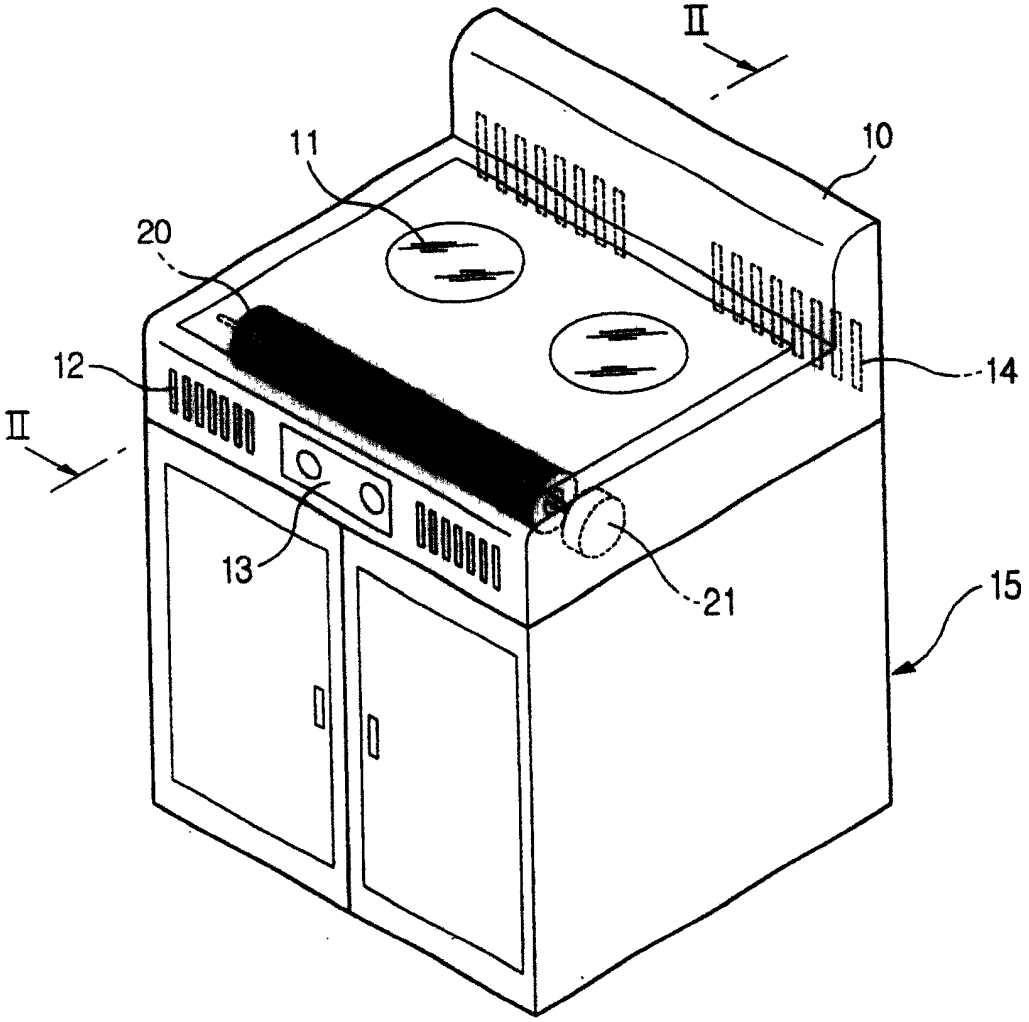


图 1

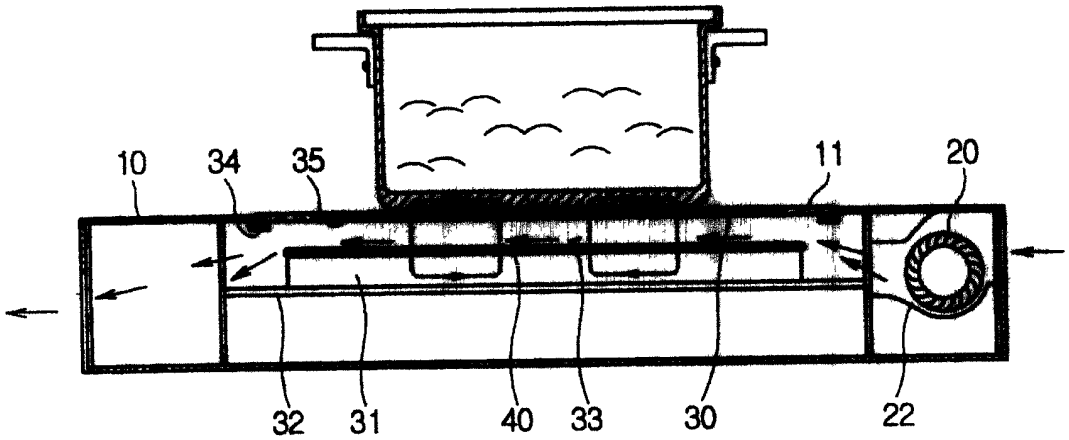


图 2

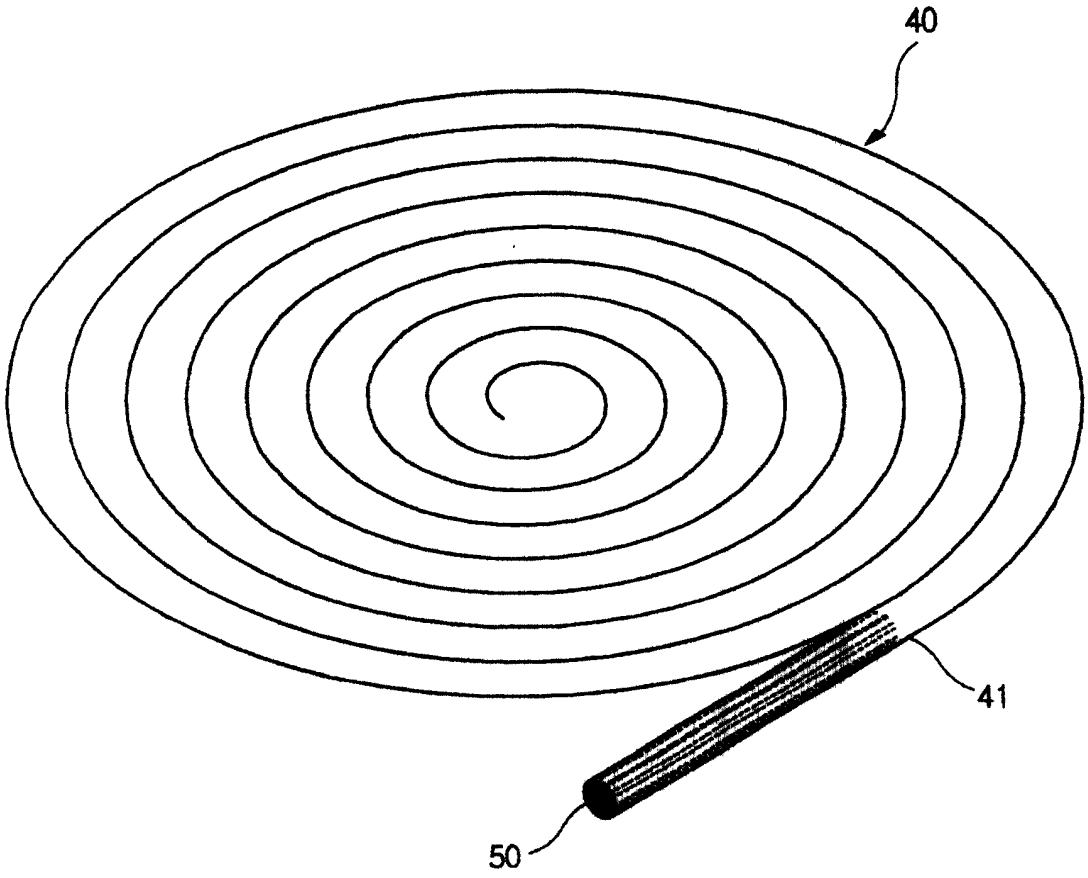


图 3

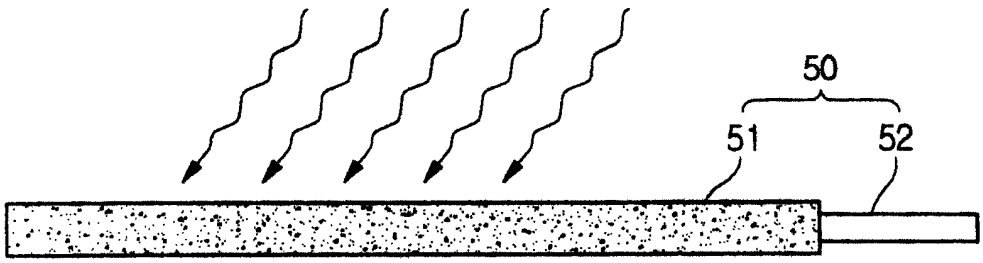


图 4

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(54) 자기 기록/재생장치의 토크 전달장치

요약

메인데크에 설치된 캡스턴모터의 동력을 이용하여 서브데크 상에 안착된 테이프 카세트의 테이프릴을 구동시키도록 동력을 전달하기 위한 자기 기록/재생장치의 토크 전달장치에 있어서, 메인데크 또는 서브데크에 회전가능하게 설치되는 하부 디스크와; 하부디스크에 자유롭게 회전가능하게 결합되는 상부디스크; 및 상부 디스크와 하부 디스크 사이에 움직임 가능하게 설치되며, 상부 디스크와 하부 디스크 각각에 탄성변형되면서 접촉되어 토크를 발생시키는 복수의 탄성볼;을 포함하는 것을 특징으로 하는 자기 기록/재생장치의 토크 전달장치가 개시된다.

대표도

도 3

명세서

도면의 간단한 설명

도 1은 일반적인 자기 기록/재생장치를 나타내 보인 개략적인 평면도.

도 2는 종래의 토크 전달장치를 나타내 보인 단면도.

도 3은 본 발명의 실시예에 따른 자기 기록/재생장치의 토크 전달장치를 나타내 보인 단면도.

도 4는 도 3에 도시된 토크 전달장치의 조립과정을 설명하기 위한 단면도.

도 5는 도 3에 도시된 하부 디스크에 탄성볼 및 비탄성볼이 설치된 상태를 나타내 보인 평면도.

< 도면의 주요부분에 대한 부호의 설명 >

2..데크 3..서브데크

10..하부 디스크 11b..수용부

20..상부 디스크 21..기어부

23..클러치판 30..탄성볼

40..비탄성볼 50..회전체

60..클램퍼

발명의 상세한 설명

발명의 목적

발명이 속하는 기술 및 그 분야의 종래기술

본 발명은 자기 기록/재생장치에 관한 것으로, 보다 상세하게는 테이프 카세트의 테이프릴을 구동시키기 위한 토크를 전달하기 위한 자기 기록/재생장치의 토크 전달장치에 관한 것이다.

일반적으로, 자기 기록/재생장치는 자기테이프와 같은 기록매체에 정보를 기록하고, 기록된 정보를 재생하는 장치로서, VCR(video cassette tape recorder), 캠코더(camcoder)등이 있다.

도 1을 참조하면, 통상의 자기 기록/재생장치는 헤드드럼(1)이 회전가능하게 설치되는 메인데크(2)와, 이 메인데크(2)에 로딩/언로딩 가능하게 설치되는 서브데크(3)와, 상기 서브데크(3)에 회전 가능하게 설치되어 카세트 테이프의 테이프릴을 구동시키는 한 쌍의 릴테이블(4a,4b)과, 메인데크(1)에 마련된 캡스턴모터(5)의 동력을 상기 릴테이블(4a,4b)중 어느 하나로 선택적으로 전달하기 위한 동력전달유닛을 구비한다.

도면에서 좌측의 릴테이블(4a)은 테이프 카세트로부터 자기 테이프를 공급하기 위한 서플라이측 릴테이블이고, 우측 릴테이블(4b)은 공급되는 자기 테이프를 감는 테이크업측 릴테이블이다.

상기 동력전달유닛은 캡스턴 모터(5)의 축기어(5a)에 연동되는 캡스턴기어(6a)와, 상기 캡스턴기어(6a)의 동력을 타이밍벨트(6b)를 통해 전달받는 풀리기어(7) 및 그 풀리기어(7)에서 전달된 동력을 상기 릴테이블(4a,4b) 중 어느 한 쪽으로 선택적으로 전달하는 스윙기어(8)를 구비한다.

상기 풀리기어(7)는 도 2에 도시된 바와 같이, 메인데크(2)의 고정축(2a)에 회전가능하게 설치되는 풀리 디스크(7a)와, 상기 풀리 디스크(7a)의 축부에 회전가능하게 지지되는 클러칭기어(7b)와, 상기 풀리 디스크(7a)와 클러칭기어(7b) 사이에 토크를 발생시켜 동력이 감속되어 전달되도록 하는 마그네크(7c) 및 금속판(7d)을 구비한다. 마그네트(7c)는 풀리 디스크(7a)에 고정되고, 금속판(7d)은 마그네트(7c)에 마주하도록 클러칭기어(7b)에 고정된다. 따라서, 마그네트(7c)와 금속판(7d)사이의 자력에 의해 타이밍벨트(6b)를 통해 풀리 디스크(7a)로 전달된 동력이 클러칭기어(7b)로 전달될 수 있으며, 클러칭기어(7b) 측에 걸리는 부하에 따라서 전달되는 토크량이 감속되어 전달된다.

상기 스윙기어(8)는 회동플레이트(9)에 의해 풀리기어(7)에 회동가능하게 연결되고, 클러칭기어(7b)에 기어연결된다.

이상에서 설명한 바와 같이, 토크 전달장치 즉, 마그네트(7c)와 금속판(7d)을 포함한 풀리기어(7)에 의해 타이밍벨트(6b)에서 전달된 큰 회전력에 적절히 감속되어 릴테이블(4a,4)로 전달될 수 있게 된다. 따라서, 예를 들어 테이프 카세트에서 테이프를 어느 한쪽으로 되감을 때 최종적으로 감기는 부분에서 릴테이블(4a,4b)의 속도를 감속시켜 테이프에 손상이 가는 것을 방지할 수 있게 된다.

그런데, 상기 구성을 갖는 종래의 토크 전달장치의 경우에는, 고가의 마그네트 등이 필요하게 되어 제조비용이 높아지는 문제점이 있다.

발명이 이루고자 하는 기술적 과제

본 발명은 상기와 같은 문제점을 해결하기 위해 창안된 것으로, 고가의 마그네트를 배제하고도 토크의 전달이 가능하도록 개선된 자기 기록/재생장치의 토크 전달장치를 제공하는데 그 목적이 있다.

발명의 구성 및 작용

상기 목적을 달성하기 위한 본 발명에 따른 자기 기록/재생장치의 토크 전달장치는, 메인데크에 설치된 캡스턴모터의 동력을 이용하여 서브데크 상에 안착된 테이프 카세트의 테이프릴을 구동시키도록 상기 동력을 전달하기 위한 자기 기록/재생장치의 토크 전달장치에 있어서, 상기 메인데크 또는 상기 서브데크에 회전가능하게 설치되는 하부 디스크와; 상기 하부 디스크에 자유롭게 회전가능하게 결합되는 상부디스크와; 상기 상부 디스크에 상기 하부 디스크와 마주하도록 고정되는 클러치판; 및 상기 클러치판과 상기 하부 디스크 사이에 움직임 가능하게 설치되며, 상기 클러치판과 하부 디스크 각각에 탄성변형되면서 접촉되면서 토크를 발생시키는 복수의 탄성볼;을 포함하는 것을 특징으로 한다.

여기서, 상기 상부 디스크와 상기 하부 디스크 사이의 최소간격을 확보하도록 상기 상부 디스크와 하부 디스크 사이에 이동 가능하게 설치되는 복수의 비탄성볼;을 더 포함하는 것이 바람직하다.

또한, 상기 탄성볼은 상기 비탄성볼보다 큰 지름을 갖는 것이 좋다.

또한, 상기 하부 디스크는, 상기 탄성볼을 수용하도록 상면에 환영의 수용부를 갖는 하부 디스크 몸체와; 상기 하부 디스크 몸체의 중심에 소정 높이로 일체로 마련되어 상기 상부 디스크를 회전가능하게 지지하며, 축공을 가지는 축부;를 포함하는 것이 좋다.

또한, 상기 축공이 끼워져 상기 하부디스크가 회전가능하게 지지되며, 하단부에 하부 디스크의 이탈을 방지하는 플랜지부가 형성된 중공형의 회전체와; 상기 회전체의 상단에 결합되어 상기 상부 및 하부 디스크의 분리를 방지하는 클램퍼를 더 포함하는 것이 좋다.

또한, 상기 상부 디스크의 외주에는 기어이가 형성되며, 상기 하부 디스크의 외주에는 타이밍벨트가 연결되는 트랙이가 형성된 것이 좋다.

또한, 상기 상부 디스크는, 상기 하부 디스크의 축부에 회전가능하게 결합되며 외주에 기어이가 형성된 중공형의 기어부와; 상기 기어부의 외주에 고정되어 상기 탄성볼에 접촉되는 클러치판;을 포함하는 것이 좋다.

이하 첨부된 도면을 참조하여 본 발명의 실시예에 따른 자기 기록/재생장치의 토크 전달장치를 자세히 설명하기로 한다.

도 3을 참조하면, 본 발명의 실시예에 따른 자기 기록/재생장치의 토크 전달장치는, 메인데크(2)에 회전가능하게 설치되는 하부 디스크(10)와, 상기 하부 디스크(10)에 회전가능하게 설치되는 상부 디스크(20)와, 하부 디스크(10)와 상부 디스크(20) 사이에 개재되는 탄성볼(30) 및 비 탄성볼(40)을 구비한다.

여기서, 상기 메인데크(2)에는 도 1을 통해 설명한 바와 같이, 서브데크(3)가 로딩/언로딩되게 설치된다. 또한, 상기 서브데크(3)에 안착되는 테이프 카세트의 테이프릴을 구동시키기 위한 동력을 제공하는 캡스턴모터(5)도 메인데크(2)에 설치된다. 이러한 메인데크(2)에는 고정샤프트(2a)가 설치된다. 상기 고정샤프트(2a)에는 회전체(50)가 회전가능하게 설치된다. 회전체(50)의 하부에는 확장형성된 플랜지부(51)가 마련되어 하부 디스크(10)를 지지한다.

상기 하부디스크(10)는 상기 회전체(50)에 끼워져 결합되어 함께 회전된다. 이러한 하부 디스크(10)는 외주에 트랙이(11a)가 형성되는 디스크 몸체(11)와, 상기 몸체(11)의 중심부에서 상부로 연장된 중공형의 축부(13)를 가진다. 상기 트랙이(11a)에는 도 1에서 설명한 바와 같이, 동력전달을 위한 타이밍벨트(6b)가 연결된다. 또한, 상기 디스크 몸체(11)의 상면에는 환형의 수용부(11b)가 형성된다. 상기 수용부(11)에는 상기 탄성볼(30)과 비탄성볼(40)이 자유롭게 이동 가능하도록 수용된다. 여기서, 상기 수용부(11)의 깊이는 비탄성볼(40)의 지름보다 작게 형성된다.

상기 상부 디스크(20)는 하부 디스크(10)의 축부(13)에 회전가능하게 설치된다. 이 상부 디스크(20)는 외주에 기어이(21a)가 형성되는 중공형의 기어부(21)와, 상기 기어부(21)의 하측에 상기 하부 디스크(10)의 상면에 마주하도록 설치되는 클러치판(23)을 구비한다. 여기서, 상기 기어부(21)의 기어이(21a)는 다른 이웃한 기어 예를 들어, 도 1의 스윙기어(8)에 연결되어 동력을 전달할 수 있게 된다. 상기 클러치판(23)은 상기 탄성볼(30) 및 비탄성볼(40)을 사이에 두고 하부 디스크(10)와 소정 간격 이격되게 배치된다. 따라서, 상기 탄성볼(30)의 접촉력에 의해 하부 디스크(10)의 회전력이 클러치판(23)으로 전달되어 토크가 발생하게 된다.

여기서, 상부 기어부(21)와 클러치판(23)은 일체로 형성될 수도 있으나, 본 실시예에서는 별도의 부품으로 제조되어 결합되었다. 또한, 상기 클러치판(23)은 탄성볼(30)과의 접촉에 의한 마모를 감안하여, 내마모성이 좋은 금속판인 것이 바람직하다. 클러치판(23)을 기어부(21)의 외측에 끼워서 고정시킨 상태에서 회전되는 것을 방지하도록, 클러치판(23)의 결합부에는 로킹홈을 형성하고, 기어부(21)의 외측에는 로킹돌기를 각각 형성할 수 있다.

