Please find below a copy of granted European Patent No. EP Z ZZZ ZZZ. A prior art search has been conducted by a junior searcher in your company who has provided to you six documents (a copy of each can be found below).

Your task is to read EP Z ZZZ ZZZ and the six documents and decide which of these documents are:

(i) of interest; or
(ii) might be of interest; or
(iii) are not of interest

regarding the **novelty** of **all** of the **independent** claims of EP Z ZZZ ZZZ.

Please explain why you have categorized each of the six documents in one of the three categories above with regard to each independent claim of EP Z ZZZ ZZZ by filling in Table A below in a Word or Excel document.

Table A

Document	Category (i) of interest; or (ii) might be of interest; or (iii) are not of interest	Regarding which independent claim of EP Z ZZZ ZZZ	Reason(s) why document has been categorized as (i) , (ii) or (iii)
2B1			
2B2			
2B3			
2B4			
2B5			
2B6			

When providing your explanation in the fourth column of Table A, please cite specific phrases, sentences or paragraphs that appear in the document by page number and line number or by the drawing number that you find important in your assessment. Also clearly state any assumptions you have made. **Do not** make any conclusive statements about the novelty of the independent claims (i.e. that a claim is novel or not novel or that a document anticipates a claim or that a document is a X, Y, P, E, L, O, T or A document).

For each document that you categorized **as being (i) of interest**, please fill in Table B below for each independent claim of EP Z ZZZ ZZZ in a Word or Excel document. If there is more than one independent claim, create a separate Table B for each independent claim. For the documents you categorized as (ii) or (iii), you do **not** need to complete Table B below.

Table B

Features of Independent Claim No. ? of European Patent No. EP Z ZZZ ZZZ	Reference Number of the Document of Interest (e.g. Document No. 2B1)	Location of Feature in the Document of Interest (e.g. Feature ? is described as "a component having…" (see page 2, lines 3-5 or Figure number 1)	Reference Number of Another Document of Interest (**if there is one**)	Location of Feature in the Document of Interest
Insert the text of Feature ? of the independent claim here. **Note: add more rows below for each claimed feature of the independent claim(s)**				**Note: add two more columns to the right for each additional document you categorized as being of interest**

Please upload your completed Table A and Table B(s). This exam is out of a total of 110 marks. Good Luck!

European Patent No. Z ZZZ ZZZ

Title	Priority Number	Priority Date	Application Date	Publication Date
An Appliance	EPZZZZZZZ	1987-Feb 12	1988-Feb 5	1988-July-15
IP classes: A47J37/00 ; A47J37/06 ; A47J37/08				

ABSTRACT

An electric appliance comprises at least one heating element that can be brought into the proximity with a subject food that needs to be heated. The temperature of the elements may be controlled to a desired preset temperature, e.g. between a temperature ranging from 230°C to 300°C. This enables the rate of heating to be adjusted. Further, the appliance comprises a timer that is adjustable independent of the adjustment of the temperature.

INTRODUCTION

In the prior art it is known to make toasted bread and other heated food items in a toaster apparatus. Most of the known systems contain two plates which may be heated and between which a food item could be placed. In the standard prior art devices there may be a control light that indicates whether the plates are at their (maximum) temperature and which indicates to the user that the device is heated.

DETAILED DESCRIPTION

In the present invention an appliance is described that provides the user with a performance that can be controlled better. In the present appliance the user may set his own temperature maximum and minimum and independently, the user may set the time of heating. This allows a broader range of heating by which the user may choose to slowly heat the food item over a long time, thereby causing an even warming of the item while preventing overheating, or, at the other extreme, may quickly heat the food item at a high temperature which may be useful if only the crust of the food item needs to be toasted.

The invention is illustrated in Figures 1 and 2 that show the appliance of the invention which is suitable for the browning of bread or bread-like food items as an example. In Fig. 1 an appliance (10) is shown that has an opening (12) at the top of the appliance for placing the food item into the appliance. An activation lever (26) is available for starting the electric appliance. However, in another embodiment of the invention the activation lever may be replaced by a push button and/or a knob that can be turned. Action on the activation lever (26), or, alternatively, a knob may also start a timer switch. The timer switch may for example be set to a maximum of 10 minutes by default, but the duration of heating can be adjusted by using the timer knob (28). The appliance may also not have a timer switch in which case the timer knob (28) is used to set the duration of heating. Such a knob can be used in combination with a push button that switches the appliance on and off (and then the lever may be omitted). On the other hand, the lever (26) may also be used to only allow the food item into the device to a certain level, which is controlled by the pressing of the lever. Such a limited submersion of the food item in the apparatus can be used if only a part of the food item needs to be toasted. The appliance also has a

Title	Priority Number	Priority Date	Application Date	Publication Date
An Appliance	EPZZZZZZZ	1987-Feb 12	1988-Feb 5	1988-July-15
IP classes: A47J37/00 ; A47J37/06 ; A47J37/08				

temperature selector knob (38) for selecting the desired temperature independently of the selected duration of heating set by the timer knob (28).

Fig. 2 shows the appliance in operating condition. A food item (14), e.g. a slice of bread, is put in place through the opening (12) of the top of the electric appliance (10). The food item (14) is allowed to move inside the electric appliance by the movement of the block (24) controlled by the activation lever (26). The slice of food (14) (bread typically) is in contact with a pair of heated surfaces (18) of heating elements (16), pressed against the food item, by a pair of springs (22). The heated surfaces (18) may be coated with a non-sticking material, such as anodized aluminium. The pair of heating elements (16) are heated by heating a pair of heaters (20). The temperature of each heating element (16) is measured by a probe (36) embedded inside each heating element. It is possible that only one probe is embedded in only one of the two heating elements.

Heating of the two heaters (20) is controlled by two heating controllers (32) piloted by the temperature selector knob (38) and each one using the feedback of the probe(s) (36). Browning starts when the lever (26) is pushed (or the device is switched in the ON-position through another mechanism), allowing powering of the appliance. The timer, set through knob (28) will determine when the device again has to be switched off. Optionally, a signal to warn the user may be produced, which signal may be the release of the lever (26) causing the food item to 'jump out' of the appliance, or it may be a light signal or an audible signal or a combination of these.

The appliance can be used to prepare a variety of foods including toasted bread slices or heated waffles. For example, sliced bread can be browned using the appliance and then the browned bread slices can be coated with one or more of butter, peanut butter or marmalade.

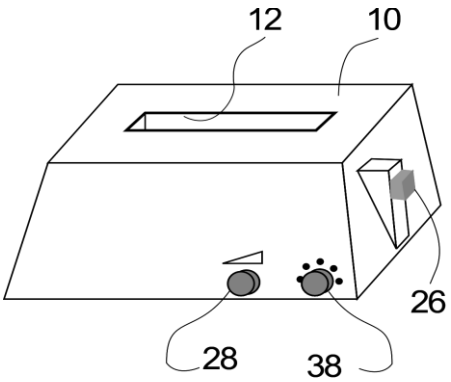


FIG. 1

European Patent No. Z ZZZ ZZZ

Title	Priority Number	Priority Date	Application Date	Publication Date
An Appliance	EPZZZZZZZ	1987-Feb 12	1988-Feb 5	1988-July-15
IP classes: A47J37/00 ; A47J37/06 ; A47J37/08				

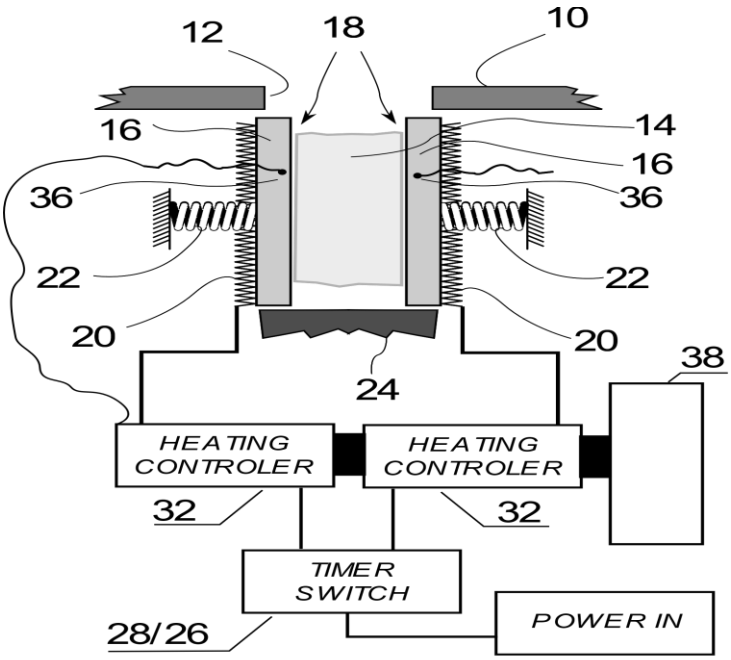


FIG. 2

European Patent No. Z ZZZ ZZZ

Title	Priority Number	Priority Date	Application Date	Publication Date
An Appliance	EPZZZZZZZ	1987-Feb 12	1988-Feb 5	1988-July-15
IP classes: A47J37/00 ; A47J37/06 ; A47J37/08				

CLAIMS

1. An electric appliance comprising:
one or more heating elements located in proximity of an edible food to be heated;
a temperature selector that is adjusted to a desired temperature at which the one or more heating elements will be heated;
a probe for sensing the actual temperature of the one or more heating elements;
a controller that receives input from the probe and controls the heating of the one or more heating elements to maintain the desired temperature;
a timer that is adjustable to select a desired time for heating the one or more heating elements; and wherein the adjustment of the timer is independent of the adjustment of the temperature selector.

2. An electric appliance as claimed in claim 1, wherein the temperature of the one or more heating elements is adjustable between a temperature range from 230°C to 300°C.

3. An electric appliance as claimed in claim 1 or 2, wherein the one or more heating elements is coated with a non-sticking material.

4. An electric appliance as claimed in claim 3, wherein the non-sticking material is anodized aluminium.

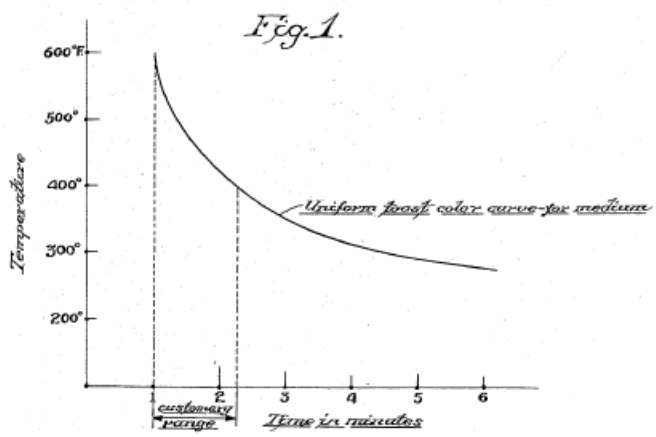
5. A method for browning an edible food by using an electric appliance as defined in claim 1 comprising the steps of:
- bringing one or more heating elements into proximity of the edible food to be browned;
- selecting a desired temperature to which the one or more elements are heated;
- selecting a desired time for heating independent of the selection of the temperature;
- heating the one or more elements for the desired time;
- sensing the temperature of the one or more heating elements; and
- controlling the heating such that the one or more elements are heated to and maintained at the desired temperature.

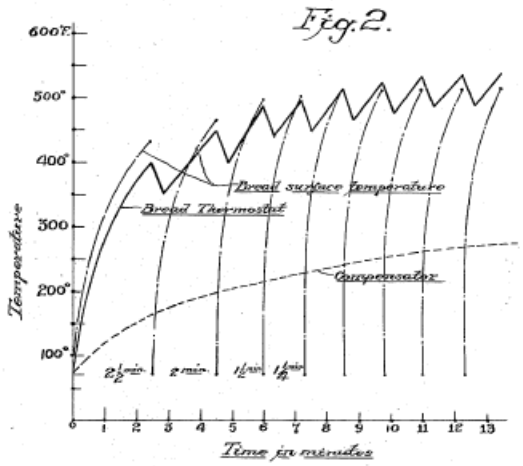
6. A set of browned slices of bread that are coated with a mixture of butter, peanut butter and marmalade, wherein said set of browned slices of bread has been prepared by a method according to claim 5.

