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Declarations under Rule 4.17:

- as to the identity of the inventor (Rule 4.17(i))
- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))

(54) Title: INDUCTION STOVE

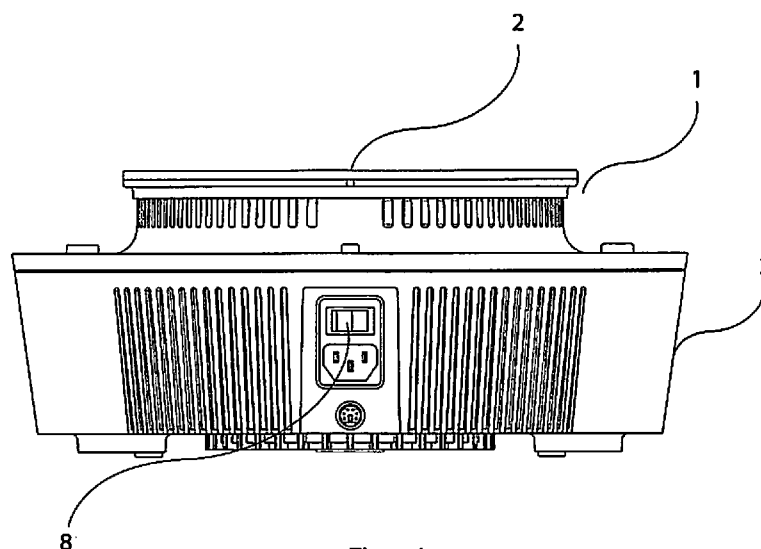


Figure 1

(57) Abstract: The present induction stove is designed to solve the difficulty in cooking with unflatten- bottom cooking vessels especially where the middle of the planar of the cooking vessels is higher than the surrounding area (planar). Precisely, the present induction stove provides a new induction stove structure which has 2 different levels of heating surfaces. This new structure of the present induction stove can induce the heat to an unflatten-bottom cooking vessels effectively.



Published:

- *with international search report (Art. 21(3))*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

Title of Invention

Induction Stove

Technical Field

This invention relates to mechanical engineering, particularly the induction stove.

5 Background Art

Grilled dishes are very popular, especially food cooked and grilled by customers themselves or so called the Bar B Que style. Therefore this type of restaurant usually provides customers with a stove and wire sieves or grill pan. In addition, since this type of restaurant is normally situated indoors with air conditioning so it has to utilize a non-flaming stove such as an electric stove which generates and raises the heat by heating coils that place in the grooves of an insulated tray. This type of electric stove is inexpensive, thus widely used. However non-flammability itself can cause detrimental effects when the hot coils inside the stove are exposed to flammable materials. If the materials are ignited, it may cause smoke. Flame could also be spread to other materials such as papers or cloth mats.

15 The special feature of an induction stove is to conduct heat to certain kinds of cooking vessels only, e.g. cooking vessels made of steel or made of some kinds of stainless steel. Therefore, if a cooking vessel does not have an electro-magnetic property, it will not be heated on the induction stove. For example, cooking vessels made of aluminum, glass or ceramic. Unlike an ordinary stove, the induction stove conducts heat directly at the bottom of a suitable cooking vessel without passing the heat through other medium. It is therefore appropriate to use in an indoor restaurant.

25 However, induction stoves that are widely used in the market nowadays have a flat cooktop and, therefore, fit to flat-bottom cooking vessels only. If the bottom of a cooking vessel or pan is not flat or level, e.g. certain parts of the bottom of the cooking vessels do not touch the cooktop, the process of electro-magnetic induction that creates the heat will not function. As a consequence, the induction stove which normally has a flat cooktop cannot be used with an uneven or unlevelled bottom cooking vessels or with a cooking vessel which combines different methods of cooking in one vessel such as a cooking vessel that has a part for grilling meats and a

part for boiling/heating soup. Therefore, there is need to make an induction stove which can create different levels of heat, one having an area for grilling meats and another having an area for heating soup. To be capable of grilling meats and heating soup at the same time, the stove may also need to have different levels of cooktop. Therefore, induction stoves which are available in the market cannot be used for this purpose.