상기 탄성볼(30)은 신축성을 가진 고무재료로 소정량의 탄성을 갖도록 형성된다. 이 탄성볼(30)은 하부 디스크(10)의 수용부(11b)에 자유롭게 이동되도록 수용된다. 탄성볼(30)은 도 4에 도시된 바와 같이, 수용부(11b)의 깊이보다 큰 직경을 갖는다. 이 탄성볼(30)은 하부 디스크(10)에 상부 디스크(20)가 결합될 때, 도 3에 도시된 바와 같이 클러치판(23)에 눌려져 탄성변형된다. 상부 디스크(20)의 결합시 클러치판(23)이 하부디스크(10)의 상면에 접촉되지 않도록, 클러치판(23)의 직경(D1)이 수용부(11b) 외경(D2)보다 작게 마련된다.

상기 비탄성볼(40)은 탄성을 갖지 않는 재질 예컨대, 금속 등의 재질로 형성되며, 상기 탄성볼(30)보다는 작은 직경을 갖는다. 이러한 비탄성볼(40)은 수용부(11b)에 복수개가 자유로이 이동될 수 있도록 수용된다. 또한, 비탄성볼(40)은 수용부(11b)의 깊이보다는 큰 직경을 가진다. 이러한 비탄성볼(40)은 클러치판(23)과 하부 디스크(10) 사이의 간격을 일정하게 유지시키는 기능을 한다. 즉, 상기 탄성볼(30)이 너무 큰 힘으로 눌려서 많이 변형되더라도, 클러치판(23)은 비탄성볼(40)에 접촉됨으로서 하부 디스크(10) 쪽으로 더 이상 접근하지 않게 된다. 따라서, 클러치판(23)이 하부디스크(10)에 직접 접촉되는 것을 방지하면서, 탄성볼(30)이 적절히 탄성 변형되도록 제어한다. 도 5에 도시된 바와 같이, 상기 탄성볼(30)과 비탄성볼(40)은 교번되게 배치되어 클러치판(23)에 탄성볼(30)이 규칙적으로 접촉되도록 하는 것이 좋다.

또한, 상기와 같이 각 디스크(10)(20)가 조립되어 회전체(50)에 지지된 상태에서, 각 디스크(10)(20)가 회전체(50)의 윗방향으로 이탈되는 것을 방지하기 위한 클램퍼(60)가 더 구비된다. 상기 클램퍼(60)는 회전체(50)의 상단에 형성된 후크부(53)에 끼워져 고정됨으로써, 각 디스크(10)(20)가 분리되는 것을 방지하고, 안정되게 회전될 수 있도록 지지한다. 여기서, 상기 클램퍼(60)는 그 길이가 연장되어 도 1 및 도 2에서 설명한 회동레버(9)의 기능을 추가시킬 수 있다. 즉, 본 발명의 실시예에 따른 토크 발생장치가 도 1에서 설명한 풀기기어(7)의 역할을 하도록 배치될 경우, 클램퍼(60)는 회동레버(9)의 기능을 하도록 적절히 설계될 수 있게 된다. 또한, 하부 디스크(10)에는 타이밍벨트(6b)가 연결되고, 상부 디스크(20)의 기어부(21)에는 스윙기어(8)가 연결된다.

상기 구성을 가지는 본 발명의 실시예에 따른 자기 기록/재생장치의 토크 전달장치는, 하부 디스크(10)에 동력이 전달되어 그 하부 디스크(10)가 회전된다. 그러면, 탄성볼(30)의 탄성력에 의해 상부 디스크(20)로 하부 디스크(10)와 함께 회전됨으로써, 상부 디스크(20)로 토크를 전달할 수 있게 된다.

또한, 상부 디스크(20)에 큰 부하가 걸려있을 경우, 하부 디스크(10)는 정상적으로 회전되지만 상부 디스크(20)에 걸린 부하에 의해 탄성볼(30)이 조금씩 회전되면서 감속되어 상부 디스크(20)로 감소된 토크만이 전달된다. 따라서, 상부 디스크(20)는 하부 디스크(10)에 비해 작은 속도로 회전된다. 물론, 비탄성볼(40)도 함께 회전되면서 클러치판(23)과 하부 디스크(10) 사이의 간격을 일정하게 유지시킨다.

이와 같이 동작되는 본 발명의 실시예에 따른 토크 전달장치는, 하부 및 상부 디스크(10)(20) 사이에 탄성볼(30) 및 비탄성볼(40)을 개재시켜 마찰에 의한 토크를 발생시켜 전달하도록 한 구성을 갖는다. 따라서, 종래와 같이 고가의 마그네트를 채용하지 않고 상대적으로 저렴한 제품을 채용하여 생산단가를 낮출 수 있게 된다.

한편, 본 발명의 실시예에서는 메인데크(2)에 각 디스크(10)(20)가 설치되어 타이밍벨트(6b)의 동력을 스윙기어(8)로 전달하는 것을 예로 들어 설명하였다. 그러나, 다른 예로서, 본 발명에 따른 토크 전달장치는 서브 데크(3;도1참조)에 설치되는 릴테이블에 적용될 수 있는 것은 당업자에게는 자명한 일일 것이다.

발명의 효과

이상에서 설명한 바와 같은 본 발명의 자기 기록/재생장치의 자기 기록/재생장치의 토크 전달장치에 따르면, 고가의 마그네트를 삭제하고 상대적으로 저렴한 재료를 이용하여 토크를 전달할 수 있는 구성을 갖는다. 따라서, 제품의 단가를 낮출 수 있게 된다.

(57) 청구의 범위

청구항 1.

메인데크에 설치된 캡스턴모터의 동력을 이용하여 서브데크 상에 안착된 테이프 카세트의 테이프릴을 구동시키도록 상기 동력을 전달하기 위한 자기 기록/재생장치의 토크 전달장치에 있어서,

상기 메인데크 또는 상기 서브데크에 회전가능하게 설치되는 하부 디스크와;

상기 하부디스크에 자유롭게 회전가능하게 결합되는 상부디스크; 및

상기 상부 디스크와 하부 디스크 사이에 움직임 가능하게 설치되며, 상기 상부 디스크와 하부 디스크 각각에 탄성변형되면서 접촉되어 토크를 발생시키는 복수의 탄성볼; 및

상기 상부 디스크와 상기 하부 디스크 사이의 최소간격을 확보하도록 상기 상부 디스크와 하부 디스크 사이에 이동 가능하게 설치되는 복수의 비탄성볼;을 더 포함하는 것을 특징으로 하는 자기 기록/재생장치의 토크 전달장치.

청구항 2.

삭제

청구항 3.

제1항에 있어서, 상기 탄성볼은 상기 비탄성볼보다 큰 지름을 갖는 것을 특징으로 하는 자기 기록/재생장치의 토크 전달장치.

청구항 4.

제1항에 있어서, 상기 하부 디스크는,

상기 탄성볼을 수용하도록 상면에 환영의 수용부를 갖는 하부 디스크 몸체와;

상기 하부 디스크 몸체의 중심에 소정 높이로 일체로 마련되어 상기 상부 디스크를 회전가능하게 지지하며, 축공을 가지는 축부;를 포함하는 것을 특징으로 하는 자기 기록/재생장치의 토크 전달장치.

청구항 5.

제4항에 있어서, 상기 축공이 끼워져 상기 하부디스크가 회전가능하게 지지되며, 하단부에 하부 디스크의 이탈을 방지하는 플랜지부가 형성된 중공형의 회전체와;

상기 회전체의 상단에 결합되어 상기 상부 및 하부 디스크의 분리를 방지하는 클램퍼를 더 포함하는 것을 특징으로 하는 자기 기록/재생장치의 토크 전달장치.

청구항 6.

제1항, 제3항, 제4항 또는 제5항 중 어느 한 항에 있어서,

상기 상부 디스크의 외주에는 기어이가 형성되며,

상기 하부 디스크의 외주에는 타이밍벨트가 연결되는 트랙이가 형성된 것을 특징으로 하는 자기 기록/재생장치의 토크 전달장치.

청구항 7.

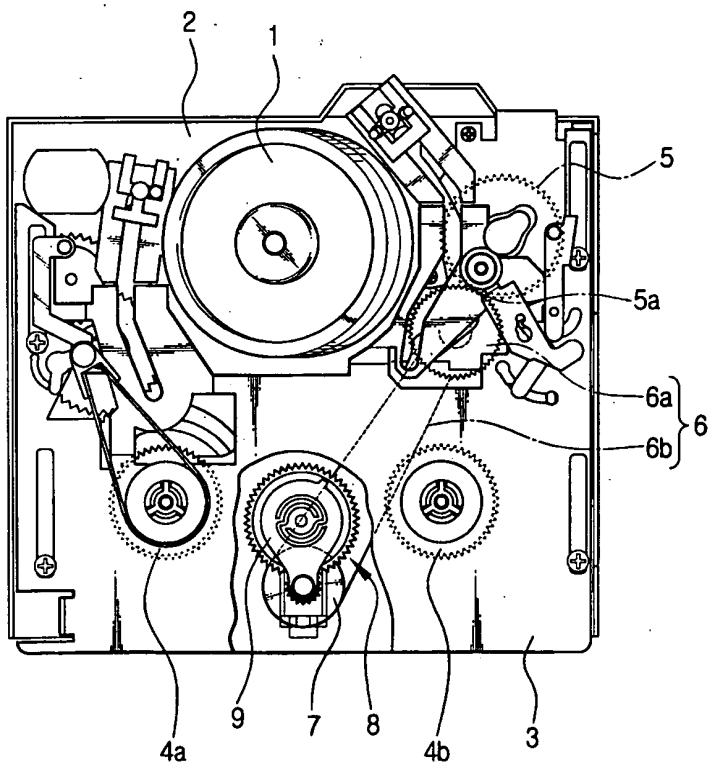
제1항에 있어서, 상기 상부 디스크는,

상기 하부 디스크의 축부에 회전가능하게 결합되며 외주에 기어이가 형성된 중공형의 기어부와;

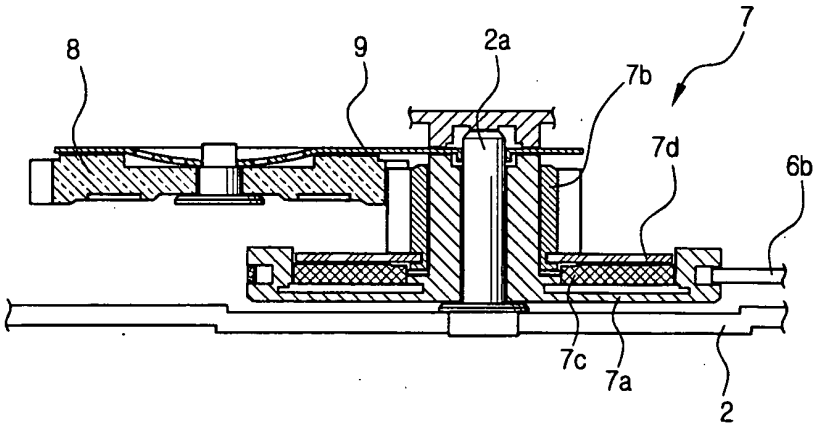
상기 기어부의 외주에 고정되어 상기 탄성볼에 접촉되는 클러치판;을 포함하는 것을 특징으로 하는 자기 기록/재생장치의 토크 전달장치.

도면

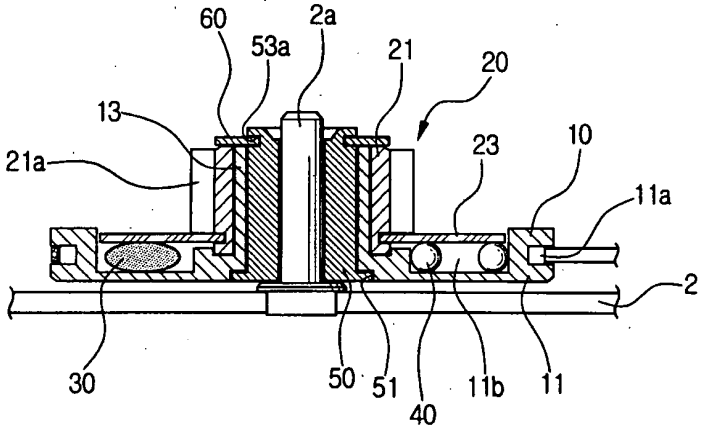
도면1



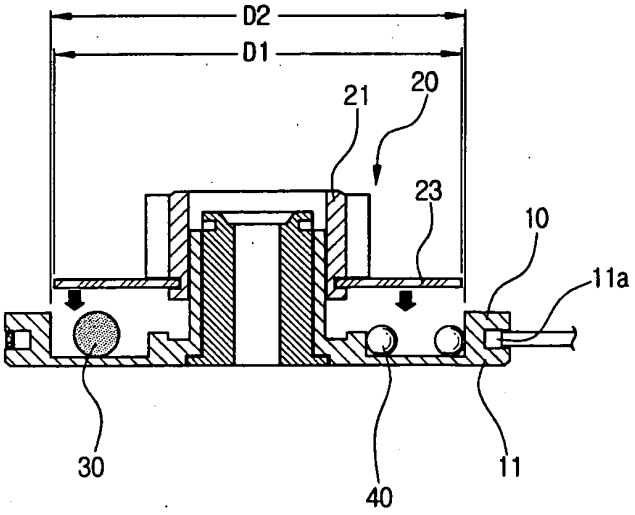
도면2


8
9
2a
7
7b
7d
6b
7c
7a
2

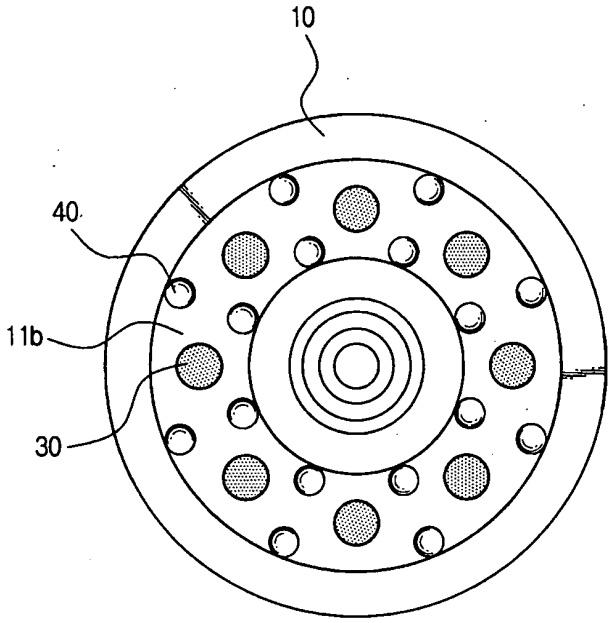
도면3


60
53a
2a
21
20
13
21a
23
10
11a
2
30
50
51
40
11b
11

도면4


D2
D1
21
20
23
10
11a
30
40
11

도면5



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(54) 전자사진 화상형성장치의 정착 장치

요약

본 발명은 전자사진 화상형성장치의 정착장치에 관하여 개시한다. 개시된 전자사진 화상형성장치의 정착장치는 양단이 밀봉되어 있고, 그 내부공간에 소정량의 작동유체를 수용한 관상의 히트파이프; 상기 히트파이프를 감싸도록 설치되는 원통롤러; 및 상기 원통롤러와 히트파이프의 사이에 설치되어 열을 발생하는 발열부를 구비한다. 상기 작동유체는 아세트산 나트륨 용액이며, 상기 히트파이프에 기계적 충격을 가해서 과냉각된 상기 아세트산 나트륨 용액을 결정화하는 적어도 하나의 기계장치를 구비한다. 이에 따르면, 쿨드 스타트시에는 과냉각된 아세트산 나트륨 용액의 용융열을 이용하여 워밍업 시간을 단축하고, 인쇄 모드에서는 히트파이프 내의 열적 매체로 정착롤러의 표면의 온도를 균일하게 유지할 수 있다.

대표도

도 3

명세서

도면의 간단한 설명

도 1은 할로겐 램프가 열원으로 적용된 종래 정착롤러의 개략 횡단면도이다.

도 2는 도 1에 도시된 정착롤러를 포함하는 정착장치의 개략 종단면도이다.

도 3은 본 발명의 바람직한 실시예에 따른 정착장치의 개략 단면도이다.

도 4는 도 3의 IV-IV 선단면도이다.

도 5a 및 도 5b는 도 3의 제1엔드캡의 사시도이다.

도 6a 및 도 6b는 도 3의 제2엔드캡의 사시도이다.

도 7은 도 6의 제2앤드캡에 연결되는 전원연결부의 분해사시도이다.

<도면의 주요부분에 대한 부호의 설명>

100: 정착장치 110: 정착롤러

111: 토너이형층 112:원통롤러

113: 발열부 114: 히트파이프(heat pipe)

115: 작동유체 117, 137: 리드선

118: 서미스터 119: 써머스탯

120: 제1엔드캡 130: 제2엔드캡

140: 바이브레이터 160: 가압롤러

200: 전원연결부

발명의 상세한 설명

발명의 목적

발명이 속하는 기술 및 그 분야의 종래기술

본 발명은 전자사진 화상형성장치의 정착장치에 관한 것으로서, 더욱 상세하게는 과냉각된 아세트산 나트륨의 결정화시 발생되는 열을 정착롤러의 순간 승온에 이용하는 전자사진 화상형성장치의 정착장치에 관한 것이다.

전자사진 화상형성장치는 토너화상이 전사된 용지를 가열하여 그 용지 상의 분말 상태의 토너화상을 일시적으로 용융시켜서 그 용지에 융착시키는 정착 장치를 구비한다. 정착 장치는 토너를 종이에 융착시키는 정착롤러와, 상기 정착롤러를 향해서 상기 용지를 미는 가압롤러를 구비한다.

도 1은 할로겐 램프가 열원으로 적용된 종래 정착롤러의 개략적인 횡단면도이며, 도 2는 도 1의 정착롤러를 채용한 정착장치의 개략적인 종단면도이다.

도 1을 참조하면, 정착롤러(10)는 원통 롤러(11)와 그 내부 중앙에 설치된 할로겐램프(12)를 구비한다. 상기 원통롤러(11)의 표면에는 테프론 코팅층(11a)이 형성되어 있다. 상기 할로겐램프(12)가 원통롤러(11)의 내부에서 열을 발생하고, 원통롤러(11)는 할로겐램프(12)로부터의 복사열에 의해 가열된다.

도 2를 참조하면, 정착롤러(10)의 하부에는 용지(14)를 사이에 두고 정착롤러(10)와 대향되게 가압롤러(13)가 위치한다. 상기 가압롤러(13)는 스프링(13a)에 의해 탄력적으로 지지되어 정착롤러(10)와 가압롤러(13)사이를 통과하는 용지(14) 를 정착롤러(10)에 소정의 압력으로 밀착시킨다. 이때, 분말상태의 토너화상(14a)이 형성되어 있는 용지(14)는 정착롤러(10)와 가압롤러(13)사이를 통과하면서 소정의 압력과 열에 의해 용지(14)에 융착된다.

상기 정착롤러(10)의 일측에는 정착롤러(10)의 표면온도를 측정하는 서미스터(Thermistor: 15)와, 정착롤러(10)의 표면온도가 설정값을 넘었을 때 할로겐 램프(12)로의 전원을 차단하는 써머스탯(Thermostat: 16)이 설치되어 있다. 서미스터(15)는 정착롤러(10)의 표면온도를 측정하여 프린터(미도시)의 제어부(미도시)로 측정된 전기 신호를 전송하며, 제어부는 측정온도에 따라 할로겐 램프(12)에 공급하는 전력을 제어하여 정착롤러(11)의 표면온도를 주어진 범

위 내에서 유지시킨다. 또한, 상기 써머스탯(16)은 상기 서미스터(15) 및 제어부에 의한 정착롤러(10)의 온도조절이 실패하여 정착롤러(10)의 온도가 한계 설정치 보다 높을 때 써머스탯(16)의 콘택트(미도시)를 오픈(open)하여 상기 할로겐 램프(12)에 흐르는 전원을 차단한다.