United States Patent Publication No.- **2B1**

Title	Priority Number	Priority Date	Application Date	Publication Date
Bread browning appliance	US19372541A	1937-Sept-03	1937-Sept-03	1938-Mar-07

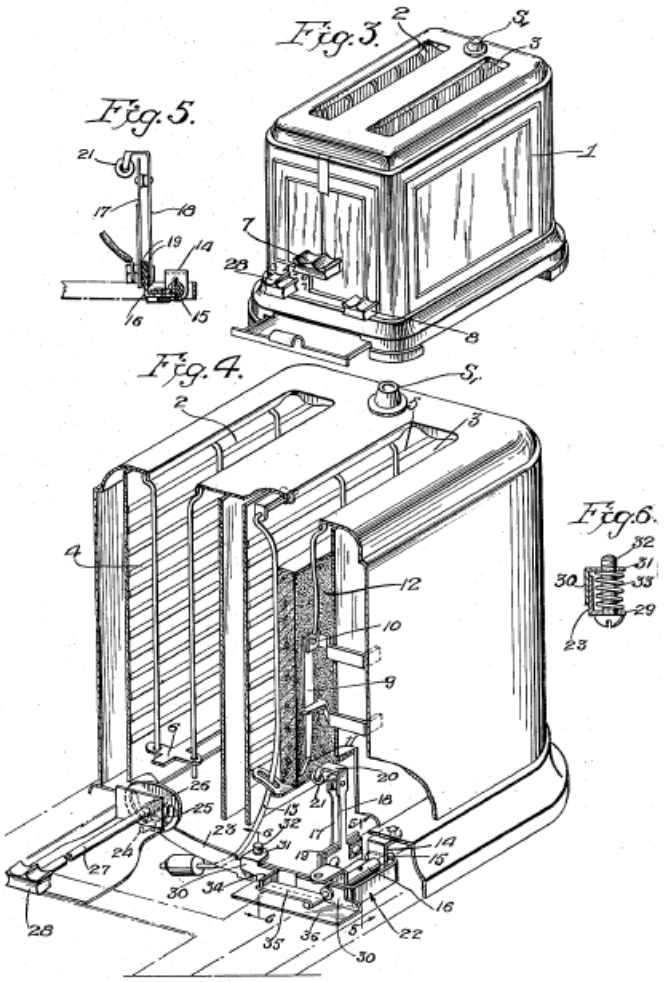
Document Classification	
IPC Subgroup	A47J003708
CPC - Current	A47J00370814





United States Patent Publication No.- **2B1**

Title	Priority Number	Priority Date	Application Date	Publication Date
Bread browning appliance	US19372541A	1937-Sept-03	1937-Sept-03	1938-Mar-07



Title	Priority Number	Priority Date	Application Date	Publication Date
Bread browning appliance	US19372541A	1937-Sept-03	1937-Sept-03	1938-Mar-07

This invention relates to automatic bread browning appliance of the type employing a thermosensitive element which is to be directly and principally affected by a change in the surface temperature of the bread being browned, but which is unavoidably and adversely affected to a lesser extent by the temperature of the heating elements, framework, and other surrounding parts of the bread browning appliance which derive heat from the heating elements and radiate it. It is a characteristic defect of prior bread browning appliance of this type that the bread does not toast uniformly during the warming up period of the bread browning appliance from an initial state of being cold. The principal reasons for this have been determined by careful experimentation and analysis and are found to be the following.

The relation between the surface temperature of the bread and the color or degree of browning of the bread varies during the warming up period.

Assuming a certain color or degree of browning of the bread is desired, the surface temperature of the bread corresponding to that color will be lower when the bread browning appliance is cold than it will be when the bread browning appliance it thoroughly heated. Therefore, if the bread browning appliance is used to toast the bread to the desired color when the bread browning appliance is cold, it will not toast the bread to the same color when the bread browning appliance has reached its operating temperature, or vice versa. In other words, a given bread surface temperature may be identifiable with a given bread color only when the temperature of the heating elements and the browning well are substantially stable. Since it is desirable not to have to preheat an automatic bread browning appliance to a stable condition before use, the lack of uniformity in toast color between the first and following bread slices browned in a bread browning appliance of this type has interfered with the sale and use of such bread browning appliance.

The relation between the surface temperature of the bread and the color or degree of browning is dependent-upon the rate or speed of the browning operation. When the bread browning appliance is cold, the rate of browning is slower than it is when the bread browning appliance has been heated to its proper operating temperature. As the bread browning appliance is heated from its cold condition, the rate of browning increases and causes increase of the bread surface temperature corresponding to a particular color. When the rate of browning becomes constant, the relation between the bread surface temperature and the desired color likewise becomes constant.

The varying influence of the heat radiated from the heating elements and heated parts of the bread browning appliance contribute to the non-uniform browning. During the browning of the first few bread slices, the heating elements lag behind the bread surface temperature, but as the bread browning appliance is heated the heating elements is subjected to increasing heat. This change in relation between the heat element temperature and the bread surface temperature naturally causes variation in the first several browning operations.

By the present invention there is provided means for causing the bread browning appliance to shut off or stop the browning operation at the different bread surface temperatures corresponding to a given color during the warming up period, or in other words, to control the browning operation under the influence of the bread surface temperature in accordance with the increasing browning ability of the bread browning appliance. Such means takes the form of a compensator which functions during the warming up period to compensate for the variation in relation between bread surface temperature and a desired bread color. The compensator also compensates for the variation in relation between the heat element temperature and the bread temperature.

The principal object of the invention is, therefore to provide a novel bread browning appliance of this type embodying means for effectively compensating for the above-noted effects during the warming up period and prior to arrival of the bread browning appliance at a stable state.

A more specific object of the invention is to provide in a bread browning appliance of this type a compensating thermosensitive element which is arranged so as to be affected principally by the heat radiated by the bread surface, and which thermosensitive element is constructed and arranged to adjust a switch so as to vary

Title	Priority Number	Priority Date	Application Date	Publication Date
Bread browning appliance	US19372541A	1937-Sept-03	1937-Sept-03	1938-Mar-07

the proximity of the bread surface to the heating element. In this way, the bread browning appliance can adjust how close the bread slice is to the heating element.

Other objects and features of the invention will be apparent hereinafter.

In the accompanying drawings:

Figs. 1 and 2 are graphs or curves illustrating the operation of a bread browning appliance of the type here involved and the application of the invention thereto;

Fig. 3 is a perspective view of a bread browning appliance embodying the invention;

Fig. 4 is a sectional perspective view illustrating the mechanism provided by the invention;

Fig. 5 is a detail sectional view taken along line 5 - 5 of Fig. 4; and

Fig. 6 is a detail sectional view taken along line 6 - 6 of Fig. 4.

In Fig. 1, there is shown a uniform toast color curve, that is, a curve representing a desired uniform color to which each successive bread slice is to be browned. The ordinate of this curve shows various temperatures of a thermosensitive element located near the bread surface, while the abscissa shows time in minutes. It will be seen from this curve that a longer period of time is required for the bread to reach the desired color when the bread browning appliance is "cold" than when it attains its operating temperature. It will be understood, of course, that this curve represents a particular color and that different but similar curves will represent other colors.

In Fig. 2, there are illustrated curves representing respectively the bread surface temperature, the heating element temperature, and the temperature characteristic of the compensator provided by this invention, all of these curves being plotted against time. These curves show the various temperature characteristics for successive bread slices starting with the bread browning appliance cold. The maximum points of the family of curves (dot and dash) representing bread surface temperature indicate the bread surface temperatures at which a desired broad color is attained on successive slices. It will be seen that these temperatures increase during the warming up period until the bread surface temperature corresponding to the desired bread color becomes constant.

It will be noted also that the heating element temperature (solid line saw-tooth curve) lags behind the bread surface temperature for the first several bread slices, but leads the bread surface temperature when the bread browning appliance reaches its stable condition, this action being due to the effect of the heated parts of the bread browning appliance upon the heating element as above described.

It will be noted further that the rate of browning of the bread is slow when the bread browning appliance is cold and increases as the bread browning appliance becomes heated. In other words, the time required to toast each successive bread slice decreases, as indicated by the successive time intervals. In order to compensate for the above effects, the present invention provides a compensator having the characteristic shown by the dotted curve. It will be noted that the action of the compensator bears a definite relation to that of the, heating element and that the action of the compensator varies during the warming up period. By virtue of the action of the compensator the successive browning operations are interrupted when the bread surface temperature reaches the successive values corresponding to a desired uniform color during the warming up period, and after the bread browning appliance operation has become stable, the browning operations are interrupted when the bread surface temperature reaches that constant value corresponding to the desired color. In other words, In effect the compensator stabilizes the action of the bread browning appliance during the unstable warming up period. The manner in which the compensator operates will be described later with reference to a specific mechanical embodiment.

Experiment has shown that the desired compensation above mentioned may be attained only by strict observance of certain considerations. Such compensating devices as have been proposed heretofore for use in other types of bread browning appliances have been found to be unsatisfactory for the present purpose, and when tried produced the following contradictory results:

Title	Priority Number	Priority Date	Application Date	Publication Date
Bread browning appliance	US19372541A	1937-Sept-03	1937-Sept-03	1938-Mar-07

(1) No noticeable effect at all.

(2) A small effect in the right direction.

(3) A proper compensation on the second bread slice and then increased darkening of the subsequent bread slices until they were burned.

(4) A proper compensation on the second bread slice followed by fading of the toast on subsequent bread slices.

(5) Proper compensation at one color of the toast but not at other colors.

Certain factors which must be taken into consideration in order to attain the desired compensation in a bread browning appliance of the type here involved are as follows:

(1) When the temperature of the compensator is a rectilinear function of the heating element, no compensation at all is produced.

(2) Should the compensator not lag sufficiently In its rate of heating, it will not produce sufficient compensation at any time. If the compensator's activity is increased too much to secure greater movement of the first bread slice away from the heating element that is being heated to the browning temperature, over compensation may be observed with the second and subsequent bread slices resulting in under toasted slices.

It has been found that unless a bimetal having a substantially rectilinear deflection with temperature is employed in the thermosensitive element, It is practically impossible to construct a compensating thermosensitive element. Since the bimetal previously used for the bread control in a bread browning appliance of this type was not rectilinear in its movement with temperature in the browning range, this difficulty had to be surmounted.

Both the bread-sensitive element and the compensator element have to approach their maximum deflection at about the same time, although the compensator has a slow start.

A physical embodiment of a bread browning appliance of the type here involved, employing a compensator according to the invention, is shown in Figs. 3 to 6.

Referring to these figures, there is illustrated a bread browning appliance of the two-slice type comprising a body 1 having recesses or wells 2 and 3 adapted to receive the bread slices, as well understood. Within the wells 2 and 3, there are provided the usual electrical heating elements 4 and 5 which are adapted to surface cook or toast the bread slices. In this particular type of bread browning appliance, the bread slices are carried by a vertically and horizontally movable carriage 6 which is adapted to be moved to its lowermost position by a knob 7, there being provided means (not visible) for urging the carriage to its upper position and a latching mechanism for holding the carriage in its lower position. The latching mechanism is releasable by means of a knob 8. This general structure of the particular bread browning appliance illustrated is conventional and forms no part of the present invention. It is, therefore, unnecessary to describe such structure in greater detail.

Referring now to Fig. 4, there is provided with the recess or well 3 a downwardly-extending thermosensitive strip or element 9 which is fixed at its upper end at 10 and the lower end 11 of which Is free and capable of moving in response to its flexing under the influence of heat. This thermosensitive strip is formed of bimetal having a rectilinear temperature-to-movement characteristic as above mentioned. This element is disposed as illustrated so that it is adapted to be affected by the surface temperature of a piece of bread 12. A weighted arm 13 moves the slice of bread closer or away from the heating elements depending on the movement of the thermosensitive strip.

Within the base of the bread browning appliance, there is provided a bracket or support 14 which carries a rotatable shaft 15 to which there is secured a switch support 16 carrying a pair of switch arms 17 and 18 insulated from one another by means of insulating sheets of mica 19. At their upper ends, the switch arms 17 and 18 carry contact buttons which are normally in engagement with one another. The upper end of the switch arm 18 has an extension 20 bent around the end of the switch arm 17 and carrying a roller 21 formed of insulating material. The roller 21 is adapted to be engaged by the end 11 of the thermosensitive element 9. When the thermosensitive element flexes under the influence of heat, the upper end of the arm 13 is moved so as to move the carriage containing the bread slice further from the heating element.

