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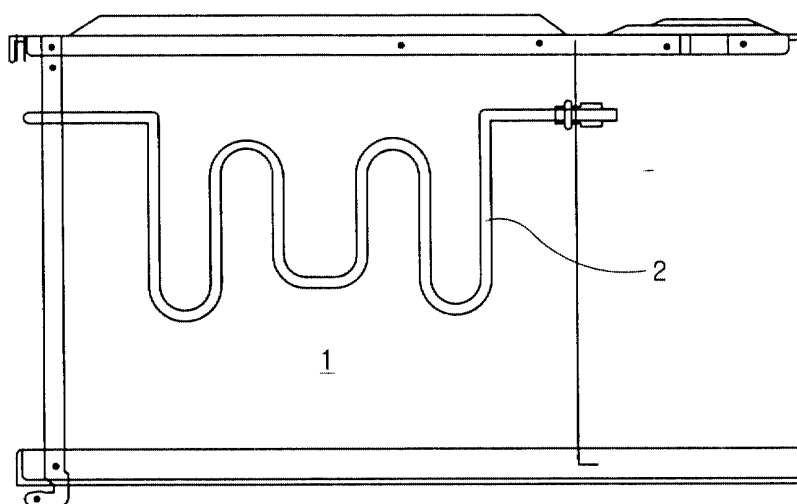
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(54) **Heating device for microwave ovens**

(57) Disclosed herewith is a heating device for microwave ovens, which generates heat by a heater and deflects improperly directed heat by heat reflecting means. The heating device comprises a heater for generating heat to cook food. The heater is mounted in the

cavity of the microwave oven. Heat reflecting means is fixedly mounted to the heater while being upwardly spaced apart from the heater, and serves to reflect heat radiated by the heater to the food. Clamping supports are provided to fixedly mount the heat reflecting means to the heater.

Fig 1



Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates generally to microwave ovens, and more particularly to a heating device for microwave ovens, which generates heat by a heater and deflects improperly directed heat by heat reflecting means.

Description of the Prior Art

[0002] A general microwave oven cooks food by heating the food positioned in its cavity using microwaves generated by the oscillations of its magnetron. Recently, there has been proposed a composite heating type microwave oven in which a heater is provided in addition to a magnetron and the heater heats food together with microwaves generated by a magnetron. The heater heats food in a radiant fashion differently from the microwaves generated by the magnetron, so that it is possible to heat food to a high temperature.

[0003] However, in the composite heating type microwave oven, the heater is generally fixed at a specific position in the cavity of the microwave oven, such as the upper or lower portion of the cavity, so that the heater is operated at a specific position regardless of the quantity or volume of the food. Accordingly, the heater is not utilized optimally and the food is not cooked sufficiently and uniformly.

[0004] In order to overcome the shortcomings of the stationary heater type microwave oven, a moving heater type microwave oven has been proposed. In the moving heater type microwave oven, its moving heater is rotated within a certain rotation angle according to the quantity or volume of food, so that the heater is caused to generate heat near food. Accordingly, the microwave oven is provided with the moving heater, so that the heater is capable of approaching the food and applying uniform heat to the food. As a result, the food is cooked sufficiently and uniformly. Since the construction and operation of the moving heater type microwave oven are well known, the detailed description of those is omitted herein.

[0005] However, in the conventional moving heater type microwave oven, the following shortcomings occur and are described with reference to the accompanying drawings. Fig. 1 is a horizontal cross section of the conventional moving heater type microwave oven showing the moving heater. Fig. 2 is a vertical cross section of the conventional moving heater type microwave oven showing the moving heater.

[0006] With reference to the drawings, the main body of the conventional moving heater type microwave oven is provided with a cavity 1 in which food to be cooked is situated and cooked. A moving heater 2 that is capable

of being rotated is mounted on the surrounding wall of the cavity 1.