상기 할로겐램프(12)를 열원으로 사용하는 종래 정착장치는 전력소모가 많으며, 특히 전원을 껐다가 화상형성을 위해 전원을 다시 켰을 때 상당히 긴 워밍업(warming up) 시간을 필요로 한다. 따라서, 워밍업 시간이 짧은 새로운 정착장치가 필요하다.

발명이 이루고자 하는 기술적 과제

본 발명은 상기의 문제점을 개선하기 위하여 창출된 것으로서, 본 발명의 목적은 콜드 스타트시 과냉각된 아세트산 나트륨 용액의 용융열을 이용하여 워밍업 시간을 단축시키는 정착장치를 제공하는 것이다.

발명의 구성 및 작용

상기의 목적을 달성하기 위하여 본 발명의 전자사진 화상형성장치의 정착장치는,

양단이 밀봉되어 있고, 그 내부공간에 소정량의 작동유체를 수용한 관상의 히트파이프;

상기 히트파이프를 감싸도록 설치되는 원통롤러; 및

상기 원통롤러와 히트파이프의 사이에 설치되어 열을 발생하는 발열부를 구비하며,

상기 작동유체는 아세트산 나트륨 용액이며,

상기 히트파이프에 기계적 충격을 가해서 과냉각된 상기 아세트산 나트륨 용액을 결정화하는 적어도 하나의 기계장치가 구비된 것을 특징으로 한다.

상기 아세트산 나트륨 용액을 과냉시키는 냉각팬이 더 마련된 것이 바람직하다.

상기 기계장치는, 상기 히트파이프의 일단부면에 부착된 바이브레이터인 것이 바람직하다.

상기 바이브레이터는 콜드 스타트 시에만 수 초 이내 작동되는 타이머를 포함하는 것이 바람직하다.

또한, 상기 바이브레이터는 모터를 포함하며,

상기 모터는 외부전원에 상기 발열부와 함께 병렬연결되는 것이 바람직하다.

한편, 상기 아세트산 나트륨 용액은,

상기 히트파이프 내에서 50~65 % 부피를 차지하며,

아세트산 나트륨의 중량이 물의 중량에 대해서 100~150 % 인 것이 바람직하다.

이하, 첨부된 도면들을 참조하여 본 발명의 바람직한 실시예에 따른 전자사진 화상형성장치의 정착장치를 상세히 설명한다. 이 과정에서 도면에 도시된 층이나 영역들의 두께는 명세서의 명확성을 위해 과장되게 도시된 것이다.

도 3은 본 발명의 바람직한 실시예에 따른 전자사진 화상형성장치의 정착장치의 개략적인 단면도이고, 도 4는 도 3의 IV-IV 선단면도이다.

도 3 및 도 4를 참조하면, 정착장치(100)는 토너화상(151)이 형성된 용지(150)가 배출되는 방향(화살표 A 방향)으로 회전하는 원통롤러(112)를 포함하는 정착롤러(110)와, 용지(150)를 사이에 두고 정착롤러(110)와 대향되게 설치되어 용지(150)를 정착롤러(110)에 가압하면서 화살표 B 방향으로 회전하는 가압롤러(160)를 구비한다.

상기 원통롤러(112)의 표면에는 소정 두께, 예컨대 20~30 ㎛ 두께의 테프론 재질의 토너이형층(111)이 형성되어 있다. 상기 원통롤러(112)의 내부에는 발열부(113)가 배치되어 있으며, 상기 발열부(113) 내부에는 그 양단이 밀폐되어

소정 압력으로 유지된 히트파이프(114)가 배치되어 있다.

한편, 상기 토너 이형층(111)의 상부에는 정착롤러(110)의 표면온도를 측정하는 서미스터(118)가 설치되어 있다. 또한, 상기 정착롤러(110)의 표면온도가 급 격하게 상승하는 경우에 상기 발열부(113)에 공급되는 전원을 차단하여 과열을 방지하는 써머스탯(119)이 설치되어 있다.

상기 발열부(113)는 외부로부터 공급된 전원에 의해 열을 발생시키는 Ni-Cr 저항 코일(113a)과, 저항 코일(113a)의 상부 및 하부에는 절연층인 운모시트(113b, 114c)가 배치되어 있다. 발열부(113)의 양단의 저항 코일(113a)에 전기를 연결하는 리드선(117)을 구비한다. 상기 저항 코일(113a)은 Cr-Fe 선을 사용할 수도 있다.

상기 히트파이프(114)는 관형으로 이루어져 있으며, 그 양단은 밀폐되어 있다. 그 내부에는 작동유체(115)가 소정량 수용되어 있다. 상기 작동유체(115)는 아세트산 나트륨(sodiun acetate) 용액으로서 상온에서는 과냉각된 액체(supercooled liquid) 상태로 존재한다. 이러한 아세트산 나트륨 용액은 일반적으로 히트 팩(heat pack)으로 사용되며, 외부로부터의 충격에 의해서 아세트산 나트륨이 결정화되면서 아세트산 나트륨 용액을 소정온도, 예컨대 54 ℃ 정도까지 상승시킨다. 또한, 발열부(113)에서 발생된 열을 전달받아 120 ℃를 지나면 아세트산 나트륨과 결합된 결합수가 이탈된다. 이탈된 결합수 및 아세트산 나트륨 내의 물은 기화되어, 그 열을 원통롤러(112)에 전달하여 원통롤러(112)의 표면의 온도편차를 방지하고 빠른 시간 내에 원통롤러(112) 전체가 가열되게 하는 열적 매체의 역할을 한다.

아세트산 나트륨 100 그램에 75 그램의 물을 혼합한 아세트산 나트륨 용액을 작동유체(115)로 사용하는 경우, 상온에서 과냉각된 아세트산 나트륨 용액을 자극하면 결정화가 일어나면서 대략 54 ℃ 로 상승한다. 여기서 아세트산 나트륨의 비율을 증가시키면 결정화에 따른 온도가 상승되지만 그 기울기가 매우 낮으므로, 아 세트산 나트륨 용액 중 아세트산 나트륨을 물에 대한 중량비로 100 ~ 150% 로 하는 것이 바람직하다. 작동유체(115)는 히트파이프(114)의 체적에 대하여 5 내지 70 %의 체적비를 차지하며, 50 내지 65 % 체적비를 차지하는 것이 바람직하다. 한편, 상기 작동유체(115)가 차지하는 체적비가 5% 이하인 경우에는 드라이 아웃(dry out)현상이 발생될 가능성이 매우 높으므로 이를 피하는 것이 바람직하다.

한편, 정착롤러(110)의 일측에는 냉각장치, 예컨대 냉각팬(미도시)이 마련되는 것이 바람직하다. 이 냉각팬은 화상형성장치를 오프하는 경우, 히트파이프(114) 내의 아세트산 나트륨 용액을 과냉각시키는 데 사용될 수 있다.

상기 히트파이프(114)는 구리(Cu), 알루미늄, 알루미늄 합금 등이 사용된다.

상기 원통롤러(112)는 상기 발열부(113)에서 발생된 열이 전달되거나, 상기 히트파이프(114)에 수용되어 있는 작동유체(115)에 의한 기화열에 의하여 가열되어 상기 용지(150)에 형성되어 있는 분말상의 토너(151)를 융착하는 역할을 하는 것으로, 그 재질은 스테인레스 스틸(Stainless Steel), 알루미늄(Al) 또는 구리(Cu) 등으로 만들어진다.

상기 히트파이프(114)의 일단부면에는 전기적으로 작동되는 바이브레이터(140)가 부착되어 있다. 바이브레이터(140)는 콜드 스타트(cold start) 시 외부로부터 제어된 전원을 공급받아서 타이머에 의해 소정시간 작동된 후 멈춘다. 바이브레이터(140)는 구동시 히트파이프(114)의 일단부면을 진동시켜서 아세트산 나트륨 용액(115)을 진동시킴으로써 아세트산 나트륨 용액(115)을 고상화한다. 이 고상화 과정에서 발열된 열은 작동유체를 순간적으로 소정온도, 예컨대 54 ℃ 로 상승시킨다. 바이브레이터(140)의 모터로의 전원연결은 후술한다.

상기 정착롤러(110)의 양단에는 정착롤러(110)의 회전축 상에서 원통롤러(112)의 양단에 끼워지는 제1(120) 및 제2엔드캡(130)이 위치한다. 제2엔드캡(130)은 그 구조에 있어서 대부분이 제1엔드캡(120)과 동일하며, 다만, 제2엔드캡(130)의 외주면을 따라 기어(131)가 형성되어 전동장치의 기어(미도시)와 맞물려 회전되는 것이 다르다. 또한, 정착롤러(110)의 양단 상에는 회전하는 정착롤러(110)를 지지하는 베어링(133)이 설치되어 있다.

도 5a 및 도 5b는 도 3의 제1엔드캡(120)의 사시도이고, 도 6a 및 도 6b는 도 3의 제2엔드캡(130)의 사시도이다.

도 5 내지 도 6을 참조하면, 제1(120) 및 제2엔드캡(130)에는 저항코일(113a)의 양단에 연결된 리드선(도 3의 참조번호 117)이 통과하는 리드선홀(122, 132)과, 바이브레이터(140)의 모터에 연결된 리드선(도 3의 참조번호 137)이 통과하는 리드선홀(128, 138)이 각각 형성되어 있다. 바이브레이터(140)의 모터(미도시)의 하나의 단자는 히트파이프(114)의 일단부면과 연결되어서 히트파이프(114)의 타단부면에 마련된 리드선(137) 및 리드선홀(128)을 통해서 외부전원에 연결된다. 바이브레이터(140)의 모터의 다른 하나의 단자는 리드선(137) 및 리드선홀(138)을 통해서 외부전원에 연결된다. 즉, 발열부(113) 및 바이브레이터(140)의 모터는 외부전원에 병렬연결되어서 제어된 전원을 공급받는다. 히트파이프(114)의 양단에 대향하는 면의 반대쪽의 엔드캡(120, 130)의 외측 중앙부에는 전극(210)이 삽입되는 전극홈(126, 136)이 형성되어 있다. 상기 전극(210)은 리드선홀(122, 132)에 인입되어 직각으로 꺾인 리드선들(117, 137)에 전원을 공급한다.

도 7은 제2엔드캡(130)에 연결되는 전원연결부(200)의 분해 사시도이다. 도면을 참조하면, 전원연결부(200)는 프레임(도 3의 170 참조) 내에 설치되어, 외부전원을 공급받아 상기 발열부(113)에 전달한다. 전원연결부(200)는 상기 전극홈(126, 136)에 삽입되는 전극(210)과, 상기 전극(210)과 접촉되게 설치되는 브러시(220)와, 상기 브러시(220)가 상기 전극(210) 쪽으로 밀착되어 전기 접속되게 하는 탄성수단(240)을 구비한다.

상기 브러시(220)는 외부로부터의 리드선(도 3의 254 참조)과 연결되어서 전극(210)에 전기를 전달한다.

상기 탄성수단(240)은 상기 브러시(220)가 전극(210)에 밀착되도록 스페이서(230)에 탄성력을 제공하며, 상기 정착롤러(112)가 작동 중에 열팽창 또는 열수축이 반복적으로 일어나는 경우에도 그 변형을 흡수하여 상기 브러시(220)가 전극(210)으로부터 떨어지는 것을 방지한다. 그러므로, 상기 탄성수단(240)은 압축스프링을 사용하는 것이 바람직하다. 이때, 상기 브러시(220)에는 외부로부터 리드선홀(252)을 통해서 리드선(도 3의 254)이 연결되는데, 상기 리드선(254)과 상기 탄성수단(240)이 접촉하여 스파크가 발생되는 위험이 있다. 따라서, 이러한 위험을 방지하고, 상기 브러시(220)가 뒤로 밀려서 상기 엔드캡(230)이 프레임(170)에 닿는 것을 방지하는 스페이서(230)가 설치되어 있다.

상기 탄성수단(240)은 절연플레이트(250)에 의하여 상기 프레임(170) 내에 고정된다. 상기 절연플레이트(250)는 상기 탄성수단(240)을 지지하는 역할을 한다. 따라서, 프레임(170) 내에 형성된 관통구멍에 먼저 브러시(220)를 설치하고, 그 다음에 탄성수단(240) 및 스페이서(230)를 설치한다. 그 다음에 상기 탄성수단(240)이 뒤로 빠지지 않도록 절연플레이트(250)를 설치한다.

상기 엔드캡(120, 130)은 고온에서도 열변형이 적은 유리섬유(Glass Fiber)등의 충전재를 넣은 PPS(Polyphenylene sulfide), PBT(Poly Butylene Terephthalate), 나이론(Nylon) 등의 레진을 사용할 수 있다.

상기 가압롤러(160)는 상기 정착롤러(110)와 접촉하면서 정착닙을 형성하는 탄성롤러(161)와, 상기 탄성롤러(161)의 중심에서 상기 탄성롤러(161) 지지하는 샤프트(162)를 구비한다. 상기 샤프트(162)의 양단의 외주에는 베어링(163)이 마련되어서 가압롤러(160)를 지지한다.

상기 정착롤러(110)의 제작과정을 설명하면 다음과 같다.

히트파이프(114)로 사용하려는 대략 원통형 관의 일단을 밀봉하고 타단에는 외부로부터의 압축매체, 예컨대 압축액체를 불어넣을 주입구를 형성한다. 이 때 원통형 관의 양단면부를 단조가공하여 연성을 없애서 평탄화하여 이어지는 확관공정에서 변형이 적게 일어나게 하는 것이 바람직하다. 다음에 원통형 관(114)의 외주를 운모시트(113c)로 감싼 다음에 저항코일(113a)을 감는다. 이어서 운모시트(113b)로 다시 감싼다. 그 다음에 상기와 같이 마련된 원통형 관(114)을 외주면이 테프론으로 코팅된 원통롤러(112)의 내부에 삽입한다. 이어서 원통형 관(114)의 일단에 마련된 주입구로 소정 압력, 예컨대 150 기압으로 액체를 주입하여서 원통형 관(114)을 확관한다. 이에 따라서 원통형 관(114) 및 발열부(113)는 원통롤러(112)의 내부에 밀착되어서 열전달이 잘된다. 이와 같이 원통형 관(114)을 확관하여서 발열부(113) 및 원통롤러(113)와의 사이에 공기층(air gap)이 형성되지 않게하는 것은 열전달 효율의 저하를 방지하기 위해서다.

상기 구조의 전자사진 화상형성장치의 정착장치의 동작을 도면을 참조하여 상세히 설명한다.

먼저, 상온에서 과냉각된 상태의 아세트산 나트륨 용액이 소정 부피로 채워진 히트파이프가 설치된 정착장치를 콜드스타트(cold start)하는 경우를 설명한다. 외부의 리드선(254)으로부터 제어된 전원이 공급되면, 이 전원은 브러시(220) 및 전극(210)을 통해서 발열부(113)의 리드선(117) 및 바이브레이터(140)의 모터의 리드선(137)에 연결된다. 그러면, 바이브레이터(140)가 타이머에 의해서 미리 정해진 시간동안 작동하여서 히트파이프(114) 내의 아세트산 나트륨 용액(115)의 일부를 진동시킨다. 이 진동에 의해서 일부 아세트산 나트륨이 결정화되면서 발열하여 작동유체를 54 ℃ 정도로 승온시키며, 결과로서 히트파이프(114)를 소정 온도로 상승시킨다. 이 때 저항 코일(113a)에는 열이 발생된다. 발열부(113)로부터의 열의 대부분은 원통롤러(112)로 전열된다. 이에 따라서 정착롤러(110)는 목표온도, 예컨대 180 ℃ 까지 급상승된다.

이어서 발열부(113)의 열은 낮은 온도의 히트파이프(114)로 전달되어서 히트파이트(114) 내의 온도를 상승시킨다. 히트파이프(114)의 온도가 120 ℃ 이상으로 상승되면, 아세트산 나트륨과 결합된 결합수가 탈수된다. 히트파이프(114)에 수용되어 있는 물은 전달된 열에 의하여 가열되어 기화되며, 기체상의 스팀은 히트파이 프(114)의 표면에 설치된 발열부(113)를 통하여 원통롤러(112)에 전달된다. 상기 원통롤러(112)는 발열부(113)에서 발생된 열과, 작동유체(115)의 열이 전달되어 정착롤러(110)를 일정한 온도로 유지한다. 특히, 히트파이프(114) 내의 스팀은 그 전열속도가 빠르므로 정착롤러(110)의 표면에서의 온도차이를 없애는 효과가 크며, 정착장치(100)의 인쇄품질을 향상시킨다.

이어서, 인쇄모드가 되면 인쇄용지(150)에 분말상의 토너(151)가 전사되고, 이 용지(150)는 상기 정착장치(110)와 이에 대향되게 설치되어 있는 가압롤러(160)사이를 통과하면서 일정한 온도를 가지고 있는 정착롤러(110)에 의하여

용지(150)에 융착된다.

한편, 상기 정착롤러(110)가 상기 토너(151)를 용지(150)에 융착시킴에 따라 용지(150)로 열을 빼앗기게 되면, 상기 히트파이프(114)내에 수용되어 있는 상기 스팀은 열을 빼앗기게 되어 다시 액화된다. 그러면, 다시 상기 발열부(113)에 의해 열을 전달받아서 기화되면서 상기 정착롤러(110)의 표면온도를 상기 토너(151)를 융착시키기 적당한 목표온도로 유지할 수 있게 한다. 따라서 히트파이프(114) 내의 작동유체는 기화 및 액화를 반복하면서 정착롤러(110)의 온도를 일정하게 유지하는 열적 매체의 역할도 수행한다.

정상적인 토너화상의 정착온도는 160 ~ 190 ℃ 이며, 본 발명에 따른 정착장치(100)는 약 12초에 목표온도에 도달하게 된다. 그리고, 서미스터(118)가 상기 정착롤러(110)의 표면온도를 측정하여 표면온도를 상기 토너(151)를 융착하기에 적당한 소정의 범위 내에서 유지시켜준다. 만약, 상기 서미스터(118)에 의한 표면온도 조절이 실패하여 정착롤러(110)의 표면온도가 급상승하게 되면, 상기 써머스탯(119)이 이에 연결되어 있는 전원연결부(200)의 전원을 기계적인 작동으로 차단하여 정착롤러(110) 표면온도의 급상승을 방지한다. 이러한 전원공급동작은 설정온도에 따라 가변 될 수 있으며, 전원공급도 주기적인 온/오프(0N/OFF) 타입이나 펄스폭 변조방식(Pulse Width Modulation), 혹은 PI(Proportional and Integral) 등의 제어방식의 적용이 가능하다.

한편, 본 발명의 정착장치가 설치된 화상형성장치가 장시간 휴지기로 들어가서 정착장치(100)가 정지되는 경우, 화상형성장치의 일측에 마련된 냉각팬이 가동되어서 아세트산 나트륨을 포함하는 작동유체를 과냉각시켜서 과냉각된 아세트산 나트륨 용액을 히트파이프(114) 내에 형성한다.

발명의 효과

이상에서 설명한 바와 같이 본 발명에 따른 전자사진 화상형성장치의 정착장치는 콜드 스타트시에는 과냉각된 아세트산 나트륨 용액의 용융열을 이용하여 워밍업 시간을 단축하고, 인쇄 모드에서는 히트파이프 내의 열적 매체로 정착롤러의 표면의 온도를 균일하게 유지할 수 있다.

본 발명은 도면을 참조하여 실시예를 참고로 설명되었으나, 이는 예시적인 것에 불과하며, 당해 분야에서 통상의 지식을 가진 자라면 이로부터 다양한 변형 및 균등한 실시예가 가능하다는 점을 이해할 것이다. 따라서, 본 발명의 진정한 기술적 보호범위는 첨부된 특허청구범위에 한해서 정해져야 할 것이다.

(57) 청구의 범위

청구항 1.

양단이 밀봉되어 있고, 그 내부공간에 소정량의 작동유체를 수용한 관상의 히트파이프;

상기 히트파이프를 감싸도록 설치되는 원통롤러; 및

상기 원통롤러와 히트파이프의 사이에 설치되어 열을 발생하는 발열부를 구비하며,

상기 작동유체는 아세트산 나트륨 용액이며,

상기 히트파이프에 기계적 충격을 가해서 과냉각된 상기 아세트산 나트륨 용액을 결정화하는 적어도 하나의 기계장치가 구비된 것을 특징으로 하는 전자사진 화상형성장치의 정착장치.

청구항 2.

제 1 항에 있어서,

상기 아세트산 나트륨 용액을 과냉시키는 냉각팬이 더 마련된 것을 특징으로 하는 전자사진 화상형성장치의 정착장치.