Title	Priority Number	Priority Date	Application Date	Publication Date
Bread browning appliance	US19372541A	1937-Sept-03	1937-Sept-03	1938-Mar-07

Intermediate its ends, the arm 23 is provided with an ear or tab 29 (see Fig. 6), the purpose of which will appear presently. An arm or bracket 30 is loosely mounted on an end of shaft adjacent the arm 23. The arm 30 is also provided with an extending ear or tab 31 which aligns with the ear 29 on arm 23, as shown clearly in Fig. 6. The two ears 29 and 31 are apertured to receive a screw 32, the aperture in the ear 31 being threaded to threadedly receive the threaded end of the screw. A coil spring 33 encircles the shank of the screw and is disposed between the ears 29 and 31. In this manner, the arms 10 23 and 30 are operatively and adjustably connected together for a purpose which will appear presently.

The bracket or arm 30 has a turned-out lug 34 which is slotted to 'receive an end of a bimetallic 15 thermosensitive strip 35, the other end of which, is curled around the end of shaft 15 and secured thereto. This element constitutes the auxiliary or compensating thermosenstive element above mentioned. It will be noted that this compensator is positioned so that it is affected principally by the heat radiated from the heating elements of the bread browning appliance, and therefore the movement of this compensator is a function of the browning speed of the bread browning appliance. In other words, the compensator is located in a zone of lower temperatures compared to the zone in which the heating element is located, and the said temperatures are a function of the browning speed of the bread browning appliance. This compensator is designed so as to have the heat response characteristic illustrated in Fig. 2 and described above. Its movement is caused to substantially neutralize the movement of the carriage if the heating element is cool.

As the bread browning appliance warms up, however, the auxiliary thermosenstive element responds to the increase in temperature of the bread browning appliance which is a function of the browning speed, and since the two ends of the element 35 are secured, the intermediate or central portion of the said element will flex or bend. This causes slight rotation of the shaft 15 in a clockwise direction as viewed in Fig. 4, thus moving the switch 17, 18 away from the end 11 of the main thermosensitive element 9. Therefore, after the bread browning appliance has warmed up, the end 11 is required to move through a greater distance to move the bread slice away from the heating element. As a result, successive pieces of bread are browned to the same degree or color.

Although the invention has been illustrated and described in its application to a specific form of bread browning appliance, it will be understood that it is not thus limited but is capable of use in any bread browning appliance of the type here involved.

Document 2B2

Excerpt below taken from: J.F. Doolittle, *Recipes That Make You Hungry*, Penguin Publishers, New York, 1985, pp259-262

Peanut Butter Bacon Croque Madame

Up until a month or so ago I had never heard of a Croque Madame sandwich, but I came across a photo of one and was kind of blown away. It is like a grilled cheese, but so much better. The sandwich has a béchamel sauce, ham, more cheese and an egg on top. Obviously, I had to make it, but with my own twist. I swapped the ham for bacon and let's just say it was better than good. It was awesome!

That got me to thinking about swapping the béchamel for something. That something being peanut butter. I know it sounds crazy, but you guys, I promise it is so good. Just try me, you are going to love it. Nothing beats the combo of peanut butter and bacon! Further, I added some marmalade to provide a fruity taste to the thing. Never tasted anything like this!!

Prep time: 10 minutes

Cook Time: 25 minutes

Total time: 35 minutes

Yield: 2 sandwiches

Document 2B2

Excerpt below taken from: J.F. Doolittle, *Recipes That Make You Hungry*, Penguin Publishers, New York, 1985, pp259-262

260

Ingredients

8 slices thick cut bacon
4 slices rye, whole grain or pumpernickel bread
2 tablespoons butter, at room temp
4-6 tablespoons Smooth Operator peanut butter
1-2 tablespoons of marmalade
½ cup smoked Gouda cheese, shredded
2 large eggs, cooked to your liking
salt + pepper, taste
crushed red pepper, for sprinkling (optional)

Procedure

1. Preheat the oven to 400°F.
2. Line a baking sheet with foil and place the bacon in a single layer on the foil. Bake in the oven for 15-20 minutes or until crispy, rotating the pan half way through.

Document 2B2

Excerpt below taken from: J.F. Doolittle, *Recipes That Make You Hungry*, Penguin Publishers, New York, 1985, pp259-262

3. Butter one side of the 4 slices of bread. Spread 2-3 tablespoons peanut butter and 1 spoon of marmalade on the buttered side of each slice of bread.

Place 4 slices bacon onto the mix of marmalade and peanut butter and press the pieces of bread together.

Document 2B2

Excerpt below taken from: J.F. Doolittle, *Recipes That Make You Hungry*, Penguin Publishers, New York, 1985, pp259-262

4. Place the assembled sandwich under a broiler that has been preheated to 200°F to brown the bread.

5. Brown the bread for about 2 minutes. Keep your eye on a clock and watch carefully that is does not blacken. Remove from the broiler and top each sandwich with the shredded Gouda cheese. Place on a baking sheet and broil for 30 seconds to melt the cheese (again watch closely!). (This is when I cooked my eggs)

6. Remove from the oven and top each sandwich with and egg. Season with salt and pepper and sprinkle with crushed red pepper flakes. EAT!

United States Patent Publication No. **2B3**

Title	Priority Number	Priority Date	Application Date	Publication Date
Heating apparatus	US08/325671	1994-Jan-10	1995-Jan-05	1996-July-15

Document Classification	
IPC Subgroup	A47J003706
CPC - Current	A47J00370611

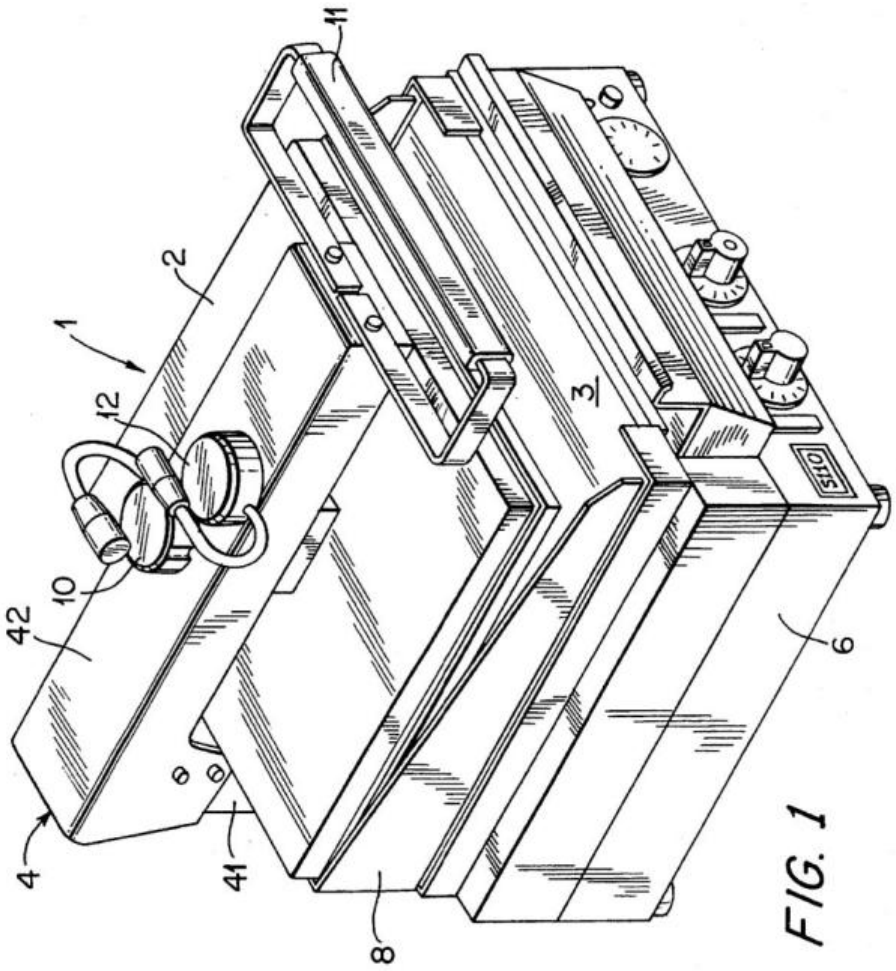


FIG. 1

Title	Priority Number	Priority Date	Application Date	Publication Date
Heating apparatus	US08/325671	1994-Jan-10	1995-Jan-05	1996-July-15

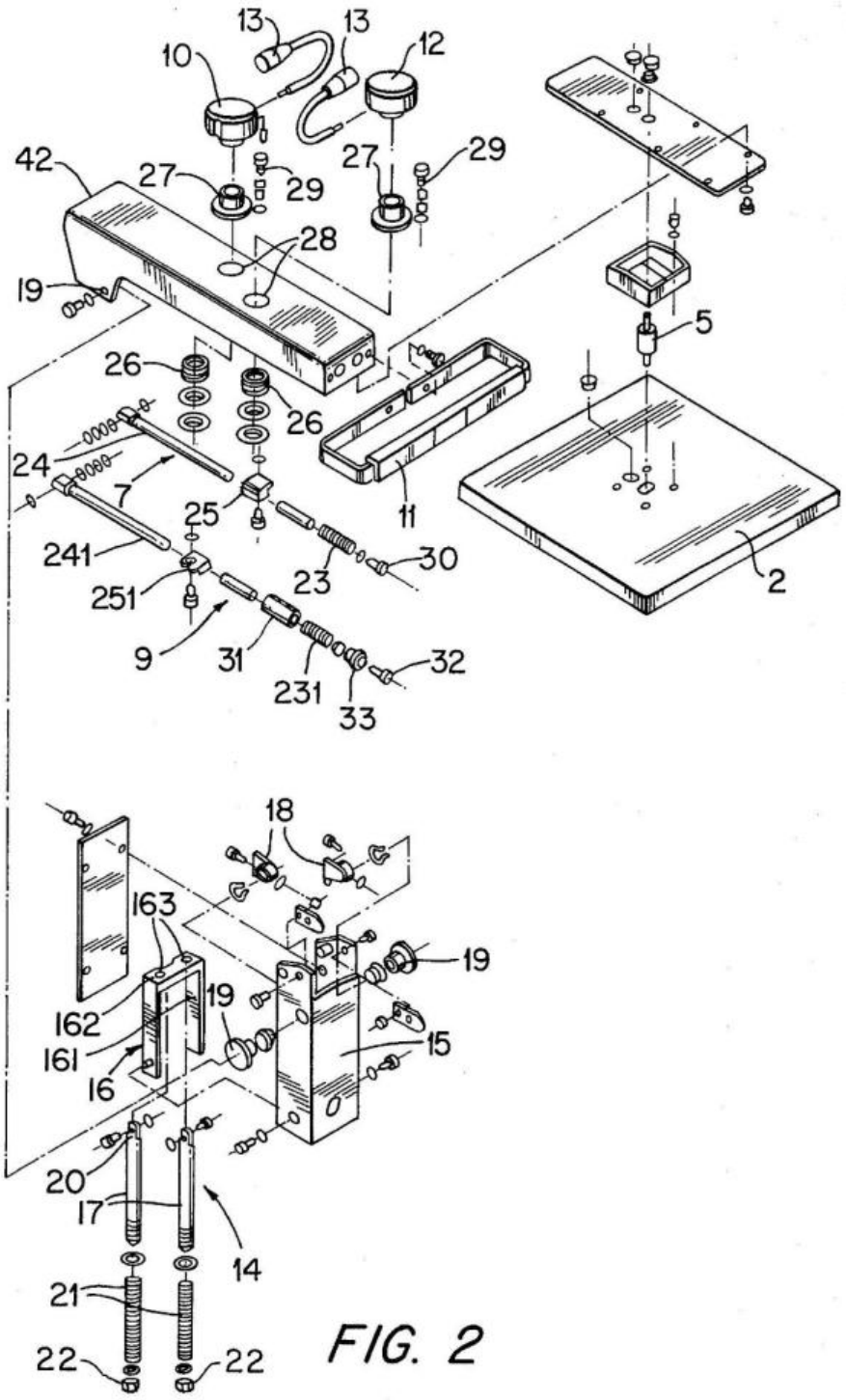


FIG. 2

Title	Priority Number	Priority Date	Application Date	Publication Date
Heating apparatus	US08/325671	1994-Jan-10	1995-Jan-05	1996-July-15