[0007] In the moving heater type microwave oven, when a user applies power to the microwave oven, its magnetron (not shown) is oscillated and simultaneously the moving heater 2 is operated. Consequently, the moving heater 2 radiates heat in all directions. In particular, the moving heater 2 radiates a relatively large amount of heat toward the top of the cavity 1 and a tray 3 positioned on the bottom of the cavity 1.

[0008] Meanwhile, the moving heater 2, as described above, is a heat radiation type heating source that directly applies heat to food, differently from the magnetron. For this reason, when sufficient heat does not reach food, the food is not cooked sufficiently.

[0009] Since the top of the cavity 1 has low reflectivity and the distance between the top and bottom of the cavity 1 is too great for reflected heat to reach, all the heat radiated to the top of the cavity 1 cannot reach the tray 3 that supports food and is positioned on the bottom of the cavity 1. Accordingly, in the conventional moving heater type microwave oven, heating through reflection does not play a great role in heating food.

[0010] There has been further proposed a conventional art in which a reflecting plate is mounted on the top of the cavity of a microwave oven so as to prevent the discoloration and deformation of the top of the cavity by the radiated heat of a moving heater and reflect heat radiated by the moving heater to food on the tray of the microwave oven.

[0011] In this conventional art, the reflecting plate does not perform the function of heat reflection sufficiently because the distance between the reflecting plate and the tray mounted on the bottom of the cavity is too great and heat is not reflected sufficiently by the reflecting plate due to the tilt of the moving heater by the rotation of the moving heater.

[0012] As a result, the amount of heat transmitted to the food on the tray is small in comparison with the amount of heat radiated by the heater, so that the heater is not utilized efficiently.

[0013] In brief, in the conventional microwave oven, the cooking period of time is lengthened and the power consumption is increased, due to the inefficiency of the conventional heating device.

SUMMARY OF THE INVENTION

[0014] Accordingly, the present invention has been made keeping in mind the above problems occurring in the prior art, and an object of the present invention is to provide a heating device for microwave ovens, which is capable of optimally utilizing heat generated by its heater.

[0015] Another object of the present invention is to provide a heating device for microwave ovens, which is capable of reducing power consumption.

[0016] In order to accomplish the above object, the

present invention provides a heating device for microwave oven, comprising: a heater for generating heat to cook food, the heater being mounted in the cavity of the microwave oven; heat reflecting means for reflecting heat radiated by the heater to the food, the heat reflecting means being fixedly mounted to the heater while being upwardly spaced apart from the heater; and clamping supports for fixedly mounting the heat reflecting means to the heater.

[0017] In accordance with a feature of the present invention, the heat reflecting means is a reflecting plate made of metallic material having superior thermal reflectivity.

[0018] In accordance with a feature of the present invention, a heat collecting surface is formed on the peripheral portion of the reflecting plate to concentrate heat radiated by the heater on the food that is positioned on the tray of the microwave oven.

[0019] In accordance with a feature of the present invention, each of the clamping supports is provided with an engagement hole for securing the upper portion of the clamping support to the heater and a ring portion for tightly accommodating a portion of the heater in the clamping support.

[0020] In accordance with a feature of the present invention, the clamping supports are made of nonmetallic material having thermal resistance.

[0021] In accordance with a feature of the present invention, the heater is a moving heater that is rotatably mounted in the cavity.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a horizontal cross section of the conventional moving heater type microwave oven showing the moving heater;

Fig. 2 is a vertical cross section of the conventional moving heater type microwave oven showing the moving heater;

Fig. 3 is a horizontal cross section showing a heating device in accordance with a preferred embodiment of the present invention; and

Fig. 4 is a vertical cross section showing the heating device of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0023] Reference now should be made to the drawings, in which the same reference numerals are used throughout the different drawings to designate the same or similar components.

[0024] Fig. 3 is a horizontal cross section showing a heating device in accordance with a preferred embodiment of the present invention. Fig. 4 is a vertical cross section showing the heating device of the present invention.

