June 3, 1941. G. W. WATSON 2,243,993

ELECTRIC COOKER

Filed Dec. 5, 1938 2 Sheets-Sheet 1

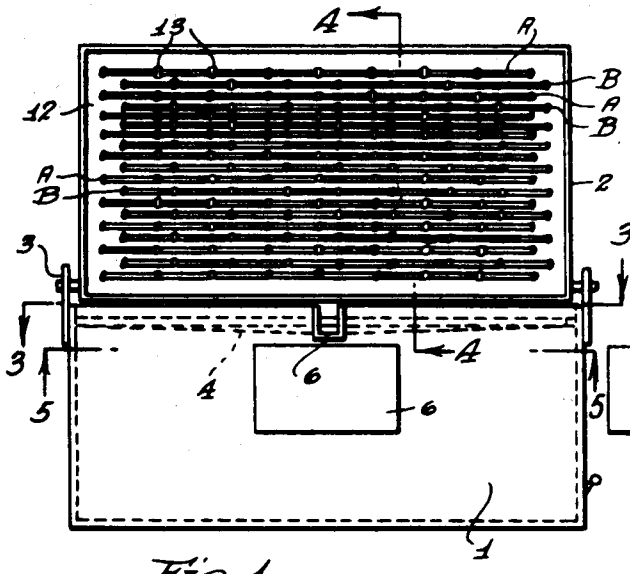


Fig. 1.

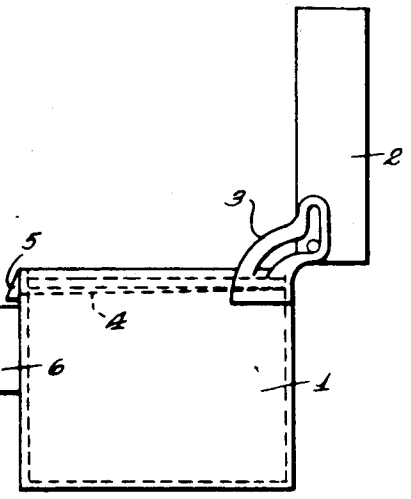


Fig. 2.

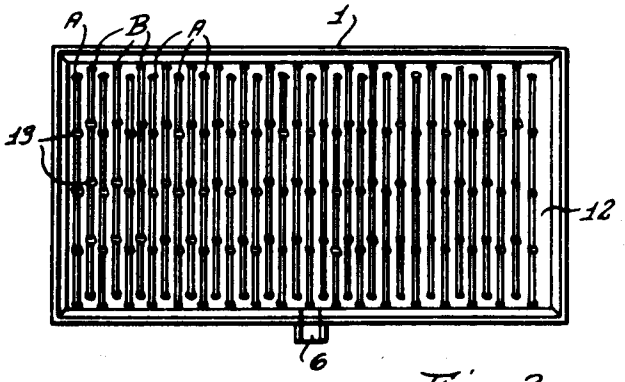


Fig. 3.

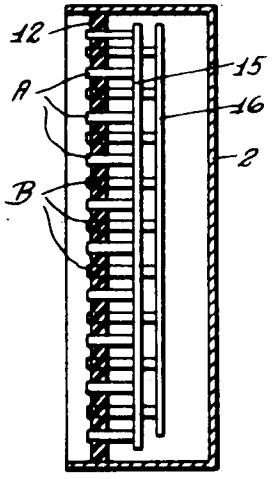


Fig. 4.

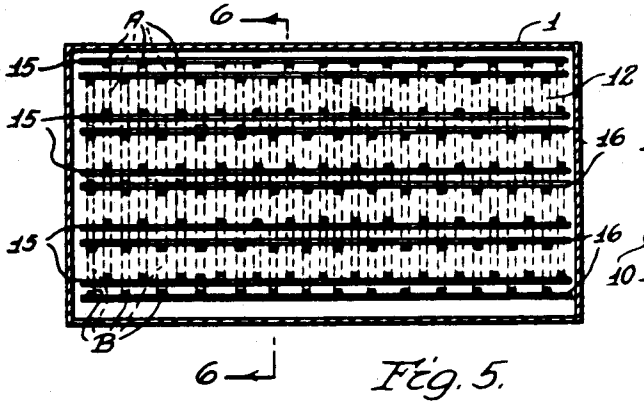


Fig. 5.