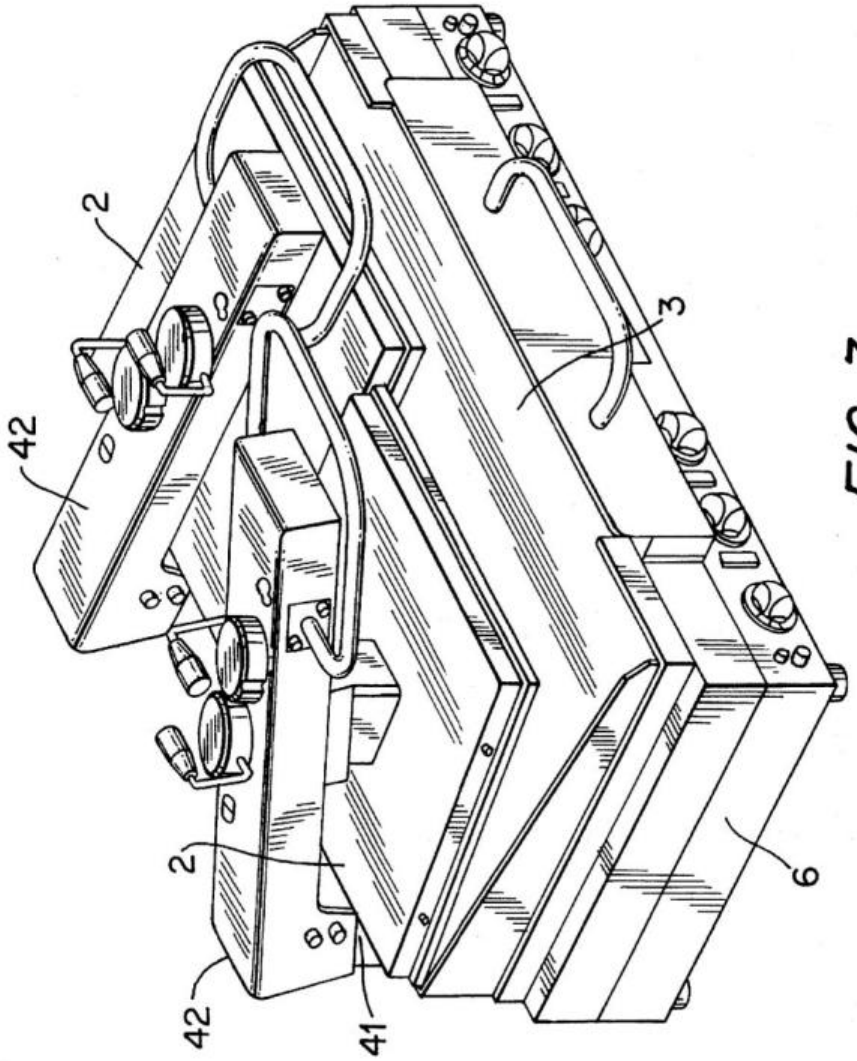


FIG. 3

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention concerns an electrical contact grill apparatus comprising at least two contact plates to be placed against the food to be grilled.

2. Prior Art

Contact grill devices of this type are well known in practice and give satisfactory results with respect to their performance, energy consumption and efficiency e.g. in the preparation of grilled food. The contact plates themselves are in general formed from metal or glass plates, the employment of these materials representing a compromise between satisfactory heat conduction and a sufficiently hard surface structure for the required frequent cleaning of the plates. Although it is generally known that for example aluminium provides better heat conduction than metal alloys, the cleaning of a contact grill plate made exclusively of aluminium is not possible to a satisfactory extent, because the durability and lifespan of such a contact plate having a relatively soft surface would be severely limited. In addition, known contact grill devices are often not satisfactory with respect to the ease with which they may be handled with regard to their being charged with food, their cleaning etc.

3. Objects of the Invention

In view of the above, it is a main object of the invention to achieve a contact grill apparatus which alleviates the drawbacks and shortcomings of such prior art apparatus.

In particular, it is an important object of the present invention to suggest a grill apparatus which provides an improvement in performance over conventional apparatus.

It is a further object of the invention to propose a contact grill apparatus which provides improved effectiveness with respect to conventional grill apparatus.

It is still a further object of the invention to provide a contact grill apparatus which is particularly easy and expedient to handle and operate.

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Heating apparatus	US08/325671	1994-Jan-10	1995-Jan-05	1996-July-15

SUMMARY OF THE INVENTION

In an electrical contact grill apparatus comprising at least two contact plates to be placed on the food to be grilled, these and other objects are achieved by providing at least one contact plate formed in the manner of a sandwich plate, such that it comprises an aluminium core and an external high-grade steel layer. In this structure, the high-grade steel layer is arranged at least on the side of the grill plate directed towards the food to be grilled or the grill area. Besides providing both a hard and smooth surface structure, a contact grill plate for an electric contact grill of this type has the essential feature of excellent heat distribution or conduction, in addition to which heat radiation from the contact grill apparatus when open is low, as the heat is reflected by the high-grade steel layer into the aluminium core. The working conditions for the operator are thereby improved. Due to the high-grade steel layer, the frequent cleaning required in practice causes essentially no wear of the contact plate or its surface. With the contact plates according to the invention, a high rate of preparation of grilled food can be achieved with a relatively low energy consumption as a result of the good heat conduction properties, so that even deep frozen food may be grilled in a relatively short period of time. Moreover, it is possible to design the contact plates themselves to be relatively thin, as the deformation of the plate when heating-up is reduced compared to conventional contact plates. The contact plate according to the invention thus demonstrates a short heating-up time, which results in high energy efficiency being achieved.

A contact plate that is particularly easy to produce can be achieved according to another aspect of the invention by roller-plating the high grade steel layer onto the aluminium core.

In order facilitate handling of the contact grill apparatus, the apparatus may comprise an upper contact plate arranged to pivot on a central arm relative to a fixed lower contact plate. By means of the arrangement of the pivotable contact plate on a central arm, the operability and the material costs of the apparatus are greatly improved in relation to conventional contact grill apparatus having two side arms, and furthermore sufficient stability and robustness are simultaneously safeguarded.

The upper contact plate can advantageously be floatingly arranged, i.e. movably mounted on or in the central arm.

Such an arrangement is particularly favorable to achieve and produce when formed as a universal joint cooperatively associated with the central arm. Due to the floating mounting, an equal

distribution of pressure on the food to be grilled can be achieved, even when the food pieces are not all of the same thickness.

In order to reduce the load applied to the food for grilling by the upper contact plate, and so achieve a particularly gentle cooking process, the upper plate may comprise a load or weight relieving device. This also facilitates the easy opening of the upper contact plate with little exertion of force. In addition, the use of a load relieving device allows the fully open upper contact plate to be held or fixed in a substantially vertical position, so that it will not automatically fall shut, and furthermore, remains such as fat or the like can run down the upper plate onto the lower plate so that soiling of the area outside the plates does not occur. In addition to this, an adjustable load relieving device may be arranged in a non-pivotable, fixed portion of the central arm and act upon the pivotable contact plate so as to relieve the load.

An adjustable load relieving device may also be arranged in a pivotable portion of the central arm and act upon the pivotable contact plate so as to relieve the load. By integrating the load relieving device in the central arm, further structural components which would increase the dimensions of the contact grill apparatus are also avoided.

To obtain load relieving devices that are particularly easy and practical to produce, these may be provided in the form of components acting to relieve the load on the upper contact plate by means of at least one compression spring, respectively. The use of compression springs is particularly cost-saving and they have a low susceptibility to failure and are very robust.

In order to ensure a very effective and also robust load relieving device with low production costs, the load relieving device arranged in the fixed central arm portion can be formed as a coupler or movement transmission mechanism in the manner of a set or arrangement of coupled transmission elements including levers.

A lightening or relieving of the load which has a particularly reliable function and satisfies all practical demands made on it is achieved when the load relieving device arranged in the fixed, non-pivotable central arm includes at least one lever arm, which is fixed to, and turns with the pivot axle of the central arm, and the end of the lever located distal from the pivot axis acts in cooperation with a bolt, the bolt being mounted in a frame which in turn is hingedly arranged in a base frame of the central arm, and wherein a compression spring is arranged between a central piece of the frame and

a nut arranged at the opposite end of the bolt to the lever. Preferably, two bolts arranged as a pair are provided, whereby each acts together with a spring and a lever, respectively.

Advantageously, each lever arm may be cranked to ensure a particularly favorable application of force for the relieving of load in all possible positions of the upper contact plate.

In order to attain a non-linear load relieving the work arms resulting from the cranked form of the lever arm may have different lengths. The effective load relieving is thereby somewhat reduced, when the shorter arms of the lever arms are used as work arms for the load relieving springs when the upper contact plate is closed. In this way, a predetermined portion of the upper contact plate can lie on the food to be grilled and act on this food according to the requirements of the cooking process. The longer work arms function as work arms when the upper contact plate is open, thereby facilitating the opening and holding open of the plate.

The load relieving device located in the pivotable portion of the central arm may be formed as a rod, mounted in the base frame of the fixed central arm portion but outside the pivot axis of the central arm, with a sliding element slidingly arranged on the rod and connected to an adjustment button or knob of the central arm, and with the compression spring mounted between the sliding element and a stop member arranged at a free end of the rod. The sliding element may be connected to the adjustment button outside the central axis of the latter, so that the sliding element is displaced upon adjusting the knob. In this way, a further and additional, reliably functioning load relieving device is obtained, wherein the effective load-lightening can be set and controlled independently of the load relieving device arranged in the fixed central arm, and thus be adapted to meet the various requirements arising in practice. In this way, food to be cooked having different heights can be prepared in batches while maintaining sufficient contact with the plates.

The contact grill apparatus can include a stop limiter for defining the minimum distance between contact plates. The stop limiter may be adjustable, i.e. allow the height adjustment of the possible minimum distance between contact plates.

The stop limiter can be arranged in the pivotable portion of the central arm. It may also be formed as a rod mounted in the base frame of the fixed central arm portion outside the pivot axis of the central arm, with a sliding element being slidingly mounted on the rod and connected to a further

adjustment knob of the central arm, and a spring mounted in a bushing being arranged between the sliding element and an end piece arranged at a free end of the rod.

To avoid the destruction of components when applying force on the contact plates when these are closed as far as the operative stop limiter, the bushing can be formed such that it defines the longitudinal extension of the spring by means of spring mounts displaceably located in its interior.

In order to extend the apparatus' areas of utilization and application and the modifications possible for satisfying practical requirements, the contact grill device according to the invention may be constructed in a modular form.

In order to meet the requirements of a particularly rapid mass production of food to be cooked, the contact grill apparatus can comprise an upper contact plate, which is laterally displaceable with respect to the base plate, i. e. the effective surface area of the lower contact plate may be larger than that of the upper contact plate, which results in the charging operation being effectively improved and also allows the contact grill apparatus according to the invention to be used for other modes of cooking, such as frying in addition to grilling.

The contact grill apparatus according to the invention may advantageously include several upper contact plates, so that the grilling operation may take place in varying cycles.

Grill operations requiring different temperatures can be made possible very simply by forming the individual contact plates to be separately controllable in this respect.

In order to simplify the servicing of the apparatus and to facilitate the access to the important components during assembly, the required electrical circuitry may be arranged in a separate module or structural unit. The module for the circuitry may thus also be arranged outside, i.e. spatially separated from the contact plates. The apparatus can be embodied according to individual customer requirements without great expense.

To improve the control of the contact plate temperatures as well as the repair and service conditions, the contact grill apparatus according to the invention can comprise electronic control. Thus the hitherto employed mechanical sensors, which have a limited lifespan, are not necessary.

To increase still further the possible areas of application, at least one upper contact plate can be formed as a radiation plate for non-contact or surface grilling or keeping food warm.

BRIEF DESCRIPTION OF THE DRAWINGS

Further objects and advantages of the present invention will be apparent from the following description and claims and are illustrated in the accompanying drawings which, by way of illustration, schematically show preferred embodiments of the present invention and the principles thereof and what now are considered to be the best modes contemplated for applying these principles. Other embodiments of the invention embodying the same or equivalent principles may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention and the scope of the appended claims. In the drawings:

FIG. 1 shows an axonometric representation of a contact grill apparatus according to the invention,

FIG. 2 shows an exploded representation of the components for load relieving devices, stop limiting and mounting of an upper contact grill plate, and

FIG. 3 shows an axonometric representation of a contact grill apparatus according to another embodiment of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A contact grill apparatus 1 according to the invention and as shown in FIG. 1 comprises a lower contact plate 3, to which an upper contact plate 2 is pivotably joined by means of a central arm 4. The upper contact plate 2 is floatingly mounted in a universal joint 5 (FIG. 2) arranged in the central arm 4. By means of this, the upper contact plate 2 has two degrees of freedom, which allows it to

almost completely cover of food pieces to be grilled having different heights. The contact plates 2, 3 are arranged above a structural module 6 containing electrical circuitry, which is not shown in detail. A splash guard 8 is arranged between the contact plates 2, 3. Upper and lower contact plates 2, 3 are formed in the manner of a sandwich plate and have an aluminium core, on which, at least facing towards the actual grilling area, a high-grade steel layer is roller-plated.