According to the Chinese utility model no.CN 20366139, title of the invention being double-leading-wire and double-ring coil panel, it explains the drawbacks of widely-used normal induction stoves, which contain only single lead wire. When induced, heat will be spread throughout the cooktop where the lead wire expands. Even though only small amount of heat is needed for relatively small cooking vessels, the induction stove still spreads out heat over the whole area, thereby wasting energy. On the other hand, if the area of the lead wire induction is small, it will induce the heat to small area only. Therefore, it will be time consuming to generate preferable heat for large cooking vessels. This utility model invention is aiming to resolve the earlier problems; mainly the waste of energy and time used for cooking, by providing an adjustable heating area in accordance with one's preferences. This is done by having twin-lead and double-ring coils on the same planar and connecting them with a controllable electrical circuit. When a small area of induction is needed, one can turn the switch to a selected inner circuit which will induct heat to the inner ring coil. When a larger area of induction is needed, one can turn the switch to both inner and outer circuits which will induct heat to both ring coils. It is obvious that this utility model invention is suitable for a flat-bottom cooking vessel but not suitable for an unflatten-bottom cooking vessel.

The US patent no. US 8695488 issued on 15 April 2014 also states the problems of traditional induction stoves that are widely sold in the market, either having one or more heating surfaces in a plate. The problems are that the food can be heated by one surface at a time only and that these types of stoves generate heat by heat conduction or heat radiation of the electric tube. Therefore, the pans or heating plates have lower heating effect, lower power effect and long pre-heating time. This is because the contacting heating conduction, the pans or the heating plates of traditional cookers are easy to be distorted causing lower heating speed and the food is cooked un-uniformity. Therefore, this invention solve these problems by providing multi-function induction cooker to obviate the above disadvantages by designing structure and electric circuits to create the following effects; the food can be heated both from the top and from the

bottom and pans can be heated on both the two surfaces at the same time. The heating system comprises three magnet coils: wherein the first coil is disposed in a body, the second and third coil are disposed in the other body in order to generate heat through both bodies at the same time with the use of switch that selectively connects one of the second or third coil to the first coil. On
5 the second connecting status, three magnet coils are connected in series. Additionally, this multi-function induction cooker is invented to be foldable (folding heating surface). Therefore, food can be heated from the top and the bottom, spreading heat to both side of the food equally, reducing time and energy for cooking. Moreover, users can switch off the power to the second coil in case they want to lower the degree of heat in a particular body of the induction cooker.
10 Yet this invention (the multi-function induction cooker) is still not compatible with unflatten-bottom cooking vessels.

Summary of Invention

The present induction stove is invented to solve the aforementioned problems of unflatten-bottom cooking vessels especially the type of cooking vessels whereby the middle of
15 the cooking vessels is higher than the rest of it. This present induction stove is designed to be an induction stove which has a new structure of cooktops that consists of two heating surfaces laying at a different level, ensuring that the heat be induced to the unflatten-bottom cooking vessels thoroughly.

The object of the present induction stove is to provide an induction stove which has a
20 lower body suitable for installing a printed circuit board and ventilator, and has an upper body designed to cover the said lower body and the said upper body has 2 different level heating surfaces in the manner of coaxial.

Another object of the present induction stove is to provide a heat adjustable induction stove whose lower body has space for installing a printed circuit board which is used to regulate
25 electrical current to the upper induction wire for generating heat on the surface. This mechanism can generate twice more heat to the upper surface than to the lower surface.

Disclosure of Invention

Figure 1 illustrates the induction stove of the present invention comprising the upper body (2) and the lower body (3). The upper body (2) is the cooktops, having 2 different level surfaces, covering the lower body (3) which is the housing of the stove. The lower body (3) has space for installing a printed circuit board and a ventilator (6). Around the outer of the lower body (3), there is a control panel (8) for controlling the operation of and the temperature of the surface of the present induction stove.