청구항 3.

제 1 항에 있어서,

상기 기계장치는, 상기 히트파이프의 일단부면에 부착된 것을 특징으로 하는 전자사진 화상형성장치의 정착장치.

청구항 4.
제 3 항에 있어서,

상기 기계장치는 바이브레이터인 것을 특징으로 하는 전자사진 화상형성장치의 정착장치.

청구항 5.
제 4 항에 있어서,

상기 바이브레이터는 콜드 스타트 시에만 수 초 이내 작동되는 타이머를 포함하는 것을 특징으로 하는 전자사진 화상형성장치의 정착장치.

청구항 6.
제 4 항에 있어서,

상기 바이브레이터는 모터를 포함하며,

상기 모터는 외부전원에 상기 발열부와 함께 병렬연결되는 것을 특징으로 하는 전자사진 화상형성장치의 정착장치.

청구항 7.
제 6 항에 있어서,

상기 모터의 하나의 단자는 상기 히트파이프의 상기 일단부면에 연결되고,

상기 히트파이트의 타단부면은 외부전원에 연결되는 것을 특징으로 하는 전자사진 화상형성장치의 정착장치.

청구항 8.
제 1 항에 있어서,

상기 아세트산 나트륨 용액은,

상기 히트파이프 내에서 50~65 % 부피를 차지하는 것을 특징으로 하는 전자 사진 화상형성장치의 정착장치.

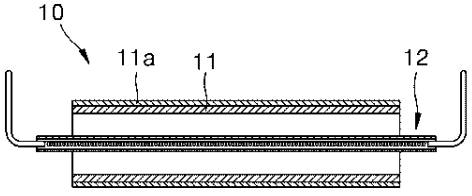
청구항 9.
제 1 항에 있어서,

상기 아세트산 나트륨 용액은,

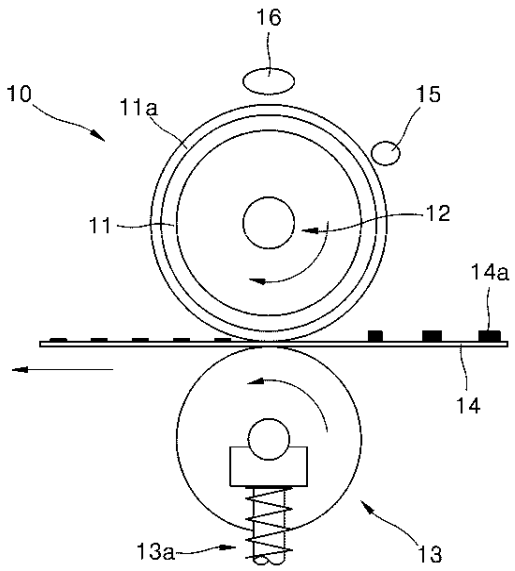
아세트산 나트륨의 중량이 물의 중량에 대해서 100~150 % 인 것을 특징으로 하는 전자사진 화상형성장치의 정착장치.

도면

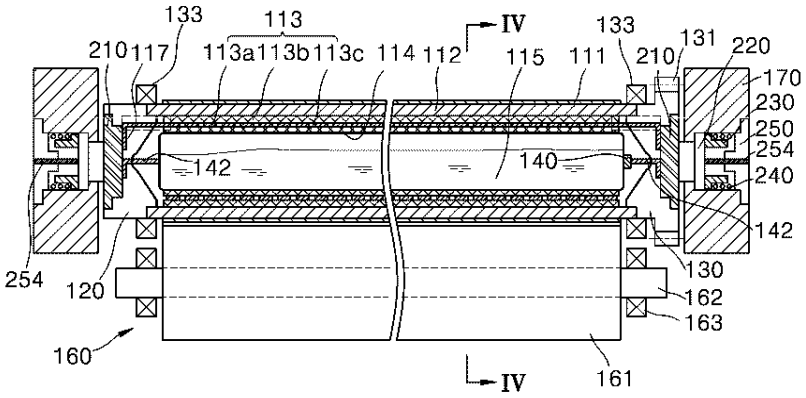
도면1



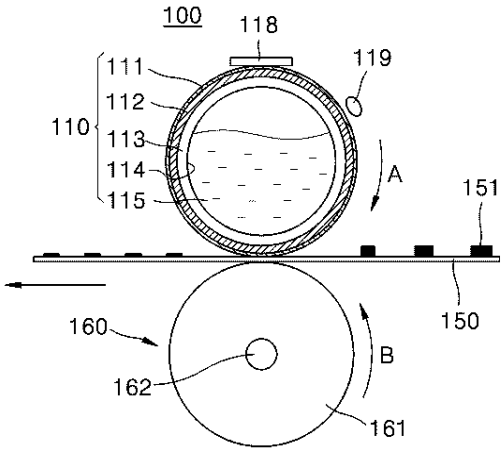
도면2


16
10
11a
15
11
12
14a
14
13a
13

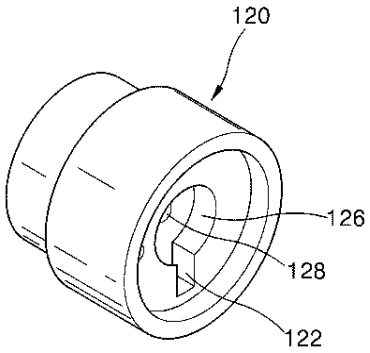
도면3


133
113
IV
133
131
220
210
117
113a
113b
113c
114
112
115
111
210
170
230
250
254
240
142
140
142
254
120
130
162
163
160
161
IV

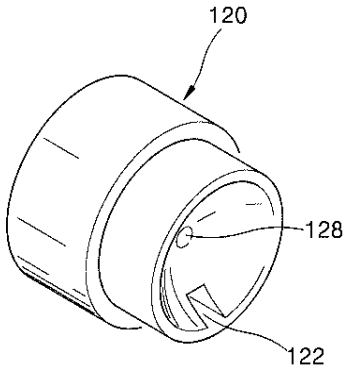
도면4


100
118
119
111
112
110
113
114
115
A
151
150
160
162
B
161

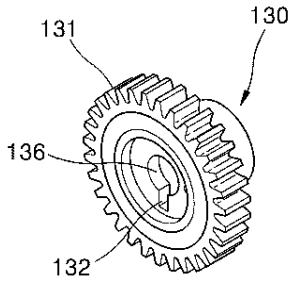
도면5a



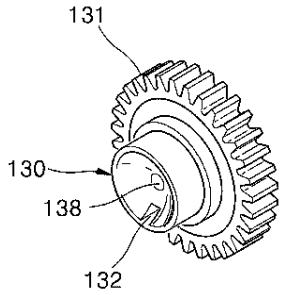
도면5b



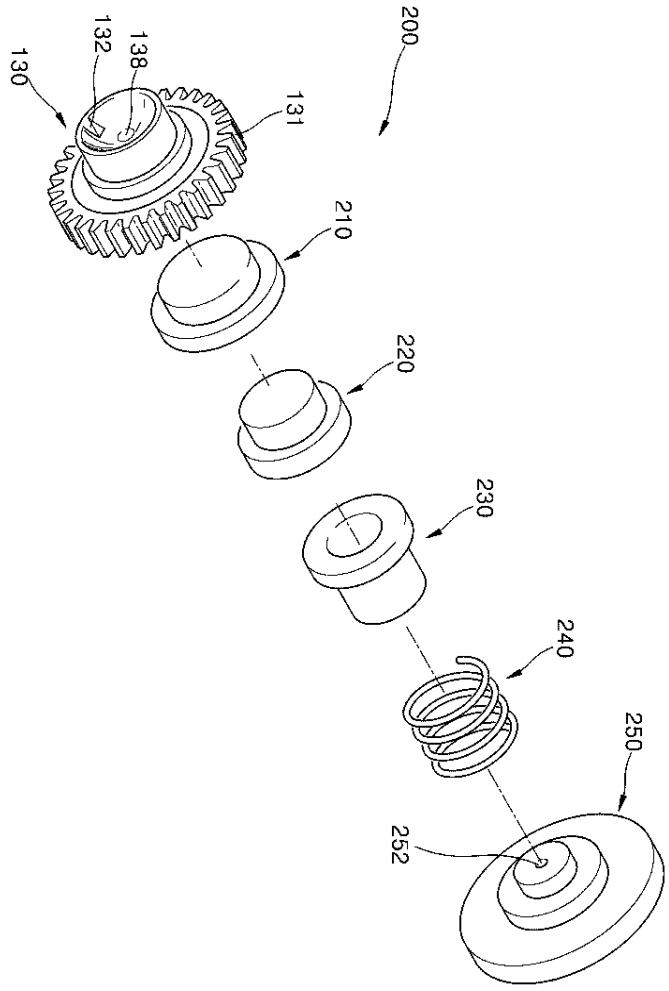
도면6a



도면6b



도면7



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요약

메인데크에 설치된 캡스턴모터의 동력을 이용하여 서브데크 상에 안착된 테이프 카세트의 테이프릴을 구동시키도록 동력을 전달하기 위한 자기 기록/재생장치의 토크 전달장치에 있어서, 메인데크 또는 서브데크에 회전가능하게 설치되는 하부 디스크와; 하부디스크에 자유롭게 회전가능하게 결합되는 상부디스크; 및 상부 디스크와 하부 디스크 사이에 움직임 가능하게 설치되며, 상부 디스크와 하부 디스크 각각에 탄성변형되면서 접촉되어 토크를 발생시키는 복수의 탄성볼;을 포함하는 것을 특징으로 하는 자기 기록/재생장치의 토크 전달장치가 개시된다.

대표도

도 3

명세서

도면의 간단한 설명

도 1은 일반적인 자기 기록/재생장치를 나타내 보인 개략적인 평면도.

도 2는 종래의 토크 전달장치를 나타내 보인 단면도.

도 3은 본 발명의 실시예에 따른 자기 기록/재생장치의 토크 전달장치를 나타내 보인 단면도.

도 4는 도 3에 도시된 토크 전달장치의 조립과정을 설명하기 위한 단면도.

도 5는 도 3에 도시된 하부 디스크에 탄성볼 및 비탄성볼이 설치된 상태를 나타내 보인 평면도.

< 도면의 주요부분에 대한 부호의 설명 >

2..데크 3..서브데크

10..하부 디스크 11b..수용부

20..상부 디스크 21..기어부

23..클러치판 30..탄성볼

40..비탄성볼 50..회전체

60..클램퍼

발명의 상세한 설명

발명의 목적

발명이 속하는 기술 및 그 분야의 종래기술

본 발명은 자기 기록/재생장치에 관한 것으로, 보다 상세하게는 테이프 카세트의 테이프릴을 구동시키기 위한 토크를 전달하기 위한 자기 기록/재생장치의 토크 전달장치에 관한 것이다.

일반적으로, 자기 기록/재생장치는 자기테이프와 같은 기록매체에 정보를 기록하고, 기록된 정보를 재생하는 장치로서, VCR(video cassette tape recorder), 캠코더(camcoder)등이 있다.

도 1을 참조하면, 통상의 자기 기록/재생장치는 헤드드럼(1)이 회전가능하게 설치되는 메인데크(2)와, 이 메인데크(2)에 로딩/언로딩 가능하게 설치되는 서브데크(3)와, 상기 서브데크(3)에 회전 가능하게 설치되어 카세트 테이프의 테이프릴을 구동시키는 한 쌍의 릴테이블(4a,4b)과, 메인데크(1)에 마련된 캡스턴모터(5)의 동력을 상기 릴테이블(4a,4b)중 어느 하나로 선택적으로 전달하기 위한 동력전달유닛을 구비한다.

도면에서 좌측의 릴테이블(4a)은 테이프 카세트로부터 자기 테이프를 공급하기 위한 서플라이측 릴테이블이고, 우측 릴테이블(4b)은 공급되는 자기 테이프를 감는 테이크업측 릴테이블이다.

상기 동력전달유닛은 캡스턴 모터(5)의 축기어(5a)에 연동되는 캡스턴기어(6a)와, 상기 캡스턴기어(6a)의 동력을 타이밍벨트(6b)를 통해 전달받는 풀리기어(7) 및 그 풀리기어(7)에서 전달된 동력을 상기 릴테이블(4a,4b) 중 어느 한 쪽으로 선택적으로 전달하는 스윙기어(8)를 구비한다.

상기 풀리기어(7)는 도 2에 도시된 바와 같이, 메인데크(2)의 고정축(2a)에 회전가능하게 설치되는 풀리 디스크(7a)와, 상기 풀리 디스크(7a)의 축부에 회전가능하게 지지되는 클러칭기어(7b)와, 상기 풀리 디스크(7a)와 클러칭기어(7b) 사이에 토크를 발생시켜 동력이 감속되어 전달되도록 하는 마그네크(7c) 및 금속판(7d)을 구비한다. 마그네트(7c)는 풀리 디스크(7a)에 고정되고, 금속판(7d)은 마그네트(7c)에 마주하도록 클러칭기어(7b)에 고정된다. 따라서, 마그네트(7c)와 금속판(7d)사이의 자력에 의해 타이밍벨트(6b)를 통해 풀리 디스크(7a)로 전달된 동력이 클러칭기어(7b)로 전달될 수 있으며, 클러칭기어(7b) 측에 걸리는 부하에 따라서 전달되는 토크량이 감속되어 전달된다.

상기 스윙기어(8)는 회동플레이트(9)에 의해 풀리기어(7)에 회동가능하게 연결되고, 클러칭기어(7b)에 기어연결된다.

이상에서 설명한 바와 같이, 토크 전달장치 즉, 마그네트(7c)와 금속판(7d)을 포함한 풀리기어(7)에 의해 타이밍벨트(6b)에서 전달된 큰 회전력에 적절히 감속되어 릴테이블(4a,4)로 전달될 수 있게 된다. 따라서, 예를 들어 테이프 카세트에서 테이프를 어느 한쪽으로 되감을 때 최종적으로 감기는 부분에서 릴테이블(4a,4b)의 속도를 감속시켜 테이프에 손상이 가는 것을 방지할 수 있게 된다.

그런데, 상기 구성을 갖는 종래의 토크 전달장치의 경우에는, 고가의 마그네트 등이 필요하게 되어 제조비용이 높아지는 문제점이 있다.

발명이 이루고자 하는 기술적 과제

본 발명은 상기와 같은 문제점을 해결하기 위해 창안된 것으로, 고가의 마그네트를 배제하고도 토크의 전달이 가능하도록 개선된 자기 기록/재생장치의 토크 전달장치를 제공하는데 그 목적이 있다.

발명의 구성 및 작용

상기 목적을 달성하기 위한 본 발명에 따른 자기 기록/재생장치의 토크 전달장치는, 메인데크에 설치된 캡스턴모터의 동력을 이용하여 서브데크 상에 안착된 테이프 카세트의 테이프릴을 구동시키도록 상기 동력을 전달하기 위한 자기 기록/재생장치의 토크 전달장치에 있어서, 상기 메인데크 또는 상기 서브데크에 회전가능하게 설치되는 하부 디스크와; 상기 하부디스크에 자유롭게 회전가능하게 결합되는 상부디스크와; 상기 상부 디스크에 상기 하부 디스크와 마주하도록 고정되는 클러치판; 및 상기 클러치판과 상기 하부 디스크 사이에 움직임 가능하게 설치되며, 상기 클러치판과 하부 디스크 각각에 탄성변형되면서 접촉되면서 토크를 발생시키는 복수의 탄성볼;을 포함하는 것을 특징으로 한다.

여기서, 상기 상부 디스크와 상기 하부 디스크 사이의 최소간격을 확보하도록 상기 상부 디스크와 하부 디스크 사이에 이동 가능하게 설치되는 복수의 비탄성볼;을 더 포함하는 것이 바람직하다.

또한, 상기 탄성볼은 상기 비탄성볼보다 큰 지름을 갖는 것이 좋다.

또한, 상기 하부 디스크는, 상기 탄성볼을 수용하도록 상면에 환영의 수용부를 갖는 하부 디스크 몸체와; 상기 하부 디스크 몸체의 중심에 소정 높이로 일체로 마련되어 상기 상부 디스크를 회전가능하게 지지하며, 축공을 가지는 축부;를 포함하는 것이 좋다.

또한, 상기 축공이 끼워져 상기 하부디스크가 회전가능하게 지지되며, 하단부에 하부 디스크의 이탈을 방지하는 플랜지부가 형성된 중공형의 회전체와; 상기 회전체의 상단에 결합되어 상기 상부 및 하부 디스크의 분리를 방지하는 클램퍼를 더 포함하는 것이 좋다.

또한, 상기 상부 디스크의 외주에는 기어이가 형성되며, 상기 하부 디스크의 외주에는 타이밍벨트가 연결되는 트랙이가 형성된 것이 좋다.

또한, 상기 상부 디스크는, 상기 하부 디스크의 축부에 회전가능하게 결합되며 외주에 기어이가 형성된 중공형의 기어부와; 상기 기어부의 외주에 고정되어 상기 탄성볼에 접촉되는 클러치판;을 포함하는 것이 좋다.

이하 첨부된 도면을 참조하여 본 발명의 실시예에 따른 자기 기록/재생장치의 토크 전달장치를 자세히 설명하기로 한다.

도 3을 참조하면, 본 발명의 실시예에 따른 자기 기록/재생장치의 토크 전달장치는, 메인데크(2)에 회전가능하게 설치되는 하부 디스크(10)와, 상기 하부 디스크(10)에 회전가능하게 설치되는 상부 디스크(20)와, 하부 디스크(10)와 상부 디스크(20) 사이에 개재되는 탄성볼(30) 및 비 탄성볼(40)을 구비한다.

여기서, 상기 메인데크(2)에는 도 1을 통해 설명한 바와 같이, 서브데크(3)가 로딩/언로딩되게 설치된다. 또한, 상기 서브데크(3)에 안착되는 테이프 카세트의 테이프릴을 구동시키기 위한 동력을 제공하는 캡스턴모터(5)도 메인데크(2)에 설치된다. 이러한 메인데크(2)에는 고정샤프트(2a)가 설치된다. 상기 고정샤프트(2a)에는 회전체(50)가 회전가능하게 설치된다. 회전체(50)의 하부에는 확장형성된 플랜지부(51)가 마련되어 하부 디스크(10)를 지지한다.

상기 하부디스크(10)는 상기 회전체(50)에 끼워져 결합되어 함께 회전된다. 이러한 하부 디스크(10)는 외주에 트랙이(11a)가 형성되는 디스크 몸체(11)와, 상기 몸체(11)의 중심부에서 상부로 연장된 중공형의 축부(13)를 가진다. 상기 트랙이(11a)에는 도 1에서 설명한 바와 같이, 동력전달을 위한 타이밍벨트(6b)가 연결된다. 또한, 상기 디스크 몸체(11)의 상면에는 환형의 수용부(11b)가 형성된다. 상기 수용부(11)에는 상기 탄성볼(30)과 비탄성볼(40)이 자유롭게 이동 가능하도록 수용된다. 여기서, 상기 수용부(11)의 깊이는 비탄성볼(40)의 지름보다 작게 형성된다.

상기 상부 디스크(20)는 하부 디스크(10)의 축부(13)에 회전가능하게 설치된다. 이 상부 디스크(20)는 외주에 기어이(21a)가 형성되는 중공형의 기어부(21)와, 상기 기어부(21)의 하측에 상기 하부 디스크(10)의 상면에 마주하도록 설

치되는 클러치판(23)을 구비한다. 여기서, 상기 기어부(21)의 기어이(21a)는 다른 이웃한 기어 예를 들어, 도 1의 스윙기어(8)에 연결되어 동력을 전달할 수 있게 된다. 상기 클러치판(23)은 상기 탄성볼(30) 및 비탄성볼(40)을 사이에 두고 하부 디스크(10)와 소정 간격 이격되게 배치된다. 따라서, 상기 탄성볼(30)의 접촉력에 의해 하부 디스크(10)의 회전력이 클러치판(23)으로 전달되어 토크가 발생하게 된다.

여기서, 상부 기어부(21)와 클러치판(23)은 일체로 형성될 수도 있으나, 본 실시예에서는 별도의 부품으로 제조되어 결합되었다. 또한, 상기 클러치판(23)은 탄성볼(30)과의 접촉에 의한 마모를 감안하여, 내마모성이 좋은 금속판인 것이 바람직하다. 클러치판(23)을 기어부(21)의 외측에 끼워서 고정시킨 상태에서 회전되는 것을 방지하도록, 클러치판(23)의 결합부에는 로킹홈을 형성하고, 기어부(21)의 외측에는 로킹돌기를 각각 형성할 수 있다.