The central arm 4 comprises a vertical first central arm portion 41 arranged in the region of the lower contact plate 3 and on which a second central arm portion 42 is pivotably mounted. An operating element 11 is arranged at the free end of the second central arm portion 42 for opening and closing the contact grill apparatus. The central arm 4 furthermore includes a first adjustment knob 10 for a weight or load relieving device 7, 14 (FIG. 2) and a second adjustment knob 12 for a stop limiter 9 (FIG. 2), whereby each adjustment knob 10, 12 can be operated by means of an adjustment lever 13, respectively.

The exploded view in FIG. 2 shows the arrangement and operation of the load relieving device 7 and the stop limiter 9 in detail. The contact grill apparatus 1 comprises two different load relieving devices 7, 14. The main load relieving device 14 is arranged in the vertical, fixed central arm portion 41, while the second load relieving device 7 is located in the pivotable central arm portion 42. The fixed central arm portion 41 includes a base frame 15 connected to the base unit or module 6 of the contact grill apparatus 1. A frame 16 is pivotably mounted in this base frame 15, such that its pivot axis is located in the lower region of the base frame 15. The frame 16 comprises two parallel legs 161 connected to one another at their upper edges by a middle piece or web 162. The middle piece 162 is formed with two holes 163, through which two bolts 17 may be inserted. The ends of the bolts 17 which protrude upwards through the middle piece 162 are hingeably connected to two lever arms 18, which are fixedly connected to the pivot axle 19, which defines a pivot axis, of the pivotable central arm portion 42 by means of a radial screw connection. The lever arms 18 are connected to the bolts 17 outside the pivot axis 19, which corresponds to that of the central arm portion 42, and are pivotally guided and screwed in slots 20 in the bolts 17. At the lower parts of the bolts 17, springs 21 (compression springs) are arranged and held by nuts 22. The springs 21 abut the middle portion 162 of the frame 16 and thereby exert a downwardly directed force on the bolts 17. This force acts on the lever arms 18 pivotably arranged in the base frame 15, so that a constant force is exerted on the upper contact plate 2 in an opening direction. The result is a lightening or relieving of the load. The strength of this load relieving depends on the biasing of the springs 21, which can be adjusted by means of the nuts 22. The upper central arm portion 42 is eccentrically hinged on the pivot axle so that a pivotal movement of the central arm portion 42 causes the frame 16 to undergo a slight pivotal movement as well. In the open position of the contact grill apparatus 1, the springs 21 hold the upper contact plate 2 open. It should be stressed that the lever arms 18 are cranked. Thus each lever arm 18 comprises two work arms, having different lengths. The shorter work arm thus operates

as the work arm for the spring 21 when the contact grill apparatus is closed. The longer work arm, on the other hand, functions as a work arm when the contact grill apparatus is open. In this way, the opening operation is facilitated.

As mentioned above, the second load relieving device 7 is located in the pivotable portion of the second central arm portion 42. To this end, a rod 24 is mounted outside the pivot axis 19 of the pivotable second central arm portion 42 in the base frame 15 of the fixed first central arm portion 41. A sliding element 25 is arranged on the rod 24 and is connected to the first adjustment knob 10 via a compression spring 26 by means of a screw connection. A bearing bush 27 is arranged between the adjustment knob 10 and the second central arm portion 42. A circle of holes 28 is located around the hole for the second adjusment knob 12, into the individual holes of which a pin of the adjusment knob 10 can lock or catch. On pulling on the adjusment knob 10 the pin is drawn out of the respective hole of the hole circle 28 and locked into another hole by a turning movement. At the same time the sliding element 25 slides along the rod 24. A spring 23 is arranged on the end of the rod 24 lying distal from its mounting and held in place by a stop member 30. The distance between the sliding element 25 and the stop member 30 is at its largest when the contact grill apparatus 1 is open due to the different points of pivot on the rod 24. When the central arm portion 42 is swung downwards, the distance between the sliding element 25 and stop member 30 is reduced until the sliding element 25 comes to rest on the spring 23, depending on the initial setting of the adjustment knob 10, so that a compression force is generated, which opposes the further downward movement of the central arm portion 42 and thus of the upper contact plate 2.

In addition to this load relieving device 7, a stop limiter 9 is also located in the pivotable central arm portion 42. The stop limiter 9 has a similar construction to the adjacently arranged load relieving device 7. The stop is embodied by a spring 231 compressibly mounted in a bushing 31. The stop function is achieved when the bushing 31 hits a sliding element 251 of the stop limiter 9 which is slidably arranged on a rod 241 and an end piece 32 arranged at the end of this rod 241 comes to rest against a spring holder 33 and/or slightly compresses the spring 231, which is mounted in the bushing 31. The desired stop position may also be set by means of the adjustment knob 12, which acts on the sliding element 251 of the rod 241 and can slide the same along the rod 241. The bushing 31 defines only the largest possible extension of the spring 231 mounted therein. The embodiment of this stop limiter 9 as a spring assembly means that pressure may unintentionally be further applied on the upper contact plate 2 in the direction of the lower contact plate 3 after the stop limitation has been reached by the end piece 32 abutting the spring holder 33 of the spring 231 without damaging the components of the stop limiter 9.

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The upper contact plate 2 is itself connected to the pivotable part of the second central arm portion 42 via a universal joint 5, such that the plate 2 is effectively floatingly mounted on the universal joint.

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Title	Priority Number	Priority Date	Application Date	Publication Date
Electrical heating elements for appliance	US198037892A	1980-Nov-17	1981-Oct-30	1982-May-17

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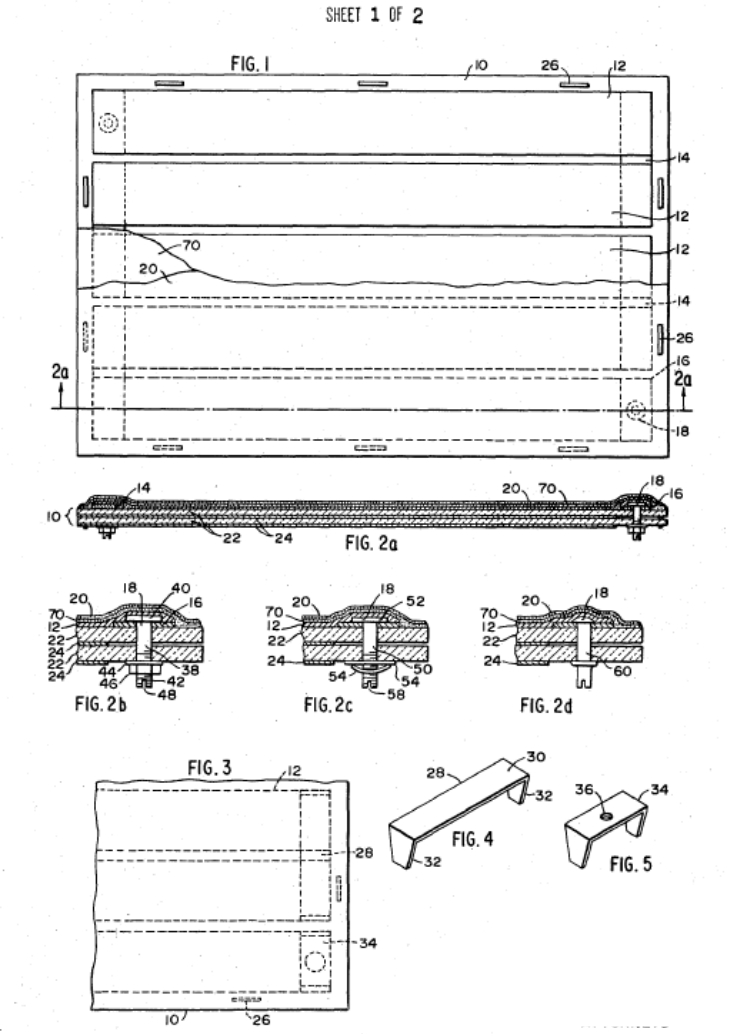

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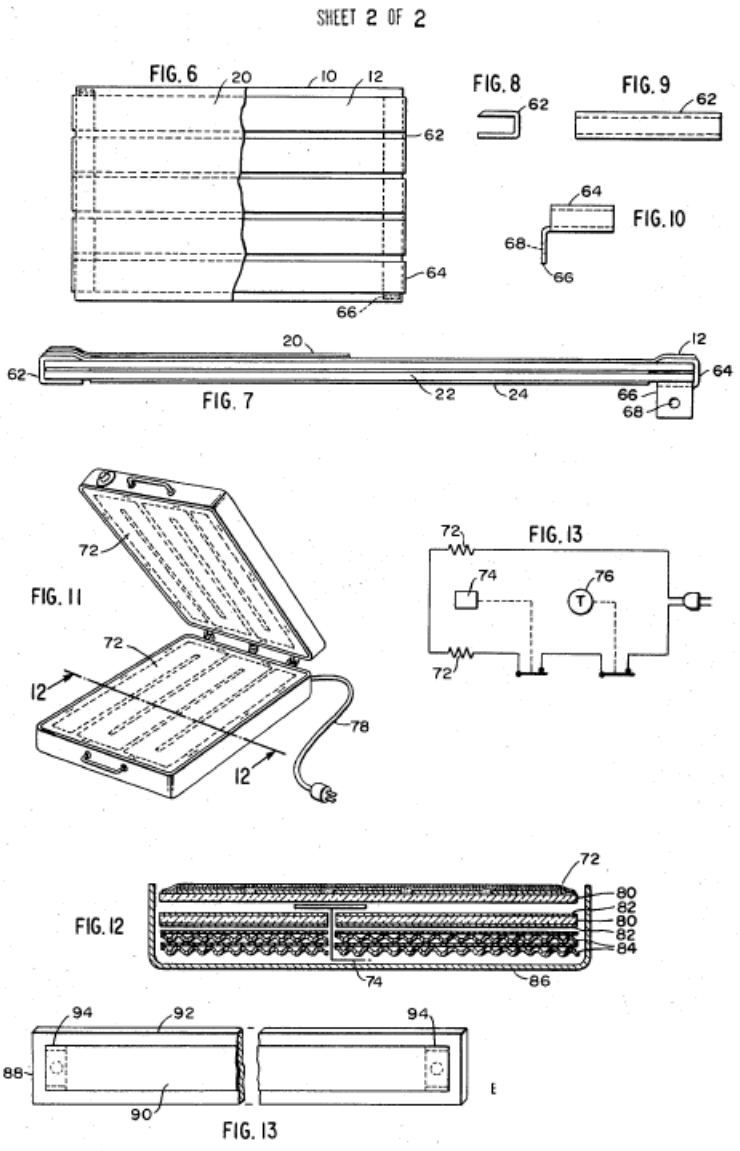
Electrical heating elements for appliance	US198037892A	1980-Nov-17	1981-Oct-30	1982-May-17



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Electrical heating elements for appliance	US198037892A	1980-Nov-17	1981-Oct-30	1982-May-17

BACKGROUND AND BRIEF DESCRIPTION OF THE INVENTION

This invention relates to electrical heating elements of particular utility in the cooking of food through surface contact heating.

Electrical heating elements in present use for cooking devices are inefficient as to both the time and energy expended, with the basic reasons for these inefficiencies stemming from the type of heating element used, as well as the technique of heat transfer employed. Generally, the heating element utilizes a resistance element of large mass, thereby requiring a substantial time to attain operating temperature. Also, the technique used to transfer heat from the heating element to the food to be heated or cooked is likewise inefficient. For example, in frying bacon in an electric skillet, a long length of time is needed to heat the large masses of the skillet and resistance heating element to the operating temperature, and much heat energy is lost, primarily through convection from the surfaces of the skillet, with some heat also lost by radiation. This same task could be accomplished with greater speed and efficiency by use of a low mass heating element having good energy transfer characteristics.

It is therefore the major purpose of this invention to provide an electrical heating element characterized by a short temperature rise time and efficient energy transfer characteristics. It is an additional purpose of this invention to provide a method for constructing the heating element by means of a series of steps readily adapted to high-speed construction procedures.

In order to accomplish the objective of an efficient heating element with a short rise time to operating temperature, the invention utilizes a thin film metallic resistor deposited by means such as flame spraying onto an insulating substratum. The thin film metallic resistor is preferably utilized in a rectangular heating element, comprised of parallel strips of metal film deposit with the ends of the strips appropriately interconnected to produce a convoluted series resistance configuration. The insulating substratum quite efficiently prevents heat loss through the rear of the heating element. While several types of insulating substratum could be used, some materials and combinations of materials are preferred as is further discussed below.