Figure 2 illustrates the upper body (2) of the induction stove of the present invention, where the cooktops have 2 different level surfaces, consisting of the upper surface (21) and the lower surface (22) whereby the upper surface (21) is higher than the lower surface (22) which is expanded around the upper body (2) and the rim of the expanded part is folded downwardly to cover the upper rim of the lower body (3) thereby assembling to be the induction stove (1). The said upper surface (21) is kept distance from said lower surface (22) in the manner of coaxial whereby its inner wall stands up-right and performs as a connecting part between the upper surface (21) and the lower surface (22). On the said inner wall, there are some through-vertical vents (32) in equidistance for ventilating thermal heat generated from the induction coils.

Figure 3 is a bottom view of the upper body (2) showing the central area of the said upper body (2) which has a ring-like edge (23) extending down vertically to support the upper cooktop (21) and to separate the inner induction coil (5) from the outer induction coil (51). The inner area from the ring-like edge (23) is equipped with the number of rectangular-shape bars (25) extending along the radius from the center of the upper body (2) to the ring-like edge (23). The rectangular-shape bars have a hole in a rectangular shape in order to support the rectangular-shape magnet. The outer area of the ring-like edge (23) is equipped with the outer induction wire coil (51) and having some bars (24) extending along the radius from the outer side of the ring-like edge (23) to the edge of the flank of the upper body (2) in order to support the rectangular-shape magnet. Both of the induction coils (5, 51) will electrically connect to the printed circuit board (7) (as illustrate in figure 4), which will generate the magnetic field for the upper body (2).

Figure 4 illustrates the lower body (3) which is in the shape of cylindrical housing which has a slightly tilted side wall (31). At the bottom area inside of said housing is equipped with a

printed circuit board (7) and a ventilator (6). The said printed circuit board (7) is electrically connected with the inner and the outer induction coils (5, 51) which are installed under the upper body (2) to generate the electro-magnetic field. The printed circuit board (7) has two controlling parts, namely one circuit board controls the electric supply to the inner induction coil (5) while
5 the other circuit board controls the electric supply to the outer induction coil (51) through a control panel (8) which is installed outside the wall of the lower body (31). On the wall of the lower body (31) there are vertical vents (33) for ventilating heat inside the lower body.

According to this invention, as illustrated in the figure 1, the control panel (8) acts as a switch which is connected to the printed circuit board (7). This switch is an electrically
10 adjustable type which can generate heat for the induction coils at 3 levels as follows: The first level, using power supply 900 watts, induces the upper coil up to 140 °C and the lower coil up to 75 °C. The second level, using power supply 1200 watts, induces the upper coil up to 170 °C and the lower coil up to 85 °C. The third level, using power supply 1500 watts, induces the upper coil up to 200 °C and the lower coil up to 95 °C.

15 **Brief Description of drawing**

Figure 1 is a side view of the present induction stove.

Figure 2 is a perspective view illustrating the upper body of the present induction stove.

Figure 3 is a bottom view of the lower body illustrating the magnetic induction part of the present invention.

20 Figure 4 illustrates the inside of the lower body of the present induction stove.

Best Mode for Carrying out the Invention

As described in the disclosure of the invention section.

Claims

1. The induction stove comprising

- The upper body performing as a lid covering the lower body assembling each other to be the induction stove

5 - The lower body performing as a housing containing space for installing the printed circuit board and the ventilator