상기 탄성볼(30)은 신축성을 가진 고무재료로 소정량의 탄성을 갖도록 형성된다. 이 탄성볼(30)은 하부 디스크(10)의 수용부(11b)에 자유롭게 이동되도록 수용된다. 탄성볼(30)은 도 4에 도시된 바와 같이, 수용부(11b)의 깊이보다 큰 직경을 갖는다. 이 탄성볼(30)은 하부 디스크(10)에 상부 디스크(20)가 결합될 때, 도 3에 도시된 바와 같이 클러치판(23)에 눌려져 탄성변형된다. 상부 디스크(20)의 결합시 클러치판(23)이 하부디스크(10)의 상면에 접촉되지 않도록, 클러치판(23)의 직경(D1)이 수용부(11b) 외경(D2)보다 작게 마련된다.

상기 비탄성볼(40)은 탄성을 갖지 않는 재질 예컨대, 금속 등의 재질로 형성되며, 상기 탄성볼(30)보다는 작은 직경을 갖는다. 이러한 비탄성볼(40)은 수용부(11b)에 복수개가 자유로이 이동될 수 있도록 수용된다. 또한, 비탄성볼(40)은 수용부(11b)의 깊이보다는 큰 직경을 가진다. 이러한 비탄성볼(40)은 클러치판(23)과 하부 디스크(10) 사이의 간격을 일정하게 유지시키는 기능을 한다. 즉, 상기 탄성볼(30)이 너무 큰 힘으로 눌려서 많이 변형되더라도, 클러치판(23)은 비탄성볼(40)에 접촉됨으로서 하부 디스크(10) 쪽으로 더 이상 접근하지 않게 된다. 따라서, 클러치판(23)이 하부 디스크(10)에 직접 접촉되는 것을 방지하면서, 탄 성볼(30)이 적절히 탄성 변형되도록 제어한다. 도 5에 도시된 바와 같이, 상기 탄성볼(30)과 비탄성볼(40)은 교번되게 배치되어 클러치판(23)에 탄성볼(30)이 규칙적으로 접촉되도록 하는 것이 좋다.

또한, 상기와 같이 각 디스크(10)(20)가 조립되어 회전체(50)에 지지된 상태에서, 각 디스크(10)(20)가 회전체(50)의 윗방향으로 이탈되는 것을 방지하기 위한 클램퍼(60)가 더 구비된다. 상기 클램퍼(60)는 회전체(50)의 상단에 형성된 후크부(53)에 끼워져 고정됨으로써, 각 디스크(10)(20)가 분리되는 것을 방지하고, 안정되게 회전될 수 있도록 지지한다. 여기서, 상기 클램퍼(60)는 그 길이가 연장되어 도 1 및 도 2에서 설명한 회동레버(9)의 기능을 추가시킬 수 있다. 즉, 본 발명의 실시예에 따른 토크 발생장치가 도 1에서 설명한 풀기기어(7)의 역할을 하도록 배치될 경우, 클램퍼(60)는 회동레버(9)의 기능을 하도록 적절히 설계될 수 있게 된다. 또한, 하부 디스크(10)에는 타이밍벨트(6b)가 연결되고, 상부 디스크(20)의 기어부(21)에는 스윙기어(8)가 연결된다.

상기 구성을 가지는 본 발명의 실시예에 따른 자기 기록/재생장치의 토크 전달장치는, 하부 디스크(10)에 동력이 전달되어 그 하부 디스크(10)가 회전된다. 그러면, 탄성볼(30)의 탄성력에 의해 상부 디스크(20)로 하부 디스크(10)와 함께 회전됨으로써, 상부 디스크(20)로 토크를 전달할 수 있게 된다.

또한, 상부 디스크(20)에 큰 부하가 걸려있을 경우, 하부 디스크(10)는 정상적으로 회전되지만 상부 디스크(20)에 걸린 부하에 의해 탄성볼(30)이 조금씩 회전되면서 감속되어 상부 디스크(20)로 감소된 토크만이 전달된다. 따라서, 상부 디스 크(20)는 하부 디스크(10)에 비해 작은 속도로 회전된다. 물론, 비탄성볼(40)도 함께 회전되면서 클러치판(23)과 하부 디스크(10) 사이의 간격을 일정하게 유지시킨다.

이와 같이 동작되는 본 발명의 실시예에 따른 토크 전달장치는, 하부 및 상부 디스크(10)(20) 사이에 탄성볼(30) 및 비탄성볼(40)을 개재시켜 마찰에 의한 토크를 발생시켜 전달하도록 한 구성을 갖는다. 따라서, 종래와 같이 고가의 마그네트를 채용하지 않고 상대적으로 저렴한 제품을 채용하여 생산단가를 낮출 수 있게 된다.

한편, 본 발명의 실시예에서는 메인데크(2)에 각 디스크(10)(20)가 설치되어 타이밍벨트(6b)의 동력을 스윙기어(8)로 전달하는 것을 예로 들어 설명하였다. 그러나, 다른 예로서, 본 발명에 따른 토크 전달장치는 서브 데크(3;도1참조)에 설치되는 릴테이블에 적용될 수 있는 것은 당업자에게는 자명한 일일 것이다.

발명의 효과

이상에서 설명한 바와 같은 본 발명의 자기 기록/재생장치의 자기 기록/재생장치의 토크 전달장치에 따르면, 고가의 마그네트를 삭제하고 상대적으로 저렴한 재료를 이용하여 토크를 전달할 수 있는 구성을 갖는다. 따라서, 제품의 단가를 낮출 수 있게 된다.

(57) 청구의 범위

청구항 1.
메인데크에 설치된 캡스턴모터의 동력을 이용하여 서브데크 상에 안착된 테 이프 카세트의 테이프릴을 구동시키도록 상기 동력을 전달하기 위한 자기 기록/재생장치의 토크 전달장치에 있어서,

상기 메인데크 또는 상기 서브데크에 회전가능하게 설치되는 하부 디스크와;

상기 하부디스크에 자유롭게 회전가능하게 결합되는 상부디스크; 및

상기 상부 디스크와 하부 디스크 사이에 움직임 가능하게 설치되며, 상기 상부 디스크와 하부 디스크 각각에 탄성변형되면서 접촉되어 토크를 발생시키는 복수의 탄성볼;을 포함하는 것을 특징으로 하는 자기 기록/재생장치의 토크 전달장치.

청구항 2.
제1항에 있어서, 제1항에 있어서,

상기 상부 디스크와 상기 하부 디스크 사이의 최소간격을 확보하도록 상기 상부 디스크와 하부 디스크 사이에 이동가능하게 설치되는 복수의 비탄성볼;을 더 포함하는 것을 특징으로 하는 자기 기록/재생장치의 토크 전달장치.

청구항 3.
제2항에 있어서, 상기 탄성볼은 상기 비탄성볼보다 큰 지름을 갖는 것을 특징으로 하는 자기 기록/재생장치의 토크 전달장치.

청구항 4.
제1항에 있어서, 상기 하부 디스크는,

상기 탄성볼을 수용하도록 상면에 환영의 수용부를 갖는 하부 디스크 몸체와;

상기 하부 디스크 몸체의 중심에 소정 높이로 일체로 마련되어 상기 상부 디 스크를 회전가능하게 지지하며, 축공을 가지는 축부;를 포함하는 것을 특징으로 하는 자기 기록/재생장치의 토크 전달장치.

청구항 5.
제4항에 있어서, 상기 축공이 끼워져 상기 하부디스크가 회전가능하게 지지되며, 하단부에 하부 디스크의 이탈을 방지하는 플랜지부가 형성된 중공형의 회전체와;

상기 회전체의 상단에 결합되어 상기 상부 및 하부 디스크의 분리를 방지하는 클램퍼를 더 포함하는 것을 특징으로 하는 자기 기록/재생장치의 토크 전달장치.

청구항 6.
제1항 내지 제5항 중 어느 한 항에 있어서,

상기 상부 디스크의 외주에는 기어이가 형성되며,

상기 하부 디스크의 외주에는 타이밍벨트가 연결되는 트랙이가 형성된 것을 특징으로 하는 자기 기록/재생장치의 토크 전달장치.

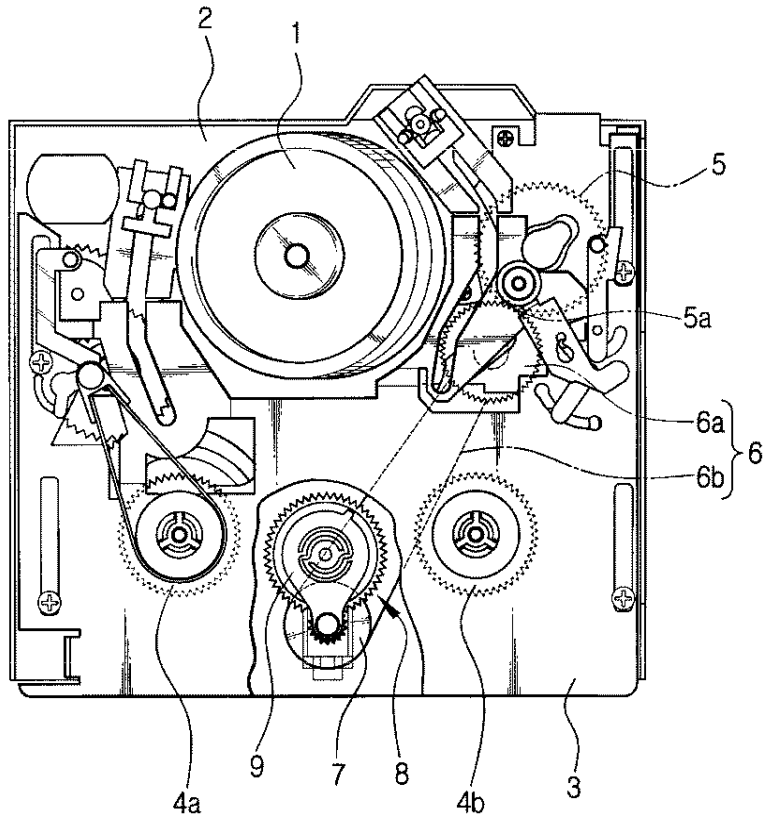
청구항 7.
제1항에 있어서, 상기 상부 디스크는,

상기 하부 디스크의 축부에 회전가능하게 결합되며 외주에 기어이가 형성된 중공형의 기어부와;

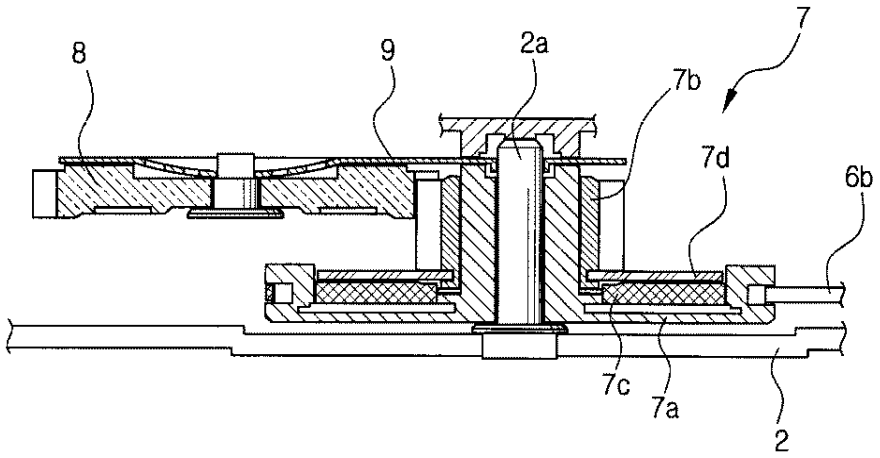
상기 기어부의 외주에 고정되어 상기 탄성볼에 접촉되는 클러치판;을 포함하는 것을 특징으로 하는 자기 기록/재생장치의 토크 전달장치.

도면

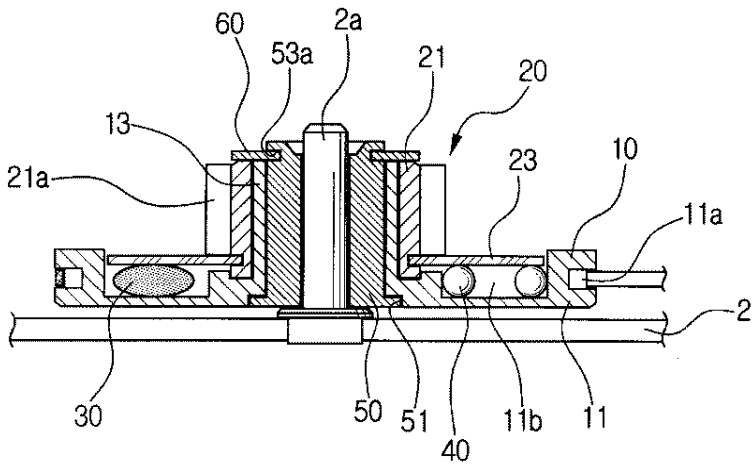
도면1



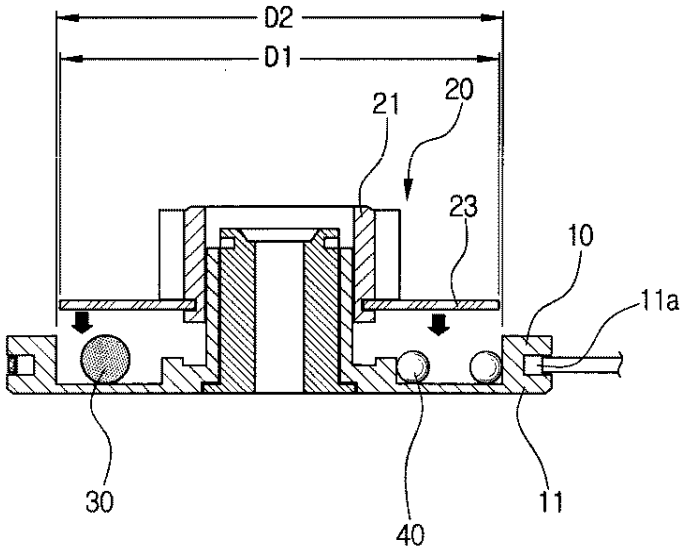
도면2



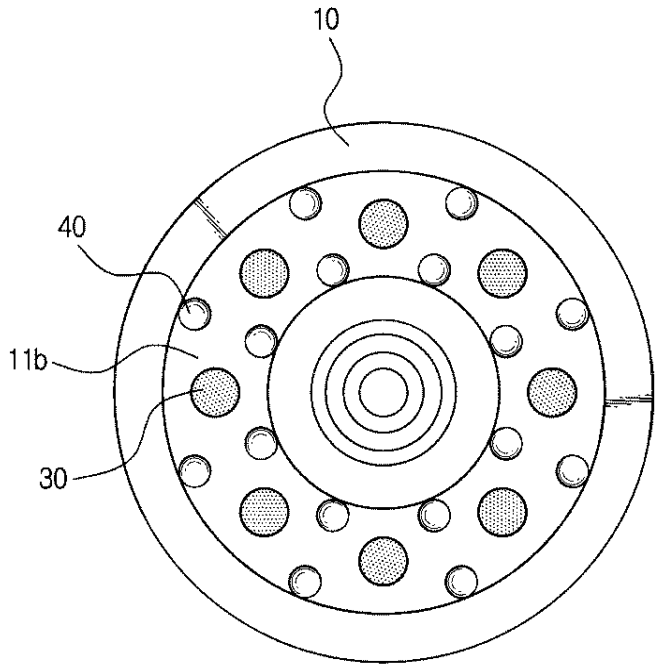
도면3


60
2a
53a
21
20
13
21a
23
10
11a
2
30
50
51
40
11b
11

도면4


D2
D1
21
20
23
10
11a
30
40
11

도면5



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(51) 。Int. Cl.[7]
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요약

개시된 본 발명에 의한 자기 기록/재생장치의 클러치 장치는, 캡스턴 모터로부터 동력을 전달받아 회전되도록 메인데크에 설치되는 제1 기어와; 상기 제1 기어의 토크에 의하여 회전되도록 상기 제1 기어와 동일 회전축상에 설치되며, 상기 아이들 기어와 기어연결되는 제2 기어와; 상기 제1 기어와 동축상에 축설되어, 상기 제2 기어를 회전가능하게 지지하는 부시; 일단이 상기 제1 기어에 고정되며, 타단이 상기 부시에 고정되어, 상기 제2 기어에 눌려 탄성변형되면서 각 기어들간에 접촉력을 제공하는 탄성지지부재; 및 상기 제1 기어의 토크가 상기 제2 기어에 일정하게 전달되도록 양 기어 사이에 개재되는 클러칭 부재를 포함한다.

이에 의하면, 캡스턴 모터로부터 릴테이블로 전달되는 동력을 감소시키기 위해 클러치 장치내에 고가의 마그네트가 구비될 필요가 없으므로 시스템의 제조원가가 절감될 수 있으며, 이에 따라 구비되는 부품의 수가 감소될 수 있다.

대표도

도 3a

색인어

마그네트, 클러치, 캠코더, VCR, 윤활유, 점성제, 글리세린

명세서

도면의 간단한 설명

도1은 일반적인 자기 기록/재생장치의 데크장치를 개략적으로 나타낸 평면도,

도2는 종래의 자기 기록/재생장치의 클러치 장치의 단면도,

도3a는 본 발명의 실시예에 따른 자기 기록/재생장치의 클러치 장치의 단면도,

도3b는 도3a의 A부의 확대도이다.

< 도면의 주요부분에 대한 부호의 설명 >

2 : 캡스턴 모터 3 : 동력전달유닛

10 : 메인데크 20 : 서브데크

100 : 클러치 장치 110 : 제1 기어

120 : 제2 기어 130 : 클러칭 부재

140 : 부시 150 : 탄성지지부재

발명의 상세한 설명

발명의 목적

발명이 속하는 기술 및 그 분야의 종래기술

본 발명은 자기 기록/재생장치에 관한 것으로, 보다 구체적으로는 자기 기록/재생장치의 데크장치상에서 토크를 발생시키는 클러치 장치에 관한 것이다.

일반적으로 자기 기록/재생장치는 자기 테이프와 같은 기록매체에 정보를 기록하고, 기록된 정보를 재생하는 장치로서, VCR(video cassette tape recorder), 캠코더 등이 있다.

도1은 일반적으로 사용되는 자기 기록/재생장치의 데크장치를 개략적으로 나타낸 평면도로서 이를 간단히 살펴보면 다음과 같다.

상기 자기 기록/재생장치의 데크장치는, 헤드드럼(1)이 회전가능하게 설치되는 메인데크(10)와, 상기 메인데크(10)에 로딩/언로딩 가능하게 설치되는 서브데크(20)와, 상기 서브데크(20)에 회전가능하게 설치되어 카세트 테이프의 테이프릴을 구동시키는 한 쌍의 릴테이블(6)과, 상기 메인데크(10)에 마련된 캡스턴 모터(2)의 구동력을 상기 릴테이블(6) 측으로 선택적으로 전달하기 위한 동력전달유닛(3)과, 상기 동력전달유닛(3)으로부터 전달되는 구동력을 클러칭 하는 클러치 장치(4)와, 상기 클러칭된 구동력을 상기 한 쌍의 릴테이블(6) 중 어느 하나로 선택적으로 전달하는 릴테이블 구동장치(5)를 구비한다.

상기 릴테이블(6)은 테이프 카세트로부터 자기 테이프를 공급하기 위한 서플라이측 공급릴 테이블(도면의 왼쪽)과, 공급되는 자기 테이프를 감는 테이크업측 권취릴 테이블(도면의 오른쪽)을 구비한다.

상기 동력전달유닛(3)은 캡스턴 모터(2)의 축기어(2a)와 기어결합되는 캡스턴기어(3a)와, 상기 캡스턴기어(3a)의 구동력을 상기 클러치 장치(4)로 전달하는 타이밍벨트(3b)를 구비한다.

도2를 참조하면 상기 클러치 장치(4)는 상기 타이밍 벨트(3b)로부터 구동력을 전달받아 회전되도록 풀리부(41a)가 형성되며 상기 메인데크(10)상에 고정된 축(11)에 축설되는 풀리기어(41)와, 상기 풀리기어(41)의 토크에 의하여 회전되도록 상기 풀리기어(41)의 축부에 회전가능하게 설치되는 클러칭 기어(43)와, 상기 풀리기어(41)와 클러칭 기어(43)사이에 개재되어 상기 풀리기어(41)의 토크를 상기 클러칭 기어(43)로 전달하는 클러칭 부재(45)를 포함한다.