Some uses of the heating element will call for a protective covering over the resistor, terminals, substratum combination. For example, if the heating element is to be used as a grill, a smooth, inert, abrasion-resistant coating, such as a porcelain, could be used. This in turn can be coated with a non-stick coating such as anodized aluminum.

A heating element formed in accordance with the present invention exhibits several advantages over existing heating elements. In general the deposited thin film forms a more durable resistor, having a higher resistance per unit mass. Additionally, the resistor being deposited onto an insulating substratum provides efficient transfer of heat, particularly by means of surface contact.

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BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of a heating element comprising as a substratum alternating layers of asbestos millboard and aluminum reflecting sheets, a thin-film resistor deposited on the upper surface of the top layer of millboard, and a protective coating applied over the heating element, with part of the protective coating cut away for illustration;

FIG. 2a is a cross-sectional view in frontal elevation of the heating element in FIG. 1, taken along line 2a--2a, with an electrode leadoff utilizing a threaded shank and nut;

FIG. 2b is an enlarged view of the electrode leadoff in FIG. 2a.

FIG. 2c is a similar view of 2b with an electrode leadoff utilizing a spring loaded contact;

FIG. 2d is a similar view of 2a and 2b with an electrode leadoff comprised of a rivet;

FIG. 3 is a plan view of a portion of another heating element using interconnectors and electrode terminals in the form of a staple.

FIG. 4 is a perspective of an interconnector in FIG. 3;

FIG. 5 is a perspective view of the electrode terminal in FIG. 3;

FIG. 6 is a plan view of another heating element;

FIG. 7 is a view in frontal elevation of the heating element in FIG. 6;

FIG. 8 is a view in frontal elevation of an interconnector used in FIG. 6;

FIG. 9 is a view in side elevation of the interconnector in FIG. 8;

FIG. 10 is a view in side elevation of an electrode terminal in FIG. 6;

FIG. 11 is a perspective view of a grill incorporating a pair of heating elements, such as those of FIG. 1;

FIG. 12 is a cross-sectional view in frontal elevation of the grill in FIG. 11, taken along line 12--12;

FIG. 13 is an electrical diagram of the grill in FIG. 11.

FIG. 14 is an oblique, shortened view of a heating element in the form of an extended strip.

DETAILED DESCRIPTION OF THE INVENTION

The heating element of the present invention is comprised of an electrically and thermally insulating substratum, a thin film metallic resistor deposited by spraying in a plurality of superposed layers,

preferably in parallel, interconnected strips onto the substratum, and electrode terminals and electrode lead-offs at the ends of the resistor. Preferably, the heating element also contains a protective coating covering the exposed upper surfaces of the resistor, interconnectors, electrode terminals and electrode lead-offs. Also in accordance with the invention, an appliance for rapid and efficient heating incorporates one or a pair of heating elements, in conjunction with appropriate timing control, base insulation, and exterior covers.

The thin film resistor is deposited in several, superposed layers onto the substratum by flame spraying, arc spraying, plasma spraying or the like.

By spraying the thin film in several passes, it is possible to achieve superior uniformity, as compared with a film of like thickness sprayed in a single pass. Although each single pass does not leave a uniform layer, by the random nature of spray application each succeeding, superposed pass tends to increase the uniformity of the film. It has been found, unexpectedly, that thin film resistors of the present invention have a resistance substantially greater than the resistance of the same metal as a solid of like dimensions.

Through such techniques, the metal can be deposited in generally any desired configuration or depth. Since the resistance of the thin film is determined by its dimensions, i.e. resistance varies directly with the length of the strip and inversely with its cross-sectional area, a wide range of resistance values in a variety of configurations can be produced. While the preferred embodiment utilized Nichrome V (T.M., a composition of 80% Ni and 20% Cr) as the resistor alloy metal, a number of other metals, for example, high resistivity alloys such as stainless steel, some aluminum alloys, or other alloys of nickel and chromium, could be used.

A heating element utilizing such a thin film resistor exhibits several advantages over a comparable heating element incorporating a solid resistor: a better bond can be achieved between the resistor and substratum; the thin film resistor has better thermal expansion characteristics; since the thin film resistor can be deposited onto the substratum by superposed passes of spray, any desired thickness and resistance can be readily obtained; the thin film resistor exhibits a higher resistance per cross-sectional area and per unit mass, than that of a comparable solid resistor.

The insulating substratum must have good thermal and electrical insulating properties and provide both structural support and a base for efficient bonding to the thin film resistor. Although several types of material would accept such a bond, many of them, for example glass and ceramics, have a high thermal conductivity. High density asbestos sheet, known in the trade as millboard, has properties particularly well suited for this use. Not only does millboard provide an extremely good bond and a low thermal conductivity, it is also readily available in thin sheets, enabling the addition of thin reflecting sheets, such as thin aluminum, behind millboard layers, with the combination of the layers of reflector and millboard having superior insulating and structural properties. Resin bonded carborundum exhibits properties similar in these respects to millboard and is also suitable in this use.

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Care must be taken in depositing the thin film resistor to insure a deposit of sufficiently uniform thickness to avoid burnouts resulting from current density irregularities. Millboard has a smooth, calendered surface with a slight grain running along it, providing adequate smoothness for a thin film deposit of at least 0.002 inch. It has been discovered, however, that a thin film deposited along the grain has a different resistance than that deposited across the grain; this characteristic of the millboard can be utilized to enable a production choice between, for example, two values of resistance with a minimum of production line changes. In addition, it might be that for a given resistance value of thin film, a better bond to the substratum is obtained when the metal is deposited in a particular direction relative to the grain of the millboard.

The thin film can be deposited in a number of configurations on the substratum, with the basic limitation that of current density burnout. While the preferred embodiment incorporates strips of thin film running parallel to one another, interconnected into a series resistor, other configurations are apparent. For example, the same strips of thin film in the preferred embodiment could be connected into a parallel configuration, or alternate adjacent strips could be parallel connected, with these parallel resistors connected in series. As further example, the thin film could be deposited in an outwardly spiraling strip, as in an electric range burner, or deposited in a long strip to be used as a baseboard heater. Of course in these cases interconnectors may not be necessary. In any case, the considerations of current density burnout, temperature expansions, and energy efficiencies are always present and the preferred embodiment serves to present one illustration in accordance with the teachings of this invention.

In the preferred embodiment, the strips of thin film are connected into a convoluted series resistance pattern by use of high conductivity interconnectors at the appropriate ends of the strips of thin film. These interconnectors must be of a sufficiently high conductivity and must run substantially along the widths of the strips of thin film to avoid current density burnout where the current "turns the corner" at the ends of the strips.

One method of forming the interconnectors is to deposit an appropriate material onto the substratum by means such as flame spraying, with the thin film subsequently deposited. Not only must the material used for the interconnectors be of a high conductivity, but also the bonding between the substratum and the interconnector, and between the interconnector and the thin film resistor, must be adequate to withstand the expansions involved in the heating of the configuration during production and use.

Another form of interconnector consists of a strip of high conductivity material secured onto the ends of the substratum, so as to run substantially along the widths of the strips to be incorporated. One embodiment of this terminal consists of a long clip of such material, which is crimped over the end of the substratum with the thin film deposited subsequently. Another embodiment consists of a staple, which has a body long enough to run substantially along the widths of the strips to be incorporated. The arms of the staple penetrate into the substratum, securing the body of the staple

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onto the substratum, with the thin film deposited subsequently. In these instances also, the thermal expansions encountered can be limiting factors in use.

The electrode terminals positioned at, and running substantially along, the width of the ends of the convoluted series resistor serve to collect the current and conduct it to the electrode lead-off without danger of thin film burnout. Since they perform the same basic function of current collection as do the interconnectors, the same considerations as to conductivity, bonding, and thermal expansions are involved. The solutions are also basically the same, with one embodiment comprised of a deposit of a high conductivity material onto the substratum with the thin film subsequently deposited, another embodiment comprised of a clip of a high conductivity material to be crimped over the substratum with the thin film subsequently deposited, and another embodiment in the form of a staple, with the arms of the staple driven into the substratum, securing the body of the clip to the surface of the substratum with the thin film subsequently deposited.

Lead-offs in electrical contact with the electrode terminals provide means for connecting the thin film resistor to a source of electrical power. The lead-offs must be of a high conductivity, and must be able to maintain contact with the electrode terminals throughout the temperature expansion cycles. Several embodiments of the lead-offs will be described below with reference to the drawings.

The protective coating applied as a final step in construction of the heating element is preferred, depending upon the utilization of the heating element. This protective coating provides an inert, durable, smooth, abrasion-resistant surface of particular utility in certain food preparation techniques, such as in grilling. Since the protective coating is deposited superposed over the various layers of interconnectors, thin film resistor, electrode terminals, and electrode take-offs, it must be capable of withstanding the temperature expansions encountered during production and use. Two materials exhibiting the necessary characteristics for use in the protective coating are porcelain and fluorocarbon resins such as polytetrafluoroethylene, e.g. Teflon (T.M.). In some cases, such as when polytetrafluoroethylene resin is used, a prime coat should be first applied to the thin film in order to produce the required smoothness in the final protective coating.

With reference to FIGS. 1 and 2a, a preferred heating element is comprised of an insulating substratum 10, a thin film metallic resistor 12 deposited as five superposed strips onto the substratum, interconnectors 14, electrode terminals 16, electrode lead-offs 18 and a protective coating 20 covering the above configuration.

As seen in FIG. 2a, the insulating substratum 10 of the preferred embodiment utilizes a layered configuration of thin asbestos millboard 22 interspersed with thin aluminum reflecting layers 24. Although any number of layers of millboard with reflectors could be employed, the preferred embodiment illustrates a four layered substratum consisting of a 0.002-inch aluminum reflector 24 below each sheet of 0.064-inch asbestos millboard 22. While other configurations of insulating substratums, other types, and other dimensions could be used, the illustrated substratum 10 has

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proved highly satisfactory in providing the basic structural, insulating and bonding qualities needed for the thin film resistor 12.

The thin film resistor 12 in FIG. 1 is comprised of 5 superposed strips of Nichrome V, each strip 9.5-inches long, 1-inch wide, and 0.002- 0.005-inches thick, formed by flame spraying 4-5 passes back and forth, and connected into a series resistance pattern through the use of the interconnectors 14. As an example of the higher resistance per cross-sectional area and per unit mass attained by the flame sprayed resistor 12, the illustrated resistor 12 has a resistance of 4.36 ohms, and with a thickness of 0.003 inches weighs less than 5 grams. By contrast, solid Nichrome V of the same pattern would have a resistance of about 0.65 ohms, and solid Nichrome V of equivalent resistance would weigh approximately 21 grams. This increased resistance per unit 0.003 inches weighs less than 5 grams. By contrast, solid Nichrome V of the same pattern and like dimensions would have a resistance of about 0.65 ohms, and solid Nichrome V of identical cross sectional dimensions and equivalent resistance would require a much greater total length and would weigh approximately 21 grams. This increased resistance per unit weight or dimension of a thin film resistor, formed in several passes by flame spraying, achieves significant benefits. For example, the smaller electrode mass of the thin film enables a faster rise time to operating temperature in comparison with solid metal.

As noted before, the smooth millboard 22 used in the substratum 10 provides adequate smoothness to ensure against burnout of the 0.002- 0.005 inch thin film 12; also, the resistance of the thin film 12 can be altered somewhat by varying the direction of deposit relative to the millboard 22. In the embodiment of FIG. 1, the resistance of the 0.003 inch thin film 12 can be doubled, to 8.7 ohms, by depositing the film 12 in strips across the substratum 10, a 90 (degree) change in direction of the strips.

The interconnectors 14 in FIG. 1 are formed of copper, 0.010 inch thick, deposited by flame spraying onto the substratum 10 prior to the depositing of the thin film resistor 12. The bonds between the copper interconnectors 14 and the substratum 10 and between the copper interconnectors 14 and the Nichrome 12 are sufficient to withstand the thermal expansion of temperatures up to at least 1,150 (degree) F. The temperature at which the heating elements is heated is selected before the appliance is turned on. A sensor (not shown) detects when the heating elements have attained the selected temperature and relays the attained temperature to the thermostat that controls the heating of the heating elements.

When the deposited interconnectors 14 are used on the layered substratum 10, means must be provided for fastening the layers of millboard 22 and aluminum reflector 24 together. As seen in FIG. 1, preferred means for fastening comprises staples 26, extending into the substratum 10, with the staples 26 positioned around a one-fourth inch border of the substratum 10 left clear for this purpose.