Characterized in that

- The upper body is a cooktop, shape like a lid, having 2 different levels performing as surfaces of the induction stove, consisting of the upper surface (21) and the lower surface (22) whereby the upper surface (21) is higher than the lower surface (22) which is (22) expanded around the upper body (2) and the rim of the expanded part is folded downwardly to cover the upper rim of the lower body (3) thereby assembling the two parts together as the induction stove (1). The said upper surface (21) is kept distance from said lower surface (22) in the manner of coaxial whereby its inner wall stands up-right and performs as a connecting part between the upper surface (21) and the lower surface (22). The central area of said upper body (2) has a ring-like edge (23) extending down vertically to support the upper cooktop (21) and to separate the inner induction coil (5) and the outer induction coil (51), where the inner area of the ring-like edge (23) is equipped with the number of rectangular-shape bars (25) extending along the radius from the center of the upper body (2) to the ring-like edge (23) where the bars (25) have a hole in a rectangular shape in order to support the rectangular-shape magnet and the outer area of the ring-like edge (23) is equipped with outer induction wire coil (51) and equipped with a number of bars (24) extending along the radius from the outer side of the ring-like edge (23) to the edge of the flank of the upper body (2) in order to support the rectangular-shape magnet. Both of the induction coils (5, 51) electrically connect with the printed circuit board (7) which will generate the magnetic field for the upper body (2) for heating.

- The lower body (3) is a housing in a cylindrical shape which has an slightly tilted outside wall (31). At the bottom area inside of the said housing is installed with a printed circuit board (7) and a ventilator (6), whereby the said printed circuit board (7) will electrically connect to the inner and outer induction coils (5, 51) which are installed under the upper body (2) to generate the electro-magnetic field.

2. The induction stove, according to Claim 1, which contains the printed circuit board (7) which in turn has two controlling parts, namely one circuit board controls the electric supply to the inner induction coil (5) while the other circuit board controls the electric supply to the outer induction coil (51) through a control panel (8) which is installed outside the wall of the lower
5 body (31).

3. The induction stove, according to Claim 1 or 2, wherein the said side wall of the upper body (2) has a number of through-vertical vents (32) in equidistance for ventilating heat occurred from the induction coil.

4. The induction stove, according to Claim 1 or 2 or 3, wherein the said lower body (3)
10 has through vents for ventilating heat occurred inside of the induction stove.

5. The induction stove, according to any one of Claim 1 - 4 , comprising additionally of a controlling panel (8) that connects to the printed circuit board (7) which is a switch capable of adjusting the level of electrics in order to adjust the heat of the induction coils to 3 levels :

- The first level using power supply 900 watts, inducing the upper coil up to 140 °C and
15 the lower coil up to 75 °C.

- The second level using power supply 1200 watts, inducing the upper coil up to 170 °C and the lower coil up to 85 °C.

- The third level using power supply 1500 watts, inducing the upper coil up to 200 °C and the lower coil up to 95 °C.

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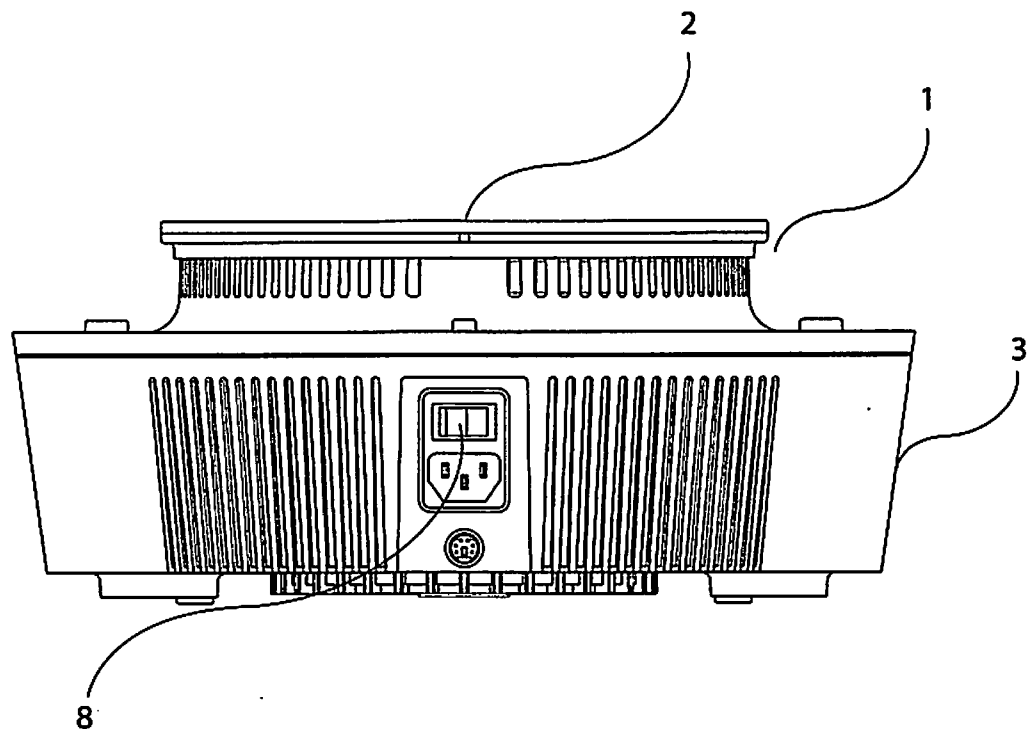