[0025] As shown in the drawings, the main body of a moving heater type microwave oven is provided with a cavity 11 in which food to be cooked is situated and cooked. A tray 12 for supporting food is mounted on the bottom of the cavity 11 to be rotated during the operation of the microwave oven. Although not depicted in the drawings, a magnetron for generating microwaves is mounted on the surrounding wall of the cavity 11.

[0026] A moving heater 13 is rotatably disposed in the cavity 11 to radiate heat for the cooking of food. The moving heater 13 is formed by bending a rod-shaped heating element a plurality of times in a single plane. The moving heater 13 is fixed to the surrounding wall of the cavity 11 by means of a hinge 13a to be rotated around the hinge 13a.

[0027] Referring to Fig. 4, a reflecting plate 14 is fixedly mounted to the moving heater 13 to reflect toward the tray 12 heat radiated by the moving heater 13. A heat collecting surface 14a is formed along the peripheral portion of the reflecting plate 14 to concentrate heat that is not reflected toward the tray 12 but is undesirably dissipated in other directions, onto the tray 12.

[0028] The construction and material of the reflecting plate 14 must be designed to fulfill the above-described function. That is, the reflecting plate 14 is sized to cover the moving heater 13 and is made of a metallic material having superior thermal reflectivity. Otherwise, the surface of the reflecting plate 14 facing the moving heater 13 is preferably surface-treated with metallic material having superior thermal reflectivity. If the reflecting plate 14 is mounted near the moving heater 13, a distance through which the heat reflected by the reflecting plate 14 must travel to reach food on the tray 12 can be shortened, thereby improving the efficiency of heat transfer by the reflection of the reflecting plate 14. The heat collecting surface 14a is preferably formed by bending the peripheral portion of the reflecting plate 14 while being integrated with the reflecting plate 14.

[0029] The reflecting plate 14 is fixedly mounted to the moving heater 13 by means of clamping supports 15, with the portions of the reflecting plate 14 secured to the clamping supports 15 by means of screws and the portions of the moving heater 13 secured to the clamping supports 15 by tight fitting of the moving heater 13 into the ring portions of the clamping supports 15. Accordingly, when the moving heater 13 is rotated around the hinge 13a, the reflecting plate 14 is rotated together with the moving heater 13.

[0030] The clamping supports 15 are preferably made of ceramic. This is because the moving heater 13 and the reflecting plate 14 are heated to high temperatures and accordingly sparks occur to cause a fire in case that the moving heater 13 and the reflecting plate 14 are

made of metal and are connected through a metallic clamping supports.

[0031] The operation of the heating device of the present invention is described in detail.

[0032] When a user applies electric power to the microwave oven while food is positioned on the tray 12, the magnetron is oscillated and at the same time the moving heater 13 is operated to radiate heat. At this time, the heat radiated by the moving heater 13 travels in all directions. In detail, a relatively large amount of heat is radiated in a direction toward the tray 12 and a direction away from the tray 12.

[0033] The heat radiated in the direction toward the tray 12 heats the food positioned on the tray 12, and the heat radiated in the direction away from the tray 12 is intercepted by the reflecting plate 14, is reflected by the reflecting plate 14 toward the tray 12 and heats the food positioned on the tray 12.

[0034] Additionally, the remaining heat, except for the heat directly radiated toward the tray 12 and reflected by the reflecting plate 14 to the tray 12, comes into contact with the heat collecting surface 14a and is reflected by the heat collecting surface 14a toward the tray 12.

[0035] As a result, since most of the heat is directly oriented or reflected toward the tray 12, most of the heat is concentrated on the tray 12 to cook the food on the tray 12. Accordingly, the efficiency of the moving heater 13 can be improved and the cooking period of time can be shortened considerably.

[0036] In the meantime, the reflecting plate 14 is upwardly spaced apart from the moving heater 13 by the clamping supports 15 of ceramic, so that the occurrence of sparks between the moving heater 13 and the reflecting plate 14 can be prevented, thereby eliminating the danger of fire in the microwave oven.