Title	Priority Number	Priority Date	Application Date	Publication Date
Electrical heating elements for appliance	US198037892A	1980-Nov-17	1981-Oct-30	1982-May-17

Another form of interconnector to be used in the embodiment similar to that illustrated in FIG. 1 is illustrated in FIGS. 3-5 and has the form of a brass staple 28 0.010 inch thick, with a broad, flat head 30 and arms 32. The staple interconnector 28 is driven into the substratum 10, so that the head 30 is secured to the substratum and positioned similar to the deposited copper interconnector 14, with the head 30 running substantially across the width of the strip 12 of thin film. When this type of interconnector 28 is used, the aluminum reflector 24 must be cut away to avoid electrical contact with the arms 32 of the staple.

The electrode terminals 16, positioned at, and running substantially along the width of the ends of the convoluted series resistor, serve to collect the current and feed it to the electrode lead-offs 18 without danger of current density burnout. They must therefore be of appreciably higher conductivity than that of the thin film resistor 12. In the embodiment in FIG. 1, the electrode terminals 16 are formed of copper deposited onto the thin film 12. The electrode terminal 34, for use in the element shown in FIG. 3, is illustrated in FIG. 5 and is comprised of a brass staple, similar to the staple interconnector 28, with a hole 36 for the electrode takeoff drilled prior to securing the terminal 34 to the substratum 10.

The electrode leadoffs 18 provides the means of connecting the thin film resistor 12 to a source of electrical power. FIGS. 2b, 2c, and 2d illustrate methods of accomplishing a good electrical contact between the electrode terminal 16 and the electrode lead-off 18 and are suitable for use with either the copper deposited terminal 16 (FIG. 1) or the staple terminal 34 (FIG. 5). The lead-off 18 illustrated in FIG. 2b is a brass stud 38 comprised of a head 40 a threaded shank 42, used in conjunction with a washer 44 and a hex nut 46. The head of the stud 40 is forced into good electrical contact with the terminal 16 through pressure exerted by the hex nut 46. A wire crimp cavity 48 is provided at the bottom of the shank 32. The thin film resistor 12 is deposited over the substratum 10, interconnecting terminal 14, electrode terminal 16, and electrode lead-off 18 combination.

FIG. 2c illustrates an alternative lead-off 50, again constructed of a brass stud with its head 52 forced into good electrical contact with the terminal 16, through pressure exerted by a push-on nut 54. Again a washer 56 is utilized, and a wire crimp cavity 58 is provided.

FIG. 2d illustrates another alternative lead-off 60, comprised of a copper rivet, utilized in a manner similar to those lead-offs in FIG. 2a and FIG. 2b.

When the leadoffs in FIGS. 2b, 2c, and 2d are used with copper deposited interconnectors, the aluminum sheets 24 used in the substratum 10 must be cut away in order to avoid contact with the leadoffs.

As noted in the figures, the thin film 12 is deposited over the interconnectors 14, the electrode terminals 16 and electrode lead-offs 18. Care must be taken that the bondings between these elements are sufficient to withstand the temperatures encountered; as example, where Nichrome is

Title	Priority Number	Priority Date	Application Date	Publication Date
Electrical heating elements for appliance	US198037892A	1980-Nov-17	1981-Oct-30	1982-May-17

deposited onto brass, a better bond can be obtained if a layer of copper is first deposited onto the brass, with the Nichrome deposited subsequently.

Other interconnectors 62, electrode terminals 64 and electrode take-offs 66 are illustrated in FIGS. 6-10. The interconnector 62 is comprised of a phospher bronze clip, thereby providing the required high conductivity, is crimped at the appropriate positions on the edges of the substratum 10 and runs substantially along the widths of the strips 12, which strips 12 are deposited subsequently. The bottom layer of the aluminum reflecting strip 24 must be cut away to avoid electrical contact with the clip 62, as seen in FIG. 7.

The electrode terminal 64 is similarly comprised of a phospher bronze clip, crimped at the ends of the resistor 12 with a take-off arm 66 extending therefrom, and a hole 68 drilled in the take-off arm 66 for external connection.

The thin film 12 is, as in the prior cases, deposited over the phospher bronze clips 62 and 64, in order to obtain adequate electrical contact.

The protective coating 20 is applied as a final step. Some coatings, such as polytetrafluoroethylene resin, will need a smoothing undercoat 70 as seen in FIG. 2b.

Choice of take-off and terminal method is dictated somewhat by the choice of protective coating: if, for example, porcelain is chosen as the protective coating, the relatively high bakeout temperature of 1,150 (degree) F. might dictate a take-off such as those in FIGS. 2b or 2c, since these provide less chance of damage by thermal expansion. However, the take-off illustrated in FIG. 2d is quite adequate for the 700 (degree) F. bake-off temperature needed for a polytetrafluoroethylene resin. The staple interconnector 28 and electrode terminal 34 enable bonds particularly resistant to damage by thermal expansions, due to the positive gripping by the arms 32 of the staple. The clips 62 and 64, however, are more suitable for lower temperature uses, such as with a polytetrafluorethylene resin.

The preferred embodiment of the heating element in FIG. 3 is, for purposes of illustration, incorporated into a grilling device illustrated in FIGS. 11-13. The heating element 72, as described above in reference to FIG. 3, has a resistance of 4.36 ohms. As seen in FIG. 11, two of these heating elements 72 are connected in series, used in conjunction with a thermostatic control 74, a time control 76, and a power source connection 78.

The cutaway view in FIG. 12 illustrates the internal configuration, somewhat blown-up for purposes of illustration, comprised of a heating element 72, two layers of 0.064-inch asbestos millboard 80 and 0.002-inch aluminum 82, and two layers of one-fourth-inch air cell asbestos 84 with aluminum reflecting foil on one side, all enclosed in an aluminum outer casing 86.

The thermostat 74 is positioned between the layers of millboard 80.

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Electrical heating elements for appliance	US198037892A	1980-Nov-17	1981-Oct-30	1982-May-17

In the configuration shown, with the two 4.36 ohm heating elements 72 connected in series across a 120V driving potential, the heating elements will attain their 500 (degree) F operating temperature in less than 2 seconds. The outer casing 86 will get no hotter than about 150 (degree) F. This is an extremely short time rise to operating temperature and provides extremely fast heating. For example, a frozen pop tart placed in between the two heating elements will be heated through in exactly 40 seconds, whereas a slice of bread will be toasted by the pair of heating elements in exactly 5 seconds. The embodiment is extremely efficient due both to the short time rise to operating temperature and to the efficient insulating configuration.

Other embodiments of the invention could include, for example, a configuration such as in FIG. 11 with a reflecting element taking the place of one of the heating elements, and an 8.72 ohm heating element opposed.

European Patent Publication No.2B5

Title	Priority Number	Priority Date	Application Date	Publication Date
Toaster	EP07845231	1987-Jan 21	1988-Jan 20	1988-Jul 21

Document Classification	
IPC Subgroup	A47J003706, A47J003708
CPC - Current	A47J003708 | A47J00370611

Fig.1.

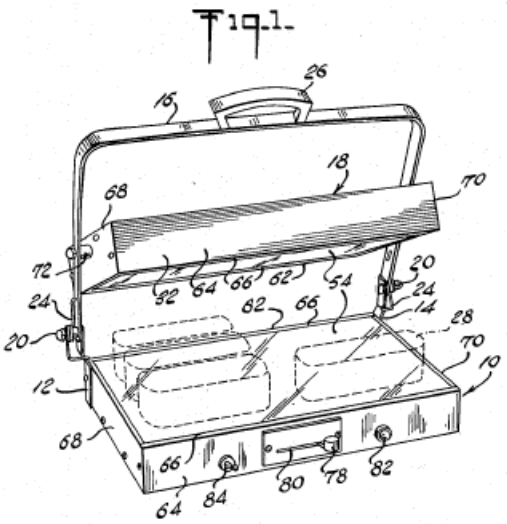


Fig.2.

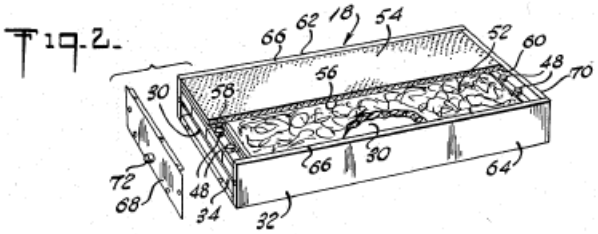
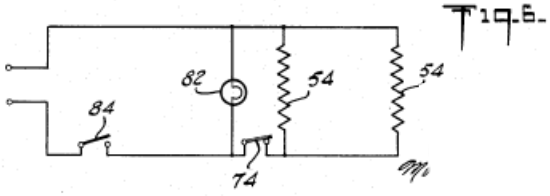
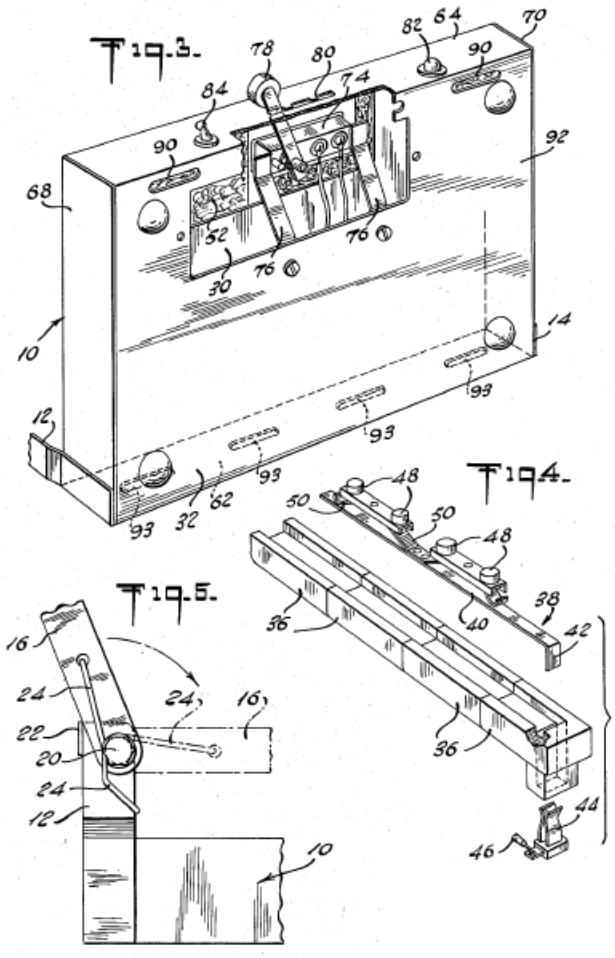


Fig.6.



European Patent Publication No.2B5

Title	Priority Number	Priority Date	Application Date	Publication Date
Toaster	EP07845231	1987-Jan 21	1988-Jan 20	1988-Jul 21



Title	Priority Number	Priority Date	Application Date	Publication Date
Toaster	EP07845231	1987-Jan 21	1988-Jan 20	1988-Jul 21

This invention relates in general to toasters and in particular to a new and useful toaster having a toasting surface comprising a material of low thermal conductivity such as glass having one surface coated with a thin film of electrically conductive material through which electrical current is passed to raise the temperature of the opposite surface for toasting foods.

The present invention includes, in one embodiment, a flat surface toasting element having a low thermal conductivity factor (K) in the range of 0.3 to 0.9 B.t.u. (hr.) (square foot) (F./ft.) at normal ambient temperatures, e.g., "Pyrex" glass with a conductivity factor of 0.63 which is evenly heated over its entire area by a conductive coating on the underside thereof and which is connected electrically to a source of power through conductive cross strips arranged at each end of the plate.

In present toaster constructions it is usual to use materials with high thermal conductivity for the toasting surfaces, such as aluminum (K of 124) or stainless steel (K of 13). In using such toasting surfaces it is not too uncommon to find that bread or rolls which are toasted thereon are blackened in certain areas and not toasted in other areas. The reason for such uneven toasting is that the rolls or bread present roughened uneven surfaces which contact the toasting element at various spaced locations along the undersurface of the bread or rolls. At the areas of contact with the toasting element a high rate of toasting is effected because as fast as the heat of the toasting element is absorbed by the roll, the conductive material of the toaster surrounding the contacting areas conducts the heat to maintain these areas at elevated temperatures. As fast as the roll is heated at these areas the toaster surface in contact therewith is heated by conduction from the other portions of the element. The result, of course, is a generally unsatisfactory blackening of the toasted buns along the outwardly extending roughened areas rather than an even brown toasting thereof.