Figure 1

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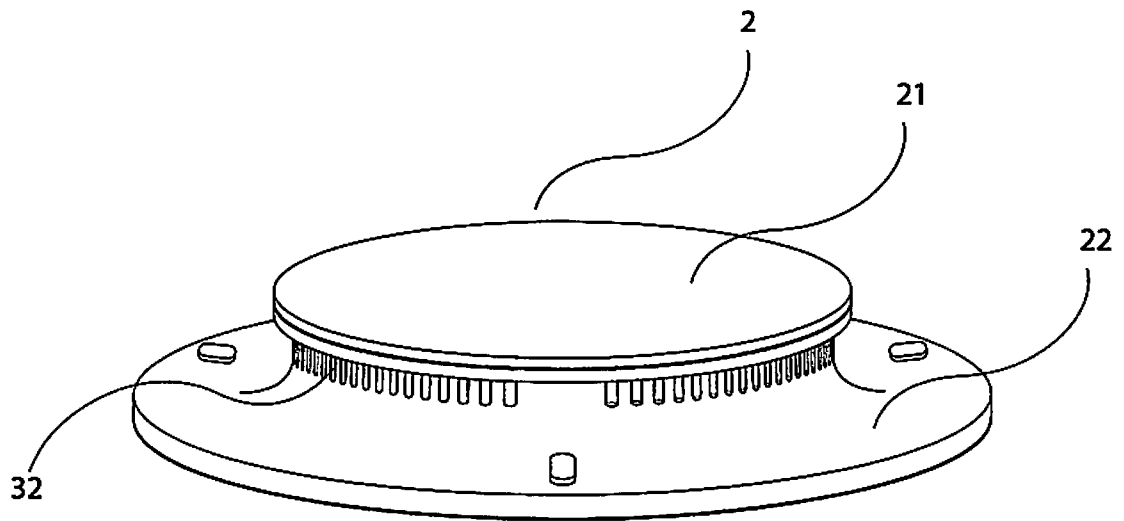