상기 클러칭 부재(45)는 상기 풀리기어(41)와 클러칭 기어(43)에 접하여 고정되는 한 쌍의 금속판(45a)과, 상기 한 쌍의 금속판(45a)사이에 개재되는 마그네트(45b)를 구비한다.

상기 릴테이블 구동장치(5)는 상기 클러치 장치(4)의 클러칭 기어(41)와 연동되는 아이들기어(5b) 및 상기 클러치 장치(4)와 아이들기어(5b)를 연결하는 회동플레이트(5a)를 가진다.

상기 회동플레이트(5a)는 중앙부위에 판스프링 기능을 갖도록 소정 패턴으로 절개된 탄성부를 갖는다. 상기 탄성부가 아이들기어(5b)에 소정 마찰력으로 접촉되므로, 아이들기어(5b)의 회전방향이 바뀌었을 때, 회동플레이트(5a)가 회동되는 토크가 발생되어 좌/우측 릴테이블(6)이 아이들기어(5b)와 선택적으로 연결될 수 있다.

이와 같은 구성에 의하면, 마그네트(45b)와 한 쌍의 금속편(45a) 사이에 발생되는 자력에 의해 풀리기어(41)의 토크가 클러칭기어(43)로 전달된다. 즉, 상기 자력에 의해 풀리기어(41)의 회전력 일부가 클러칭기어(43)로 전달된다. 따라서, 아이들기어(5b)를 거쳐 최종적으로 릴테이블(6)로 전달되는 회전력이 감소되어 적절한 회전력을 얻을 수 있게 된다.

이와 같은 종래의 클러치 장치(4)는, 풀리기어(41)의 토크를 클러칭 기어(43)로 전달하기 위해 금속편 사이에 마그네트를 개재시켜 자력을 발생시키는 방식이므로, 고가의 마그네트로 인해 그 제조비용이 높아지는 문제점이 있다.

발명이 이루고자 하는 기술적 과제

본 발명은 상기와 같은 점을 감안하여 안출된 것으로, 고가의 마그네트를 사용하지 않고 토크를 전달시킬 수 있도록 개선된 자기 기록/재생장치의 클러치 장치를 제공하는데 그 목적이 있다.

발명의 구성 및 작용

상기 목적을 달성하기 위한 본 발명에 의한 자기 기록/재생장치의 클러치장치는, 캡스턴 모터로부터 동력을 전달받아 회전되도록 메인데크에 설치되는 제1 기어와; 상기 제1 기어의 토크에 의하여 회전되도록 상기 제1 기어와 동일 회전축상에 설치되며, 상기 아이들 기어와 기어연결되는 제2 기어와; 상기 제1 기어와 동축상에 축설되어, 상기 제2 기어를 회전가능하게 지지하는 부시; 일단이 상기 제1 기어에 고정되며, 타단이 상기 부시에 고정되어, 상기 제2 기어에 눌려 탄성변형되면서 각 기어들간에 접촉력을 제공하는 탄성지지부재; 및 상기 제1 기어의 토크가 상 기 제2 기어에 일정하게 전달되도록 양 기어 사이에 개재되는 클러칭 부재를 포함한다.

여기서 상기 클러칭 부재는, 상기 제1 기어와 상기 제2 기어에 각각 서로 대향하도록 고정되는 한 쌍의 금속편과; 상기 한 쌍의 금속편 사이에 개재되는 액상의 점성유체;를 포함한다.

본 발명의 바람직한 일실시예에 의하면 상기 한 쌍의 금속편은, 상기 제1 기어측에 고정되며 철로 형성되는 제1 금속편과, 상기 제2 기어측에 고정되며 구리로 형성되는 제2 금속편을, 포함한다.

본 발명의 바람직한 일실시예에 의하면 상기 액상의 점성유체는, 글리세린으로 구성된다.

상기 목적 및 다른 특징들은 첨부도면을 참조하여 본 발명의 바람직한 실시예를 상세히 설명함으로써 보다 명백해질 것이다. 참고로 본 발명의 실시예를 설명함에 있어서, 종래와 그 구성 및 작용이 동일한 부분에 대해서는 동일한 참조부호를 부여하여 인용한다.

도3에 도시된 바와 같이, 본 발명의 일실시예에 의한 자기 기록/재생장치의 클러치 장치(100)는, 앞서 도1을 참조하여 설명한 자기 기록/재생장치에 적용되는 것으로서 캡스턴 모터(2)로부터 동력을 전달받아 회전하는 제1 기어(110), 상기 제1 기어(110)의 토크에 의해 회전하는 제2 기어(120), 상기 제2 기어(120)를 회전가능하게 지지하는 부시(140), 및 상기 부시(140)와 제1 기어(110)에 고정 결합되는 탄성지지부재(150), 상기 제1 기어(110)와 제2 기어(120)에 사이에 개재되는 클 러칭 부재(130)를 포함한다.

상기 제1 기어(110)는, 메인데크(10)상에 고정된 축(11)에 회전가능하게 축설되고, 상기 캡스턴 모터(2)로부터 발생되는 구동력을 타이밍 벨트(3b) 등에 의하여 전달받도록 풀리부(110a)가 형성된다. 상기 타이밍 벨트(3b)의 일측은 도1에 개시된 바와 같이 상기 캡스턴 모터(2)의 캡스턴 기어(3a)에 걸리고, 타측은 상기 제1 기어의 풀리부(110a)에 걸린다.

상기 제2 기어(120)는, 제1 기어(110)에 의해 토크가 발생되어 릴테이블(6)을 회전시키는 아이들 기어(5b)와 기어연결되어 아이들 기어(5b)를 회전시킨다.

상기 부시(140)는, 상기 클러칭 부재(130)를 매개로 하여 상기 제1 기어(110)의 회전력에 의하여 발생되는 토크에 의해 회전되도록 상기 제2 기어(120)를 지지한다. 또한, 외주면의 하단에는 홈부(140a)가 형성되며 상단에는 클램퍼부(140b)가 형성되어 있다.

상기 부시(140)의 클램퍼부(140b)에 의하여, 상기 제2 기어가 상기 부시(140)의 회전축부로 부터 이탈되는 것이 방지된다.

상기 탄성지지부재(150)는, 일측이 상기 제1 기어(110)의 내주면에 인서트몰딩 고정되어 일체로 고정되며, 타측이 상기 부시(140)의 외주면 하단에 형성된 홈부(140a)에 인서트몰딩 고정된다. 상측으로 탄성지지하는 상기 탄성지지부재(150)에 의하여 상기 제1 기어(110)와 상기 제2 기어(120) 사이에 개재된 클러칭 부재(130)가 일정하게 토크를 전달할 수 있게 된다. 상기 탄성지지부재(150)는 판상의 스프링 등으로 구성되는 것이 바람직하다.

상기 클러칭 부재(130)는, 상기 제1 기어(110)와 제2 기어(120)에 개재되어 제1 기어(110)의 토크에 대해 항상 일정한 토크가 발생되도록 한다. 이러한 클러칭 부재(130)는, 상기 제1 기어(110)측에 접촉 고정되는 구리판(131)과, 상기 제2 기어(120)측에 접촉 고정되는 철판(133)과, 상기 구리판(131)과 철판(133) 사이에 개재되는 액상의 점성유체(135)를 포함하여 구성된다. 상기 액상의 점성유체(135)는, 일반적으로 산업분야에서 널리 사용되는 글리세린인 것이 바람직하다.

상기 액상의 점성유체가 외부로 누설되지 않도록 상기 구리판과 철판의 외측에는 경사턱(미도시)이 형성되는 것이 바람직하다.

이하, 상기 클러치 장치가 구비되는 자기 기록/재생장치의 메인데크의 구성 및 동작과정을 도1 및 도3을 참조하여 간단히 살펴본다.

도시된 바와 같이, 캡스턴 모터(2)의 회전구동력은 상기 캡스턴 모터(2)의 축기어(2a)에 기어결합되는 캡스턴 풀리(3a)와, 제1 기어의 풀리부(110a)에 감기는 타이밍 벨트(3b)에 의하여 제1 기어(110)로 전달된다.

상기 타이밍 벨트(3b)에 의하여 전달되는 회전구동력은 클러칭 부재(130)에 의하여 클러칭 효과, 즉 상기 제1 기어(110)에 고정결합된 구리판(131)과 상기 제2 기어(120)에 고정결합된 철판(133)에 개재되는 글리세린(135)의 마찰력에 의하여 회전구동력이 감소되면서 상기 제2 기어(120)에 전달된다.

이때, 상기 제1 기어(110)의 내주면과 상기 부시(140)의 외주면 하부에 고정결합되는 탄성지지부재(150)에 의하여 상기 제1 기어(110)가 상방으로 탄성지지되어 보다 밀접하게 제2 기어측과 접촉하게 된다. 따라서, 상기 제1 기어(110)와 제2 기어(120) 사이에 개재되는 클러칭 부재(130)에 의하여 일정하게 토크가 전달되게 된다.

이와 같이 클러칭 부재(130)에 의하여 감소된 회전구동력은 상기 제2 기어(120)와 기어결합되는 아이들 기어(5b)에 전달된다.

상기 아이들 기어(5b)는 회전방향에 따라서 서브데크(20)상의 공급릴과 권취릴(6)의 각각에 선택적으로 기어결합되어 구동력을 전달하게 된다. 이와 같이 서브데크(20)상의 공급릴과 권취릴(6)의 각각에 전달된 구동력에 의해, 상기 각각의 릴에 안착되는 카세트 테이프의 릴이 회전하게 되어 테이프가 감기게 된다.

발명의 효과

이상에서 설명한 바와 같이 본 발명에 의하면, 종래 클러치 장치에 있어서 캡스턴 모터로부터 릴테이블로 전달되는 동력을 감소시키기 위해 고가의 마그네트가 구비될 필요가 없으므로 시스템의 제조원가가 절감될 수 있으며, 이에 따라 구비되는 부품의 수가 감소될 수 있다.

이상, 본 발명을 본 발명을 예시하기 위한 바람직한 실시예와 관련하여 도시하고 설명하였으나, 본 발명은 그와 같이 도시되고 설명된 그대로의 구성 및 작용으로 한정되는 것이 아니다. 오히려 첨부된 특허청구범위의 사상 및 범주를 일탈함이 없이 본 발명에 대한 다수의 변경 및 수정이 가능함을 당업자들은 잘 이해할 수 있을 것이다. 따라서 그러한 모든 적절한 변경 및 수정과 균등물들도 본 발명의 범위에 속하는 것으로 간주되어야 할 것이다.

(57) 청구의 범위

청구항 1.

메인데크에 회전가능하게 설치되며, 테이프 카세트의 테이프릴이 안착되는 한 쌍의 릴테이블 중 어느 하나로 캡스턴 모터의 동력을 선택적으로 전달하는 아이들 기어에, 토크를 발생시키는 자기 기록/재생장치의 클러치장치에 있어서,

상기 캡스턴 모터로부터 동력을 전달받아 회전되도록 상기 메인데크에 설치되는 제1 기어;

상기 제1 기어의 토크에 의하여 회전되도록 상기 제1 기어와 동일 회전축상에 설치되며, 상기 아이들 기어와 기어연결되는 제2 기어;

상기 제1 기어와 동축상에 축설되어, 상기 제2 기어를 회전가능하게 지지하는 부시;

일단이 상기 제1 기어에 고정되고 타단이 상기 부시에 고정되어, 상기 제2 기어에 의해 눌려 탄성변형되면서 각 기어들간에 접촉력을 제공하는 탄성지지부재; 및

상기 제1 기어의 토크가 상기 제2 기어에 일정하게 전달되도록 양 기어 사이에 개재되는 클러칭 부재;를 포함하는 자기 기록/재생장치의 클러치 장치.

청구항 2.
제1항에 있어서, 상기 클러칭 부재는,

상기 제1 기어와 제2 기어에 각각 서로 대향하도록 고정되는 한 쌍의 금속편;과

상기 한 쌍의 금속편 사이에 개재되는 액상의 점성유체;를 포함하는 것을 특 징으로 하는 자기 기록/재생장치의 클러치 장치.

청구항 3.
제2항에 있어서, 상기 한 쌍의 금속편은,

상기 제1 기어측에 고정되며 철로 형성되는 제1 금속편과;

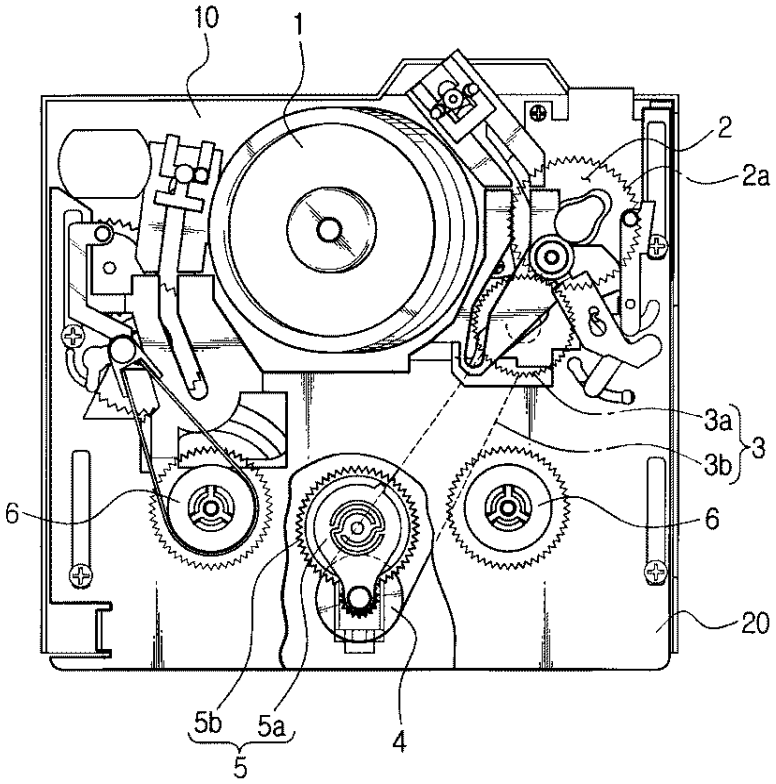
상기 제2 기어측에 고정되며 구리로 형성되는 제2 금속편;을 포함하는 것을 특징으로 하는 자기 기록/재생장치의 클러치 장치.

청구항 4.
제2항에 있어서, 상기 액상의 점성유체는,

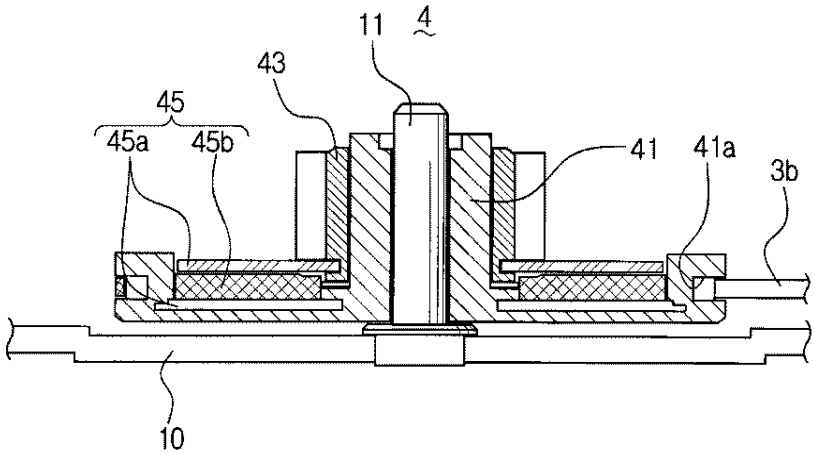
글리세린인 것을 특징으로 하는 자기 기록/재생장치의 클러치 장치.

도면

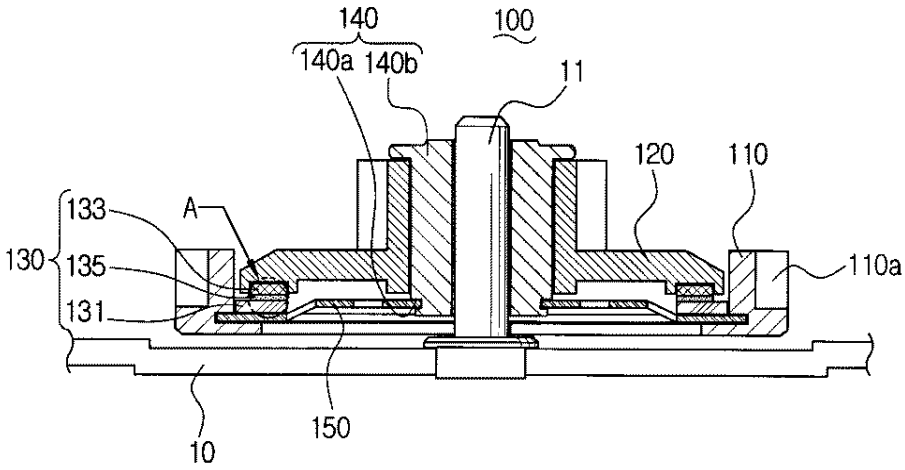
도면1



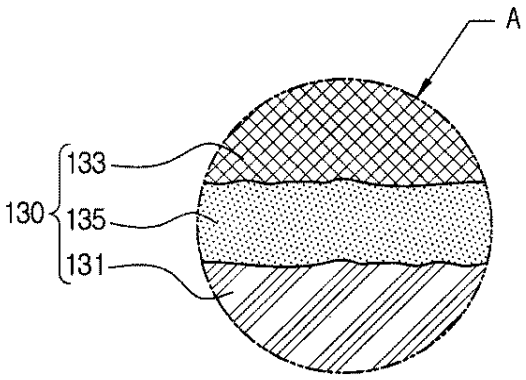
도면2



도면3a


140
140a 140b
100
11
120
110
133
A
130
135
131
110a
10
150

도면3b


A
133
130
135
131

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(54) 식기세척기

요약

본 발명은 세척수가 분사되는 분사공이 막히는 것을 방지할 수 있는 식기세척기에 관한 것이다.

본 발명에 따른 식기세척기는, 외관을 이루는 본체 내에 마련된 세척조와, 세척조 내에 수용되며 식기 등을 수납하는 식기바구니와, 세척조 내의 세척수를 가압하는 세척펌프와, 세척펌프로부터 공급되는 세척수를 분사하는 분사공을 포함한 것으로, 세척펌프와 분사공 사이의 유로에는 세척수에 초음파를 전달하는 초음파 발생장치가 구비되어, 초음파 발생장치에서 발생된 초음파에 의해 분사공에 쌓인 오염물질이 분리되어 분사공이 막히는 것을 방지할 수 있게 되는 작용효과가 있다.

대표도

도 3

명세서

도면의 간단한 설명

도 1은 본 발명에 따른 식기세척기의 구성을 보인 단면도이다.

도 2는 본 발명에 따른 식기세척기의 식기바구니의 사시도이다.

도 3은 도 1의 III부의 확대도이다.

* 도면의 주요 부분에 대한 부호의 설명 *

10: 본체, 11: 세척조,

12: 도어, 15: 세척펌프

15a: 흡입관 15b: 토출관

16: 집수부 17: 필터

20: 식기바구니 21: 세척수관

22: 급수부 23: 분사노즐

23a: 분사공

발명의 상세한 설명

발명의 목적

발명이 속하는 기술 및 그 분야의 종래기술

본 발명은 식기세척기에 관한 것으로, 더욱 상세하게는 세척수가 분사되는 분사공이 막히는 것을 방지할 수 있는 식기세척기에 관한 것이다.

일반적으로 식기세척기는 식기에 고압의 세척수를 분사하여 식기를 세척하는 장치로써, 외관을 이루는 본체 내부에 식기의 세척이 이루어지는 세척조가 마련되며, 세척조의 내부에 식기의 수납이 가능하며 외부로 인출이 가능한 식기바구니가 설치되어 있다.

또한, 세척조의 내측 하부에는 식기바구니에 담긴 식기에 세척수를 분사할 수 있도록 분사공이 마련된 분사노즐이 마련되어 있으며, 분사노즐에 고압의 세척수를 공급하기 위한 세척펌프가 구비되어 있다.