In accordance with the present invention, material of low thermal conductivity is used as the toasting element surface and this surface is uniformly heated throughout its entire area by a thin coating of electrically conductive material which is connected in an electrical circuit to raise the temperature thereof. The temperature of the toasting surface can be set by the user of the toaster by moving a lever of the toaster to select a temperature that falls in the range of between 300 and 600 F. It was discovered in accordance with the invention that toast, rolls and similar materials which are placed near the toasting surface of the toaster are browned uniformly and quickly and without the resulting blackened areas caused when using previous toasters. The toasting element of low thermal conductivity does not present areas of high thermal conductivity in contact with the rolls or bread but rather the heat is uniformly spread throughout the whole toasting surface area. Since the toasting element is of low thermal conductivity when points of contact with the rolls are made there is no tendency to continue to furnish heat at these areas at the expense of other heating areas and hence the rolls are evenly toasted.

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Toaster	EP07845231	1987-Jan 21	1988-Jan 20	1988-Jul 21

In addition to this advantage, the toasting element effects heating by radiation and convection in addition to conduction and this has been enhanced in the present construction by roughening the heat resistant material's toasting surface to present a multiplicity of high contact areas while maintaining a similar multiplicity of low areas out of contact with the bread or other foods to be toasted so that radiant heat toasting is more effective, and convective heating from circulating hot air is facilitated between the toasting surface and the food to be toasted. The circulating hot air and radiant heat hit those spots of the bread not in contact with the toasting surface and contribute to the even toasting of the total surface of the bread. In the present invention the high contact areas are .006 to .010 inch above the low areas out of contact with the elements to be toasted.

A further feature of this invention is the provision of a handle support for pivotally supporting one toasting element of a cooperative pair of elements and arranging the handle and one of the elements so that it may be balanced above the other element in an open position or swung downwardly over the other element. The handle construction is such that the top element may be positioned in close cooperating contact with the bottom element, when thin foods are to be toasted, or may be positioned in a raised spaced position above the other element when large foods, such as thick rolls, are to be toasted.

Accordingly, it is an object of this invention to provide an improved toaster.

A further object of this invention is to provide a toasting element having a toasting surface provided by a material of low thermal conductivity, the underside of which is heated by a coating of electrically conductive material applied over substantially the entire surface thereof.

A further object of this invention is to provide a toaster for rolls, bread and the like comprising a toasting surface of a material of low thermal conductivity having its underface coated with a uniform coating of electrically conductive material which is connected in an electrical circuit to heat the toasting surface, and including a similar cooperating toasting surface which is positioned on a handle element which may be swung to an open position pivotally suspended above the first element, or to a closed position aligned above the first element.

A further object of this invention is to provide a toaster which is simple in design, rugged in construction and economical to manufacture.

For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descriptive matter in which there is illustrated and described a preferred embodiment of the invention.

In the drawings:

FIG. 1 is a perspective view of a toaster constructed in accordance with the invention;

FIG. 2 is a perspective view partly broken away of one of the toasting panel assemblies;

FIG. 3 is a bottom perspective view of the lower toasting panel assembly with the access cover removed;

FIG. 4 is an exploded perspective view of the electrical terminal elements and support for the heat resistant toasting plate;

FIG. 5 is a fragmentary side elevation of the lower toasting element mounting bracket for supporting the upper toasting element handle; and

FIG. 6 is a schematic electrical diagram of the toaster.

Referring to the drawings in particular the invention as embodied therein includes a lower toasting panel assembly generally designated 10 having upstanding bracket members 12 and 14 arranged at each corner of one side, for pivotally supporting a U-shaped handle 16, which, in turn, pivotally supports an upper toasting panel assembly generally designated 18. The U-shaped bracket 16 is pivotally supported on bolts 20 which fit into the brackets 12 and 14 and it rests against a laterally extending portion 22 (FIGURE 5) of the associated bracket 12 or 14 when it is in an upright or open position (FIGURE 1). A coil spring 24 is connected to each leg of the handle 5 is located on the front face of the lower toasting panel 16 and is wound around a bolt 20 and has its opposite end positioned across the end of the associated bracket 12 or 14. When the U-shaped handle is moved downwardly it must do so against the force of the spring 24 which tends to support it in an upward position. The U-shaped 10 thermostat is directing current to each of the plates 54 in response to a sensor that senses the temperature of the heating plates 54 in order to maintain the temperature selected by the user.

Bracket 16 is provided with an outwardly extending portion 26 to permit it to be swung up and down by grasping this portion with the hand. A feature of this construction is that when the upper toasting element 18 is swung downwardly in position over articles such as rolls 28 located on the lower toasting element 10, the handle 16 forms a front guard surface to prevent contact with the upper heating element 18 by the user's fingers.

The U-shaped handle 16 is biased to an upright position by the spring 24 but the panel 18 is just heavy enough to maintain the toaster in a closed position when resting on the lower assembly 10.

In accordance with the invention each of the toasting panel assemblies 10 and 18 includes a plate 30 which is positioned against the inside surface of an outer U-shaped channel member 32 of the panel assemblies. A plurality of U-shaped channel blocks 36 (FIGURE 4) made of an insulation material, are arranged along each edge of the plate 30. The blocks 36 accommodate electrical contact elements generally designated 38. The contact elements 38 include a flat horizontal base portion and a substantially vertical portion 42 which fits into an upper toasting panel assembly, each panel assembly has an electrical socket member 44 which is electrically connected through terminals 46 to a source of power. The electrical socket member 44 is connected to a timer which can have a pre-

selected duration chosen by the user for delivering current to the system and thereby heating the heating plates 54 for the selected duration. It should be appreciated that the timer can be adjusted by the user independently of the temperature lever. Each of the contact elements 38 is provided with spaced cylindrical carbon contact members 48 which are located on spaced upwardly extending resilient members 50, 50 which are secured to the horizontal portion 40 of the contact elements.

An insulation material 52 such as fiber glass or the like is positioned on the U-shaped plate 30 between the contact elements 38. In accordance with the invention a plate of low thermal conductivity generally designated 54, which is provided with a thin uniform coating of 60 elements for energizing said films of the upper and lower electrically conductive material 56 on its lower face, is positioned on top of the insulation with a solid electrically conductive strip area 58 and 60 on each edge aligned over the contact elements 38 and in touching contact with the carbon contact members 48. The plate is preferably made of a durable material of low thermal conductivity such as a glass. The channel member 32 is constructed, and the plate 54 is dimensioned, so that side walls 62 and 64 of the channel member 32 may be sprung apart to permit positioning of the plate 54 under upper flange 60. End plates 63 and 70 are screwed on each end of the channel member 32 to hold the complete toasting panel assembly together. The upper toasting panel assembly 13 is provided with outwardly extending lugs 72 which extend into openings of the handle 16 for pivotally supporting the toasting panel,

A feature of the invention is that a thermostat element74 (FIGURE 3) for temperature control of the unit is mounted on a pair of spring members 76, and bolted to the underface of the panel assembly 10. The thermostat 74 includes a lever arm 78 which extends through a slot 80 in the front face of the toasting panel assembly 10 and which may be moved backwardly and forwardly to adjust the temperature of the heating plates 54 on each of the toasting panel assemblies 10 and 18. Each of the plates 54 of the lower toasting panel assembly 10 and the upper toasting panel assembly 18 are connected in parallel along with a pilot light 32. A switch 84 is connected in series with the thermostat and to a suitable source of power. The pilot light is located so that when the switch is closed the light will always be lighted.

The U-shaped channel member 32 is advantageously vented by means of openings 90 in a bottom wall 92 and similar openings 93 in the back wall 62 which cause a chimney like venting of the toasting panel assembly 10.

The invention provides a toaster which is particularly adaptable for toasting hot dog rolls which may be uniformly toasted to a rich golden brown coloration. Since the temperature is very uniform over the complete toasting area there is very little likelihood of scorching or of the plates are advantageously roughened to provide a multiplicity of recessed areas through which radiation heating can proceed. The unit permits a large portion of the toasting to be accomplished by radiation without any real danger of burning the food being toasted.

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Toaster	EP07845231	1987-Jan 21	1988-Jan 20	1988-Jul 21

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the invention principles, it will be understood that the claimed invention will encompass variations that depart from such principles.

European Patent Publication No. 2B6

Title	Priority Number	Priority Date	Application Date	Publication Date
Cooking appliance	EP0951753A	1978-Dec-12	1979-Dec-12	1981-Jun-23

Document Classification	
IPC Subgroup	A47J003706
CPC - Current	A47J00370611

FIG. 1

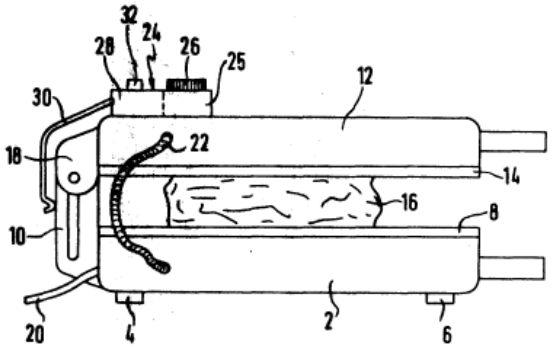
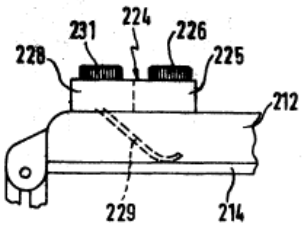


FIG. 2



European Patent Publication No. 2B6

Title	Priority Number	Priority Date	Application Date	Publication Date
Cooking appliance	EP0951753A	1978-Dec-12	1979-Dec-12	1981-Jun-23

The invention relates to an electrical contact cooking appliance such as a contact grill or waffle maker with two movable hotplates relative to each other that can be moved into an operating position so that the hotplates are close to the food to be cooked or heated.

In known contact grills usually a predetermined working temperature is adjustable, but the user needs to supervise the cooking process to get good results.

The purpose of the Invention is to create a contact cooking appliance such as a contact grill or waffle maker with a greater operating convenience that does not require supervision.

The contact cooking appliance has a timer which after a pre-selectable time switches off the hotplates. The contact cooking appliance also has a knob for selecting a particular heating temperature in a range of 150°C to 350°C. A temperature sensor within each hotplate measures the temperature of the hotplates. When the selected temperature is reached, the sensor triggers a locking mechanism to lock the hotplates in an operating position. Once the plates are locked in the operating positon, the timer switch starts. On the device there is knob for setting the duration for heating the hotplates and the time switch will automatically start when the hot plates are locked. The lock can have a manual unlocking button instead of the temperature sensor or in addition to the temperature sensor.

Fig. 1 is a side view of a contact grill device wherein the upper and lower hotplates are locked in an operating position.

Fig. 2 is a cross-section side view of a contact grill device.

Fig. 1 shows a contact grill having a housing 2 with feet 4 and 6, whose top is formed by a lower hot plate 8. A joint arm 10 is connected to the housing on a side wall. The housing 2 also has an upper housing 12, whose bottom is formed by a hot plate 14. Food to be heated or cooked is placed between hotplates 8 and 14. The joint arm 10 engages with a connector 30 that is connected to upper housing 12. The. upper housing 12 has a joint 18 on one side, interacting with the joint arm 10 of the housing 2 to enable the upper hot plate 14 to be moved closer to the food to be heated or cooked. An electrical power cord 20 passes from the housing 2 to an electrical outlet (not shown). An electric current supply and control line 22 passes from the housing 2 to the upper housing 12. A control box 24 containing a timer switch 25 is fitted to the top of the upper housing 12. A rotary knob 26 is used to set the timer switch 25. A connector 30 and the joint arm 10 can be disengaged by pressing the manual unlocking button 32. By disengaging the joint arm 10 and the connector 30, the timer switch disengaged and the upper hotplate 14 can moved out of the way so that the lower hot plate 8 can be used solely for heating or cooking food or heating a cooking utensil such as a frying pan.

Fig. 2 shows a contact grill having an upper housing 212 with a top hot plate 214. A control box 224 is arranged on the upper housing 212 containing a timer switch 225 with a time setting knob 226 as

well as a temperature selection knob 231. Also located in the control box is a thermostat 228 that controls the heating of the hotplate 214 by receiving signals from the temperature sensor 229 in hotplate 214.

The above contact cooking appliances offer not only greater operability, but also increased safety. The appliance offers protection against accidental switch on, because it automatically turns off after the set period of time and remains switched off. An added safety feature is the one or both of the hotplates can be coated with a non-stick coating such as anodized aluminum. The combination of non-sticking surface and the ability to set the timer switch and select the heating temperature ensures that the food will not be burnt.