[0037] As described above, the present invention is chiefly characterized in that the reflecting plate 14 is mounted to the moving heater 13 so that heat radiated by the moving heater 13 can be concentrated on food positioned on the tray 12.

[0038] Although there is described the embodiment in which the moving heater 13 is rotatably mounted in the cavity 11 and the reflecting plate 14 is mounted to the moving heater 13, an embodiment in which a stationary heater is fixedly mounted in a cavity and a reflecting plate is mounted to the stationary heater can pertain to the present invention.

[0039] Additionally, although the reflecting plate 14 is described as an example of heat reflecting means in the embodiment, the heat reflecting means is not limited to the reflecting plate 14.

[0040] Further, since the function of the heat reflecting means is to direct heat radiated by the heater to the tray 12 as completely as possible, the construction of the heat reflecting means is desirably designed according to a rotation angle within which the moving heater 13 can be rotated. For example, when the rotation angle is relatively large, heat reflected by the reflecting plate 14

may be reflected away from the tray 12. In this case, if the reflecting plate 14 is formed to have a curved surface, the heat reflected by the reflecting plate 14 can be concentrated on the tray 12 notwithstanding the rotation angle of the moving heater 12 being relatively large.

[0041] In the above embodiment, although the clamping supports 15 are described to be made of ceramic, any nonmetallic material having thermal resistance can be used as the material of the clamping supports 15. Otherwise, it is possible that the clamping supports may be made of metal and the portions of the moving heater 13 and the reflecting plate 14 in contact with the clamping supports may be coated with ceramic.

[0042] As described above, the present invention provides a heating device for microwave oven, which is capable of concentrating most of heat radiated by a heater on food positioned on a tray and utilizing the heat to cook the food, thereby improving the efficiency of the microwave oven.

[0043] Additionally, in the heating device, since heat reflecting means is mounted not on the top of its cavity but to the heater, the distance between the reflecting means and the tray can be shortened, thereby maximizing the effect of heat reflection. In the case of a moving heater, since the heat reflecting means can be rotated together with the moving heater, the heat reflecting means can provide an optimal effect of heat reflection regardless of the rotation of the moving heater, thereby maximizing the effect of heat reflection.

[0044] As a result, the heating device for microwave ovens according to the present invention can concentrate most of the heat radiated by the heater on the food, so that the cooking period of time can be considerably shortened and the power consumption can be considerably reduced to save the cost of electricity.

[0045] Although the preferred embodiments of the present invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

Claims

1. A heating device for microwave ovens, comprising:
 - a heater for generating heat to cook food, said heater being mounted in the cavity of the microwave oven;
 - heat reflecting means for reflecting heat radiated by the heater to the food, said heat reflecting means being fixedly mounted to the heater while being upwardly spaced apart from the heater; and
 - clamping supports for fixedly mounting the heat reflecting means to the heater.

2. The device according to claim 1, wherein said heat reflecting means is a reflecting plate made of metallic material having superior thermal reflectivity.
3. The device according to claim 2, wherein a heat collecting surface is formed on the peripheral portion of said reflecting plate to concentrate heat radiated by the heater on the food that is positioned on the tray of the microwave oven.
4. The device according to claim 1, wherein each of said clamping supports is provided with an engagement hole for securing the upper portion of the clamping support to the heater and a ring portion for tightly accommodating a portion of the heater in the clamping support.
5. The device according to any of claims 1 to 4, wherein said clamping supports are made of nonmetallic material having thermal resistance.
6. The device according to claims 5, wherein said heater is a moving heater that is rotatably mounted in the cavity.