따라서, 세척펌프가 구동되면 고압의 세척수가 분사공을 통해 분사되어 식기의 세척이 이루어지게 되는 것이다.

그런데, 이러한 식기세척기에 있어서, 세척수를 분사하는 분사공은 충분한 수압을 얻을 수 있도록 그 크기가 작게 형성되어 있으므로, 장시간 사용하게 되면 세척수 내의 잔류하는 미네랄 성분이나, 식기에서 분리된 오염물질이 쌓여 막힐 소지가 있다는 문제점이 있다.

발명이 이루고자 하는 기술적 과제

본 발명은 이와 같은 문제점을 해결하기 위한 것으로, 본 발명의 목적은 세척수에 포함된 오염물질에 의해 분사공이 막히는 것을 방지할 수 있는 식기세척기를 제공하는 것이다.

발명의 구성 및 작용

이러한 목적을 달성하기 위한 본 발명에 따른 식기세척기는, 외관을 이루는 본체와, 상기 본체 내에 마련되어 식기의

세척이 이루어지는 세척조와, 상기 세척 조 내의 세척수를 가압하는 세척펌프와, 상기 세척펌프로부터 공급된 세척수가 식기에 분사되게 하는 분사공과, 상기 세척펌프와 상기 분사공을 연결하는 유로에 구비된 초음파 발생장치를 구비한다.

또한, 상기 세척조에는 식기를 담는 식기바구니가 구비되되, 상기 식기바구니는 세척수가 안내되는 세척수관을 구비하여 상기 세척수관에 상기 분사공이 마련된다.

또한, 상기 세척수관에는 식기로 소정 압력의 세척수를 분사할 수 있도록 점진적으로 작아지는 단면을 갖는 분사노즐이 마련되어 상기 분사노즐에 의해 상기 분사공이 형성된다.

또한, 상기 초음파 발생장치는 상기 세척수관에 마련된다.

또한, 상기 초음파 발생장치는 판형상으로 형성되어 세척수에 초음파를 전달하는 진동판을 구비한다.

이하에서는 본 발명에 따른 바람직한 실시예를 첨부 도면을 참조하여 상세히 설명한다.

본 발명에 따른 식기세척기는 도 1에 도시되어 있는 바와 같이, 외관을 이루는 본체(10)의 내부에 식기의 세척이 이루어지는 세척조(11)가 마련되며, 그 일측은 개방되어 식기가 세척조(11)에 수납 및 인출할 수 있도록 세척조(11) 일측을 개폐하는 도어(12)가 설치된다.

도어(12)는 본체(10)의 개방부에 그 하단이 힌지 결합되도록 설치되어 상하로 회동하며 개폐되도록 되어 있으며,

세척조(11) 내에는 식기를 담을 수 있도록 식기바구니(20)가 진퇴이동 가능하게 설치되는데, 이러한 식기바구니(20)는 도 2에 도시되어 있는 바와 같이 내부에 세척수가 흐를 수 있도록 파이프로 이루어진 다수의 세척수관(21)이 격자형상으로 연결되어 형성되며, 후단측에는 세척수를 공급받을 수 있도록 급수부(22)가 마련된다.

이러한 세척수관(21)에는 식기측으로 세척수를 분사할 수 있도록 분사노즐(23)이 마련된다. 분사노즐(23)에는 세척수가 분사되는 분사공(23a, 도 3참조)이 상측으로 개방되도록 마련되어 있으며, 세척수관(21)에 유입된 세척수가 일정 이상의 수압으로 분사될 수 있도록 하기 위하여 점점 축소된 단면을 갖도록 형성되어 있다.

다시 도 1을 참조하면, 세척조(11)의 상부에는 세척조(11) 내부로 세척수를 공급하기 위하여 급수밸브(13)가 마련된 급수관(14)이 구비되며, 세척조(11)의 하부에는 세척조(11) 내부의 세척수를 흡입하여 가압하여 소정 압력이상으로 세척수관(21)에 공급하는 세척펌프(15)가 설치된다. 세척펌프(15)에는 토출된 세척수를 세척수관(21)으로 안내할 수 있도록 토출관(15a)이 마련되는데, 이러한 토출관(15a)의 끝단은 식기바구니(20)가 세척조(11) 내에 수납되었을 때 식기바구니(20)의 급수부(22)에 연결되어 이를 통해 식기바구니(20)에 세척수를 공급할 수 있게 하는 것이다.

또한, 세척조(11)의 하부에는 세척수와 오염물질이 고이도록 소정깊이로 함몰된 집수부(16)가 형성되며, 집수부(16)에는 세척된 오물을 걸러주는 필터(17)가 설치된다. 또한, 집수부(16)에는 세척펌프(15)의 흡입측에 연결되는 흡입관(15b)이 설치되는데, 이는 필터(17)를 통해 걸러진 세척수가 흡입관(15b)을 통해 재순환 될 수 있도록 하기 위한 것이다.

이러한 식기세척기에 있어서, 세척펌프(15)와 분사노즐(23)을 연결하는 유로상에는 초음파 발생장치가 구비된다. 초음파 발생장치는 세척수를 분사하는 분사공(23a)이 세척수 내에 포함된 오염물질에 의해 막히는 것을 방지하기 위한 것으로, 본 실시예에서 초음파 발생장치는 도 3에 도시되어 있는 바와 같이 판형상으로 형성된 진동판(30)을 구비하며, 식기세척기를 이루는 세척수관(21) 내에 설치된다.

따라서, 초음파 발생장치가 동작시켜 진동판(30)에 의해 세척수에 초음파가 전달되게 하면 이에 의해 분사공(23a) 및 세척수관(21)에 쌓인 오염물질이 분리될 뿐만 아니라, 오염물질이 분사공(23a) 및 세척수관(21)에 쌓이는 것을 예방할 수 있게 되는 것이다.

본 실시예에서 초음파 발생장치는 식기세척기를 이루는 세척수관(21) 내에 설치되어 있으나, 세척펌프(15)와 세척수관(21) 사이의 유로를 이루는 토출관(15a) 등에 설치하는 것도 가능하다.

또한, 본 실시예에서 초음파 발생장치는 진동판(30)을 구비하여 진동판(30)을 통해 세척수에 초음파를 전달할 수 있도록 되어 있으나, 이에 한정하지 않고 다양한 형태의 초음파 발생장치가 분사공(23a)이 막히는 것을 방지하기 위해 사용되어질 수 있다.

다음은 이와 같이 구성된 본 발명에 따른 식기세척기의 동작 및 작용효과를 설명한다.

먼저, 식기가 수납된 식기바구니(20)를 세척조(11)에 삽입하면, 식기바구니(20)의 후단측에 마련된 급수부(22)가 토출관(15a)과 연결되어 식기바구니(20)가 세척펌프(15) 측으로부터 세척수를 전달받을 수 있는 상태가 된다.

이러한 상태에서 세척펌프(15)가 구동하면, 세척수는 토출관(15a)을 통해 식기바구니(20)의 세척수관(21)에 전달되고, 계속해서 분사노즐(23)에 마련된 분사공(23a)을 통해 식기바구니(20) 내에 수납되어 있는 식기에 분사되어 식기를 세척한다.

이와 동시에 초음파 발생장치가 동작하여 진동판(30)이 진동하면, 초음파가 발생하여 세척수에 전달된다. 이러한 초음파에 의해 세척수에는 기포가 반복적으로 발생 및 소멸하는 케비테이션(cavitation) 현상이 발생하고, 이에 의해 세탁수에는 대략 1,000 기압 가량의 높은 충격력이 발생되어 이 압력에 의해 분사공(23a) 및 세척수관(21)에 쌓인 오염물질이 분리된다.

또한, 초음파 발생장치에서 발생된 초음파는 분사공(23a)에서 분사된 세척수를 통해 식기에 전달되고, 이에 의해 식기에 쌓인 오염물질이 보다 효율적으로 식기로부터 분리된다.

발명의 효과

이상에서 상세히 설명한 바와 같이, 본 발명에 따른 식기세척기는 세척수를 분사공으로 안내하는 유로 상에 세척수에 초음파를 방사하는 초음파 발생장치를 구 비하여 초음파 발생장치에서 발생된 초음파에 의해 분사공 및 세척수관에 쌓인 오염물질이 분리되게 되므로 장시간 사용에도 분사공이 막히는 것을 방지할 수 있게 되는 작용효과가 있다.

또한, 본 발명에 따른 식기세척기는 초음파 발생장치에서 발생된 초음파가 분사공을 통해 분사된 세척수를 통해 식기에 전달되어 식기에 쌓인 오염물질이 분리되므로 식기가 보다 깨끗하게 세척되게 되는 작용효과가 있다.

(57) 청구의 범위

청구항 1.
외관을 이루는 본체와, 상기 본체 내에 마련되어 식기의 세척이 이루어지는 세척조와, 상기 세척조 내의 세척수를 가압하는 세척펌프와, 상기 세척펌프로부터 공급된 세척수가 식기에 분사되게 하는 분사공과, 상기 세척펌프와 상기 분사공을 연결하는 유로에 구비된 초음파 발생장치를 구비한 것을 특징으로 하는 식기세척기.

청구항 2.
제 1항에 있어서,

상기 세척조에는 식기를 담는 식기바구니가 구비되되,

상기 식기바구니는 세척수가 안내되는 세척수관을 구비하여 상기 세척수관에 상기 분사공이 마련되는 것을 특징으로 하는 식기세척기.

청구항 3.
제 2항에 있어서,

상기 세척수관에는 식기로 소정 압력의 세척수를 분사할 수 있도록 점진적으로 작아지는 단면을 갖는 분사노즐이 마련되어 상기 분사노즐에 의해 상기 분사공이 형성되는 것을 특징으로 하는 식기세척기.

청구항 4.
제 2항에 있어서,

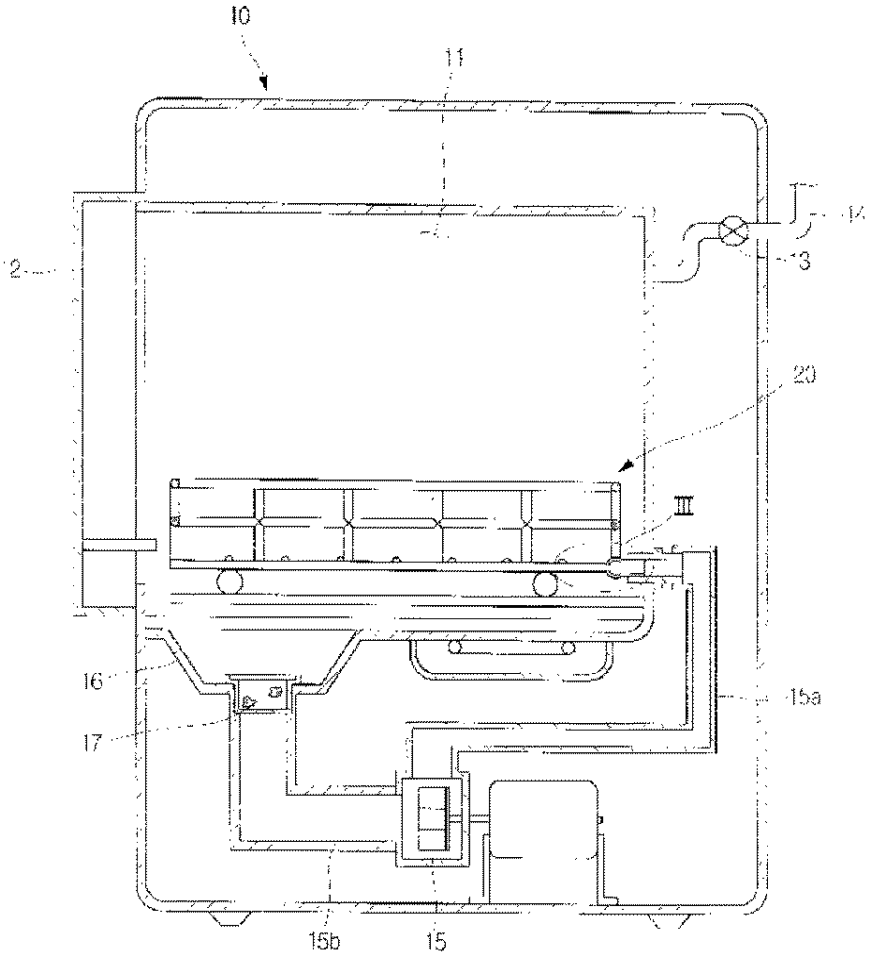
상기 초음파 발생장치는 상기 세척수관에 마련되는 것을 특징으로 하는 식기 세척기.

청구항 5.
제 1항에 있어서,

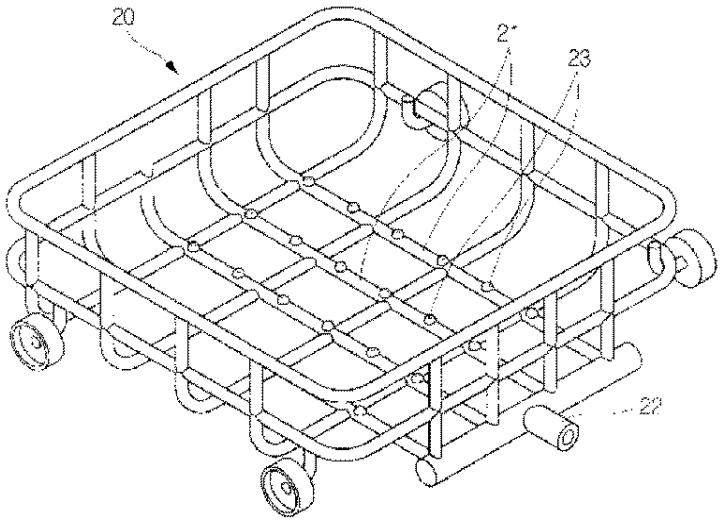
상기 초음파 발생장치는 판형상으로 형성되어 세척수에 초음파를 전달하는 진동판을 구비하는 것을 특징으로 하는 식기세척기.

도면

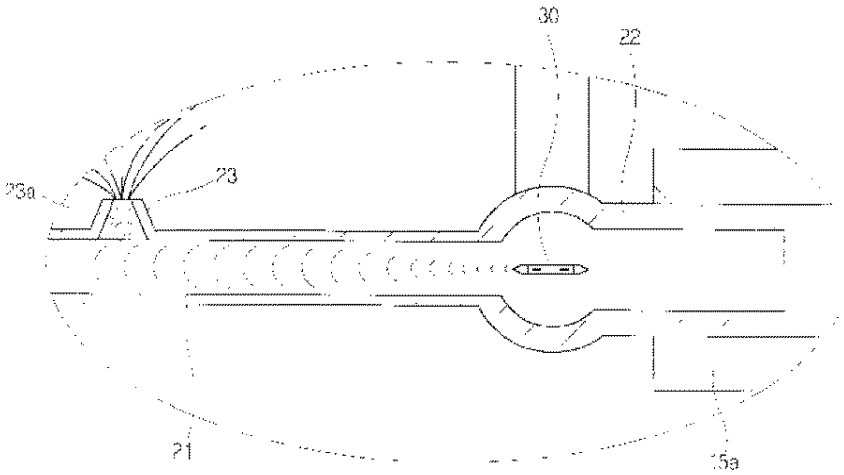
도면1



도면2



도면3



Класс 30а, 5_{01} № 83099

СССР

ОПИСАНИЕ ИЗОБРЕТЕНИЯ

К АВТОРСКОМУ СВИДЕТЕЛЬСТВУ

Г. С. Альтшулер и Р. Б. Шапиро

ПРИБОР ДЛЯ АУСКУЛЬТАЦИИ

Заявлено 24 июня 1949 г. за № 399557 в Гостехнику СССР

Медицинские приборы для аускультации, в которых для передачи звуковых колебаний используется жидкость, известны.

Особенность предлагаемого прибора для аускультации является то, что в нем вся звукопроводящая система заполнена жидкостью, а наконечники снабжены эластичными насадками, имеющими форму наружного слухового прохода у человека.

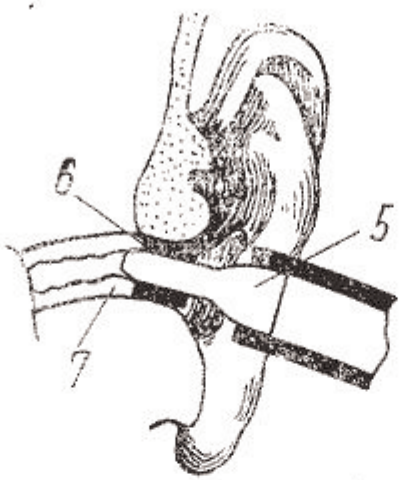
Такое устройство прибора усиливает его звукопроводящие свойства. Звук подводится к барабанной перепонке, без опасности повреждения ее.

Предлагаемый прибор изображен на фиг. 1 и 2. Коническая камера *1* закрыта съемной крышкой *2* с тонкой гибкой диафрагмой *3*. От узкой стороны камеры отходят две резиновые трубки *4*, длиной 30—40 *см*, заканчивающиеся наконечниками *5*. Наконечники вставляются в наружные слуховые проходы и фиксируются в них с помощью эластичных уплотнителей *6*. На наконечники надеты конические резиновые насадки *7*, концы которых доходят до барабанных перепонок. Камера и резиновые трубки прибора заполняются какой-либо жидкостью, например, водой. Боковые стенки камеры выполнены из толстой резины.

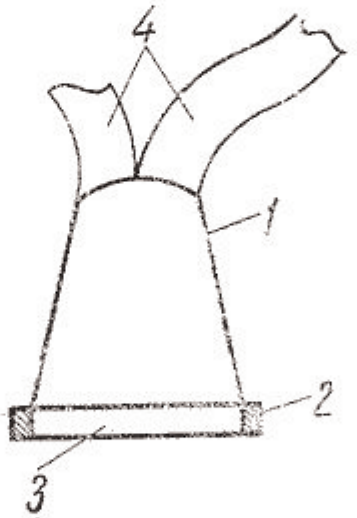
Предмет изобретения

1. Прибор для аускультации, выполненный в известной форме (например, в форме фонендоскопа), отличающийся тем, что вся звукопроводящая система, с целью улучшения звукопроводности прибора, заполнена жидкостью (например, водой).

2. Форма выполнения прибора для аускультации по п. 1, отличающаяся тем, что наконечники прибора, в целях подведения звука к барабанной перепонке, снабжены замыкающими эластичными коническими насадками, повторяющими форму наружного слухового прохода человека.



Фиг 1



Фиг. 2

Комитет по делам изобретений и открытий при Совете Министров СССР

Редактор А. К. Лейкина

Информационно-издательский отдел. Подп. к печ. 27.VII-59 г.
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Класс 12i, 11 № 71289

СССР

ОПИСАНИЕ ИЗОБРЕТЕНИЯ

К АВТОРСКОМУ СВИДЕТЕЛЬСТВУ

Г. С. Альтшулер и Р. Б. Шапиро

СПОСОБ И УСТРОЙСТВО ДЛЯ ПОЛУЧЕНИЯ КИСЛОРОДА ИЗ ВОЗДУХА

Заявлено 3 июня 1947 г. за № 10170/356157

Известно, что при нагревании окиси бария до 500° на воздухе при атмосферном давлении образуется перекись бария, при 800° перекись разлагается на окись бария и кислород. При производстве кислорода по этому способу температура поддерживается постоянной (700°), а поглощение и выделение кислорода достигается изменением давления. Очищенный воздух нагнетается под давлением около 2/3 *атм*, причем кислород поглощается, а азот выделяется через предохранительный клапан. При обратном ходе насосов создается вакуум, перекись бария при этом разлагается и кислород поступает в газгольдеры. Каждая из этих операций продолжается около 7 мин. и в час совершается всего лишь 4 цикла.

Основной недостаток этого способа состоит в малой производительности. Объясняется это тем, что избранная температура (700°) является средней между температурой максимального окисления (500°) и температурой максимального восстановления (800°). Поэтому реакция идут лишь под действием изменяющегося давления.

Предлагается вести процесс окисления при температуре около 500°, а восстановление производить при той же температуре действием катализаторов. При условии выполнения этих требований производительность резко увеличивается, сокращается расход горючего и вся установка становится несложной.

Атмосферный воздух накачивается ручным насосом *1* (см. схему) через декарбонатор *2* в реактор *3*. В декарбонаторе происходит поглощение углекислого газа, содержащегося в воздухе. В качестве декарбонатора может быть использован обычный регенеративный патрон от КИПов. При непрерывной работе установки такого патрона хватит на несколько суток, после чего необходимо произвести перезарядку.