Figure 2

3/4

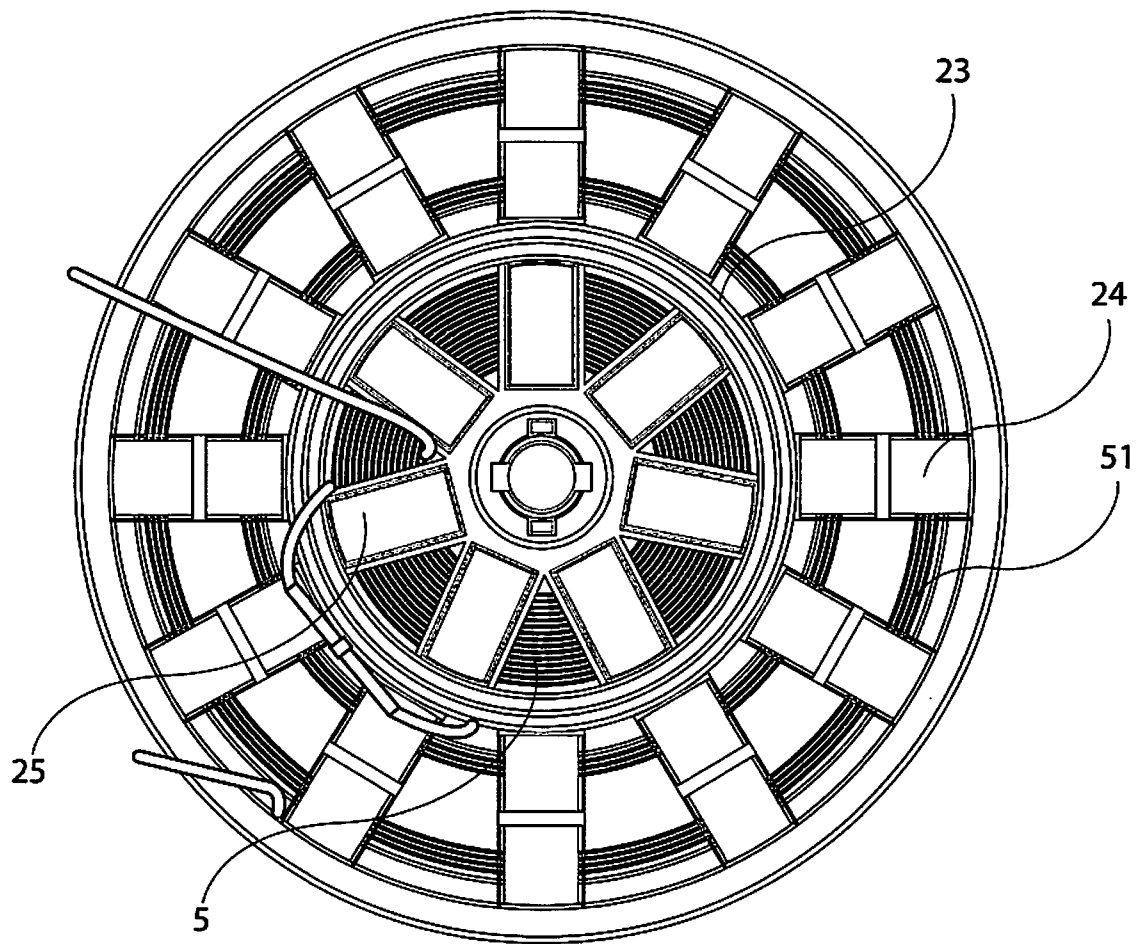


Figure 3

4/4

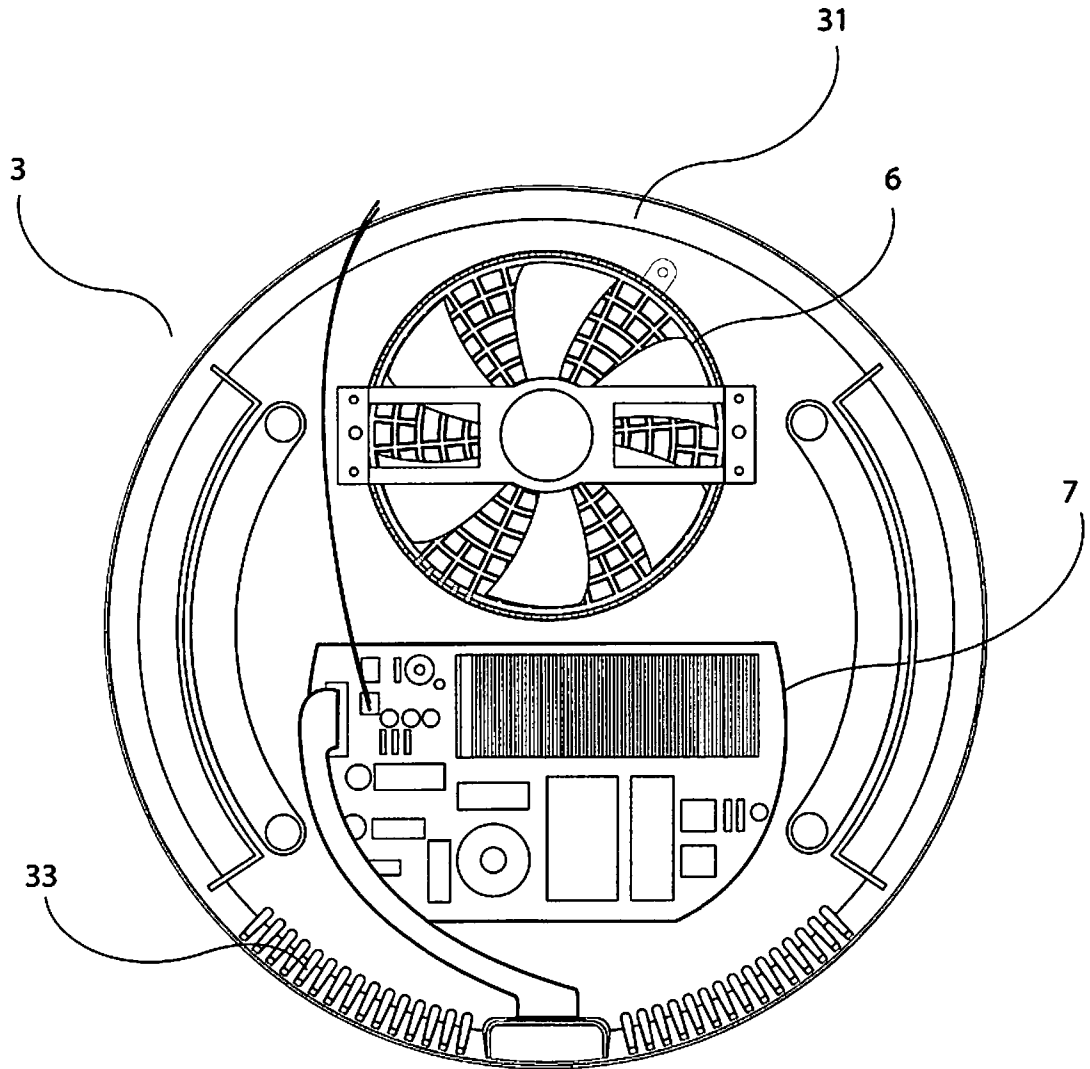


Figure 4

INTERNATIONAL SEARCH REPORT

International application No.

PCT/TH 17/00039

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - H05B 6/10, 6/12, 6/38 (2017.01)

CPC - H05B 6/02, 6/062, 6/10, 6/12, 6/1209, 6/1245, 6/1272, 6/36, 6/38, 2206/022; A47J 27/004; Y02B 40/12, 40/126; Y10S 99/14; H01F 5/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

See Search History Document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

See Search History Document

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

See Search History Document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2010/0219179 A1 (LIN) 02 September 2010 (02.09.2010), entire reference especially Fig. 3-5; para [0005], [0022], [0024]-[0025]	1-3
A	US 2013/0240505 A1 (MOON et al.) 19 September 2013 (19.09.2013), entire reference, especially Fig. 1A, 5-6; Abstract; para [0006], [0076]-[0078], [0098]	1-3
A	US 5,821,507 A (SASAKI et al.) 13 October 1998 (13.10.1998), especially Fig. 11; Abstract; col 8, ln 64-col 9, ln 19; col 9, ln 35-48	1-3
A	WO 2015/196240 A1 (BREVILLE PTY LIMITED) 30 December 2015 (30.12.2015), entire reference, especially Fig. 17; Abstract; page 18, ln 7-13	1-3
A	WO 2016/029959 A1 (ARCELIK ANONIM SIRKETI) 03 March 2016 (03.03.2016), especially Abstract and para [0013]	1-3

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

25 September 2017

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/TH 17/00039

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☒ Claims Nos.: 4-5
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.