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Fig 1

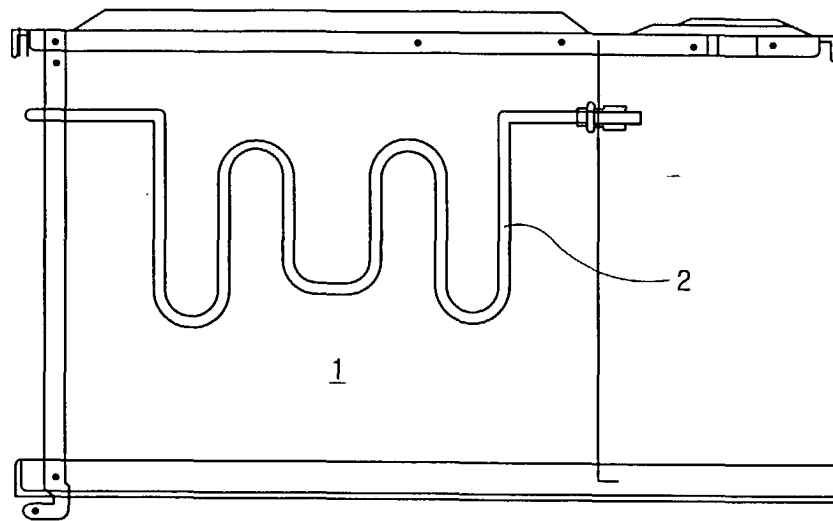


Fig 2

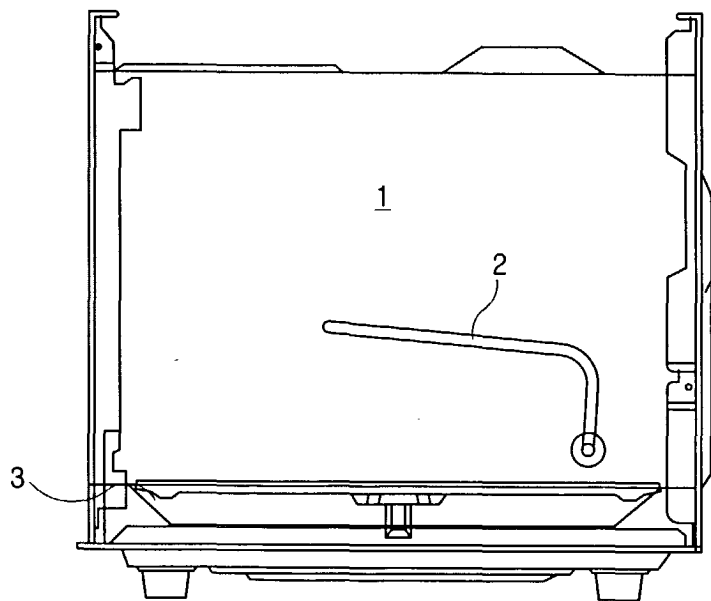


Fig 3

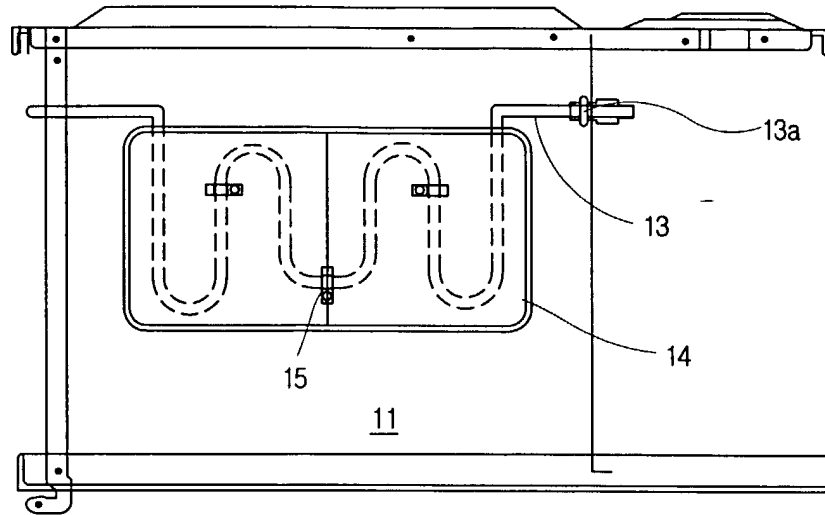


Fig 4