Реактор *3* представляет собой металлический пустотелый цилиндр диаметром 60 *мм* и длиной 120 *мм*. Цилиндр имеет завинчивающуюся крышку *4*, штуцер *5* для прикрепления трехходового крана *6* и сальник *7*.

В реактор вкладывается 800—1200 *г* окиси бария. Через сальник *7* выводится ось вилки *8*, сделанной из химически чистого серебра или железа с нанесенной на него хлористой платиной. К трехходовому крану *6* прикреплены редуктор *9* (например, РК-39) и шланг *10*, идущий к баллону *11*. Последний сделан из 3-миллиметрового железа и имеет объем порядка 20—30 *л*. Баллон *11* имеет редуктор *12*, через который кислород подается на сварку.

При работе реактор нагревается одной-двумя паяльными лампами *15* до 450—550°. При пропускании воздуха над слоем нагретой окиси бария последняя окисляется до перекиси. Давление при этом может колебаться от 1,5 до 3 *атм*, а азот выпускается через редуктор *9* в атмосферу.

Продолжительность процесса окисления не превышает 1—1,2 мин., поскольку окисление идет при наивыгоднейшей температуре и сравнительно большом давлении. Затем закрывается кран *13*, а трехходовой кран *6* переводится на подачу кислорода в баллон *11*. Контактная вилка *8* приводится во вращение часовым механизмом *14* или же от ручного привода. Перемешивание BaO_2 катализатором приводит к энергичному разложению и выделению кислорода по реакции:

$2BaO_2 \rightarrow 2BaO + O_2$. Длительность процесса не превышает 1,5—2 мин.

Возможно применение дополнительного насоса для более интенсивного разложения перекиси бария и увеличения давления в баллоне *11*. Выделившийся кислород собирается в баллоне *11* при давлении 2—4 *атм*. Здесь происходит его охлаждение и через редуктор *12* кислород под заданным постоянным давлением подается на сварку.

Производительность такой установки около 1000 *л/час*. Вес ее не превышает 30—40 *кг*. Расход горючего до 200—300 *г/час*. Установка проста и может быть легко собрана в течение короткого промежутка времени.

Предмет изобретения

1. Способ получения кислорода из воздуха через окись-перекись бария, отличающийся тем, что процесс разложения перекиси бария ведут при температуре около 500° в присутствии серебра (или хлористой платины) в качестве катализаторов.

2. Устройство для выполнения способа по п. 1, состоящее из реактора, соединенного с насосом для подачи воздуха и газгольдером для вмещения выделяемого кислорода, отличающееся тем, что внутри реактора монтирована мешалка из металла-катализатора или несущая на себе слой катализатора.

Класс 49h, 34_{01}
26a, 3_{02}
26a, 10

СССР

№ 85954

ОПИСАНИЕ ИЗОБРЕТЕНИЯ

К АВТОРСКОМУ СВИДЕТЕЛЬСТВУ

Г. С. Альтшулер и Р. Б. Шапиро

АППАРАТ ДЛЯ ГАЗОВОЙ СВАРКИ

Заявлено 16 февраля 1949 г. за № 392091 в Госкомитет СССР

Изобретение относится к области аппаратов для газовой сварки бензоло-кислородным пламенем. Такие аппараты известны.

Изобретением предусматривается аппарат, пригодный для работы в полевых условиях.

Существующие аппараты для бензоло-кислородной сварки, у которых перекись водорода подвергается каталитическому разложению, имеют тот недостаток, что значительное выделение тепла при разложении перекиси водорода вызывает интенсивное парообразование, приводящее к необходимости применения змеевиков-холодильников значительных размеров для охлаждения получаемого кислорода, что в свою очередь ведет к увеличению габаритов аппарата.

Кроме того, применение бензола в качестве горючего при низких температурах окружающего воздуха сопровождается его замерзанием.

С целью устранения указанных недостатков предложен аппарат, в котором охлаждение полученного кислорода производится за счет испарения бензола.

На фиг. 1 показан аппарат для сварки; на фиг. 2 — аппарат в части, касающейся автоматического регулирования давления горючего.

Для заливания перекиси водорода имеется бачок (1). При открытии крана (2) перекись водорода самотеком поступает через редуктор (3) в реактор (4), где и подвергается разложению при соприкосновении с контактной сеткой (5).

При повышении давления в реакторе (4) одновременно повышается давление в бачке (1) и, следовательно, — давление перекиси, поступающей в редуктор (3). При избыточном повышении давления клапан редуктора (3) закрывается.

Бензоловый бак (6) частично или полностью вставлен внутрь реактора (4).

Внутри бензолового бака (6) расположен змеевик (7) для пропускания через него горячего кислорода.

В процессе работы в связи с каталитическим разложением перекиси водорода температура в реакторе поднимается до 200°, горючее, находящееся в баке (бензол, бензин и т. п.), закипает и пары его идут на сварку.

Бензобак снабжен предохранительным клапаном и манометром (8). Кислород может подаваться на сварку также по трубе (9) при открытии крана (10). Краном (10) можно регулировать количество нагретого кислорода, поступающего в змеевики.

Образующийся кислород через холодильник (11) идет на сварку и создает давление в бачке (1) через тройник (12). Вода, остающаяся в реакторе, сливается после окончания работы через кран (13).

Наиболее подходящим материалом для изготовления реактора является алюминий. Объем реактора должен составлять примерно 0,8 объема заливного бачка.

Контактная сетка может быть изготовлена из серебра. Вес ее 0,5—1 г. Вместо серебра в качестве катализатора может быть использована окись железа или двуокись марганца или другие подобные материалы.

Температура и давление горючего могут регулироваться изменением положения бачка с горючим по отношению к реактору (4).

Поддержание нужного давления горючего может быть осуществлено также автоматически.

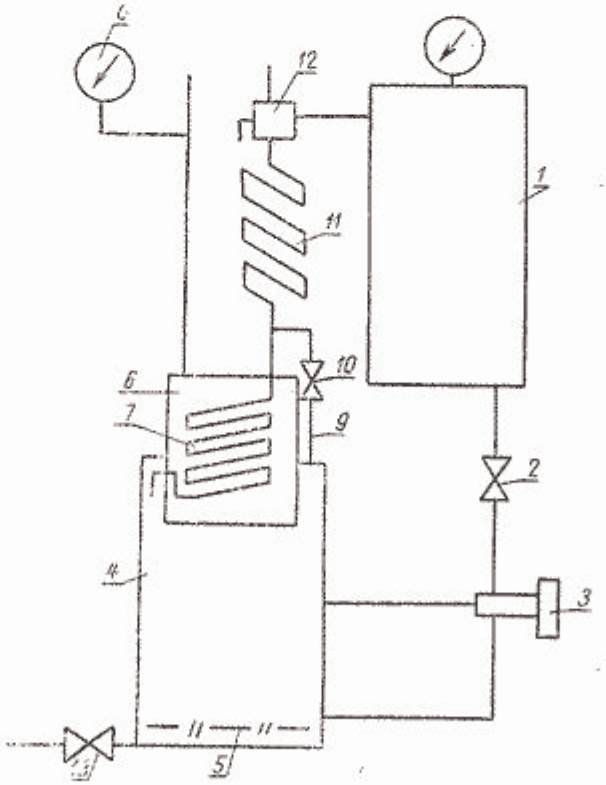
Для этой цели бачок с горючим (14) располагается отдельно от реактора (15). В реактор вмонтирован лишь испаритель (16). Жидкое горючее поступает из бачка в испаритель через редуктор (17). Из испарителя горючее поступает в трубу (18), подающую газ к горелке. Давление горючего передается в бачок (14) через тройник (19).

При избыточном давлении горючего клапан редуктора закрывается и подача горючего в испаритель прекращается. Бачок для перекиси водорода и трубопровод для подачи ее в реактор на фиг. 2 не показаны. Из реактора (15) идет трубопровод (20), соединенный с бачком (21) для конденсации паров воды.

Предмет изобретения

Аппарат для газовой сварки, снабженный реактором для каталитического получения кислорода из перекиси водорода и бензобачком, отличающийся тем, что, с целью охлаждения получающегося кислорода за счет испарения горючего, бензобачок полностью или частично помещают внутри реактора.

Фиг. 1



Класс 21 a^2, 1_{01} № 84460

СССР

ОПИСАНИЕ ИЗОБРЕТЕНИЯ

К АВТОРСКОМУ СВИДЕТЕЛЬСТВУ

Г. С. Альтшулер, Р. Б. Шапиро

УСТРОЙСТВО ДЛЯ ПОВЫШЕНИЯ АКУСТИЧЕСКОЙ ОТДАЧИ ТЕЛЕФОНА

Заявлено 10 марта 1948 г. за № 374611 в Комитет по изобретениям и открытиям при Совете Министров СССР

Предметом изобретения является устройство для повышения акустической отдачи телефона, в котором пространство между барабанной перепонкой уха и диафрагмой телефона заполняется водой, а также применена специально приспособленная для этой цели конструкция телефона.

Известно, что использование телефона связано с рядом последовательных преобразований энергии. В самом телефоне электромагнитная (или электростатическая) энергия преобразуется в механическую энергию колебаний упругой мембраны. Последняя преобразуется в акустическую энергию звуковых колебаний, распространяющихся до барабанной перепонки, где происходит обратное преобразование. Таким образом, полный коэффициент полезного использования энергии, т. е. отношение энергии воспринятых барабанной перепонкой колебаний к затраченной электрической энергии, зависит от коэффициента полезного действия трех указанных преобразований.

Потери, происходящие при преобразовании электроэнергии в механическую энергию колебаний мембраны, весьма невелики. Следовательно, величина коэффициента полезного использования энергии в основном определяется потерями, связанными с наличием воздушного промежутка между мембраной телефона и барабанной перепонкой.

Малая плотность воздуха приводит к тому, что от мембраны крайне трудно получить более или менее значительное количество энергии в форме звука, ибо воздух, прилегающий к мембране, при колебаниях устремляется от нее и сжатия, необходимого для распространения звуковых волн, не происходит. Таким образом, полный коэффициент полезного использования энергии, в конечном счете, определяется акустической жесткостью промежуточной среды.

Для передачи акустических колебаний существенное значение имеет и частота воспринимаемых звуков. При больших амплитудах все колебательные системы и среды становятся нелинейными и начинают давать комбинационные тоны. Звуковые колебания в воздухе имеют в 58 раз большую амплитуду, чем равные по энергии колебания в воде, поэтому вода является значительно более удобной средой для передачи звуковых колебаний большой мощности.

Акустическая жесткость воды в 3500 раз больше акустической жесткости воздуха, поэтому при излучении в воду колеблющаяся мембрана отдает в 3500 раз большую энергию. Таким образом, вода является со всех точек зрения более подходящей средой для передачи акустических колебаний, нежели воздух.

Применение устройства не связано с необходимостью непосредственного заполнения водой ушной полости.

Отличием описываемого устройства от известных является наличие в его корпусе полости, прилегающей к мембране и соединенной с эластичной трубкой, вставляемой в слуховой провод до соприкосновения с барабанной перепонкой. При этом указанная полость и трубка заполняются водой или другой жидкостью.

На чертеже показана конструкция предлагаемого устройства, применительно пьезоэлектрическому телефону, со следующими обозначениями: *1* корпус телефона, *2* пьезокварц, *3* обкладка, *4* полукольцевое уплотнение, *5* антифон, *6* эластичная коническая насадка, *7* барабанная перепонка.

Уплотнение *4* служит для фиксации корпуса телефона в слуховом проходе. Полукольцевая форма уплотнения обеспечивает свободный выход из слухового прохода при вставлении трубки и, благодаря этому, плотное прилегание эластичной насадки *6* к барабанной перепонке.

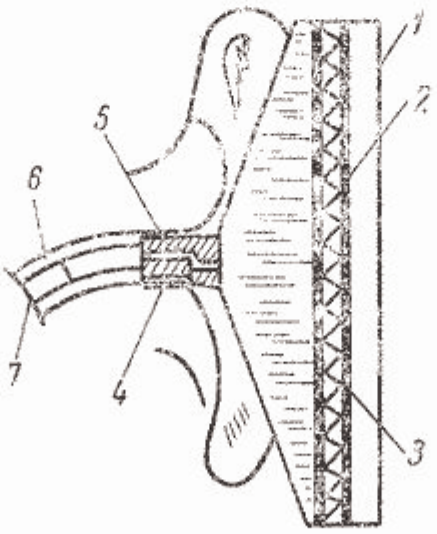
При отключении или разрыве цепи, могут возникнуть резкие акустические удары, небезопасные для барабанной перепонки. Поэтому в корпус вмонтирован антифон *5*, свободно пропускающий звуковые колебания нормальной громкости и препятствующий прохождению акустических ударов.

Вода, или другая жидкость, заполняющая полость телефона в эластичной конической насадке, может подогреваться до температуры человеческого тела специальным электрическим подогревателем.

Предмет изобретения

1. Устройство для повышения акустической отдачи телефона, в котором применяется пьезоэлектрический или электромагнитный телефон, отличающееся наличием в его корпусе полости, прилегающей к мембране и соединенной с эластичной трубкой, вставляемой в слуховой проход до соприкосновения с барабанной перепонкой, при этом указанная полость и трубка заполняются водой или другой жидкостью.

2. Устройство по п. 1, в котором для подогревания жидкости, с целью доведения ее температуры до температуры тела, применяется электроподогреватель.



Комитет по делам изобретений и открытий при Совете Министров СССР

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СССР

ОПИСАНИЕ ИЗОБРЕТЕНИЯ

К АВТОРСКОМУ СВИДЕТЕЛЬСТВУ

Г. А. Альтшуллер и Р. Б. Шапиро

АППАРАТ ДЛЯ ИНДИВИДУАЛЬНОЙ ГАЗОТЕПЛОВОЙ ЗАЩИТЫ

Заявлено 24 июля 1956 г. за № 555265 в Комитет по делам изобретений и открытий при Совете Министров СССР

Изобретение относится к средствам индивидуальной газотепловой защиты, применяемым при ведении горноспасательных работ под землей, при ликвидации подземных пожаров, а также при горячем ремонте различной аппаратуры.

Особенностью предлагаемого газотеплозащитного аппарата является использование в нем для дыхания отработанного в холодильной системе кислорода, благодаря чему устраняется необходимость в специальных респираторах.

На фиг. 1 изображена схема предлагаемого газотеплозащитного аппарата; на фиг. 2— конструкция резервуара жидкого кислорода.

Аппарат состоит из комбинезона *1*, шлема *2*, соединительного кольца *3*, резервуара *4* жидкого кислорода, дыхательного мешка *5* и маски *6*.

Отвод внешнего теплопритока достигается за счет теплопоглощения при газификации жидкого кислорода и при последующем нагревании холодного газообразного кислорода.

Часть испарившегося под небольшим избыточным давлением кислорода из резервуара *4* поступает через дыхательный мешок *5* и гофрированную трубку *7* в маску *6*, а другая часть проходит в инжектор *8*, расположенный по оси сквозного цилиндрического канала *9* резервуара *4*.

Холодный кислород, вытекая из сопла инжектора *8*, засасывает теплый воздух подкостюмного пространства и, смешиваясь с ним, охлаждает его.

Для регулирования интенсивности холодильного действия аппарата служит дроссельная заслонка *11*, управляемая маховичком *12*, с помощью которого можно изменить коэффициент инжекции и тем самым регулировать теплоприток внутрь резервуара.

Для обеспечения нормального газоотвода при любых положениях резервуара, заполняемого кислородом на $^5/_6$ свободного объема, последний имеет четыре газоотводных отверстия *13, 14, 15* и *16*, расположенных по его вершинам. Чтобы предохранить костюм от заливания кислородом через все четыре отверстия, каждое из них снабжено газоотводной трубкой *17*, огибающей резер-

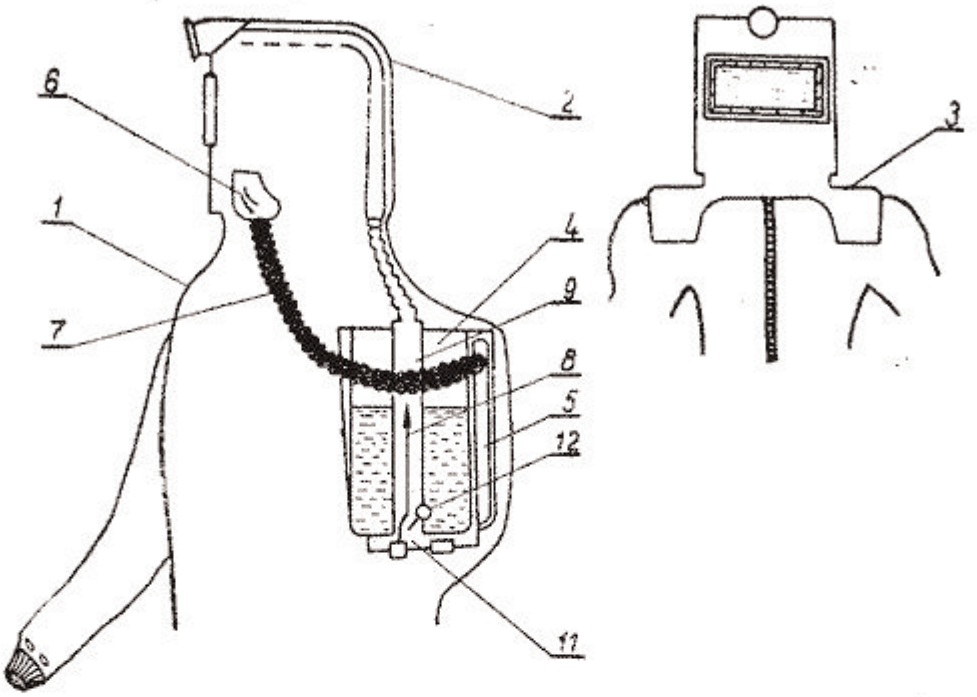
вуар последовательно над всеми отверстиями, благодаря чему жидкость не может пройти по трубке, так как одно из отверстий всегда выше уровня жидкости, а трубка выше отверстия.

Предмет изобретения

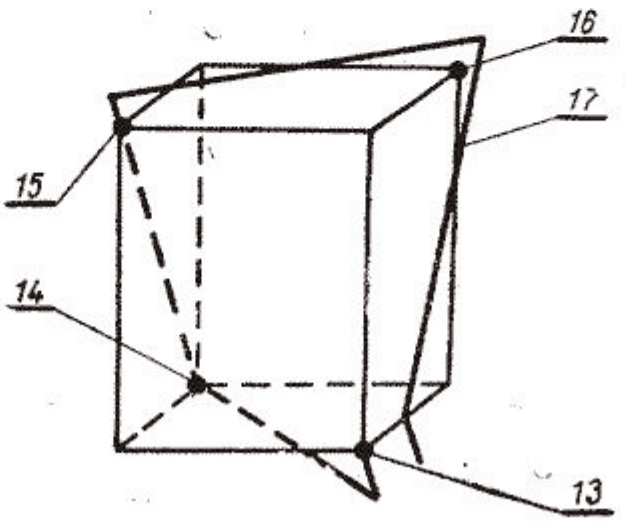
1. Аппарат для индивидуальной газотепловой защиты, состоящий из герметизированного комбинезона, шлема, соединительного кольца, дыхательного мешка, маски и размещенного в подкостюмном пространстве резервуара жидкого кислорода, отличающийся тем, что для устранения необходимости в специальных респираторах, отработанный в холодильной системе газ используется для дыхания.

2. Форма выполнения резервуара для хранения и газификации жидкого кислорода по п. 1, отличающаяся тем, что, с целью обеспечения газоотвода при любых положениях резервуара, дренажные отверстия расположены по его вершинам, а дренажные трубки, выходящие из каждого отверстия, огибают резервуар, проходя последовательно над остальными дренажными отверстиями.

3. Форма выполнения устройства для регулировки интенсивности газификации по п. 1, отличающаяся тем, что резервуар имеет сквозной канал с расположенным внутри него инжектором, изменением коэффициента инжекции которого достигается регулировка теплопритока внутрь резервуара.



Фиг. 1



Фиг. 2

«**TRIZ Practicum. Patent's Examples**»
by Alexander Theodor Narbut
Scientific editors

«**COMCON*TRIZ & FRT Corp**»
Kyiv, Ukraine

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28.06.2012

TRIZ

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Patent's Examples