Fig. 9.

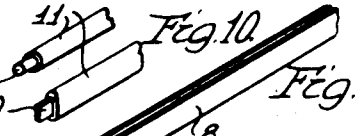


Fig. 10.

Fig. 7.

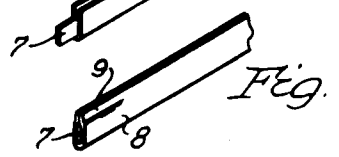


Fig. 8.

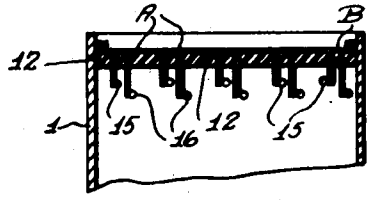


Fig. 6.

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June 3, 1941. G. W. WATSON 2,243,993

ELECTRIC COOKER

Filed Dec. 5, 1938 2 Sheets-Sheet 2

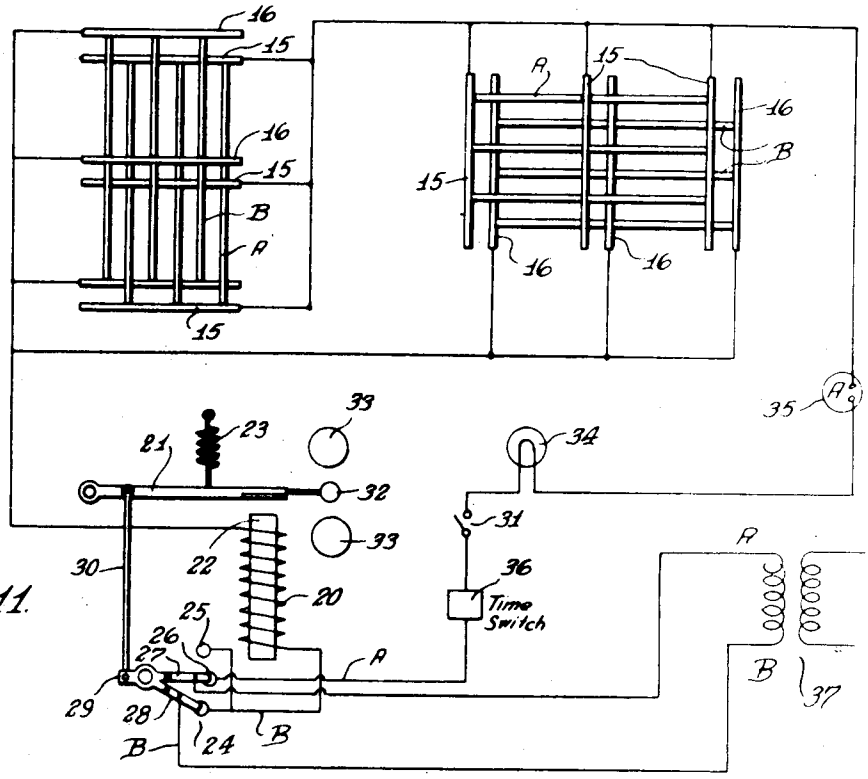


Fig. 11.

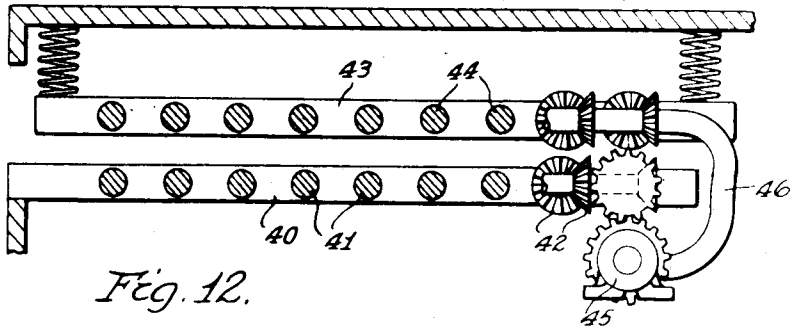


Fig. 12.

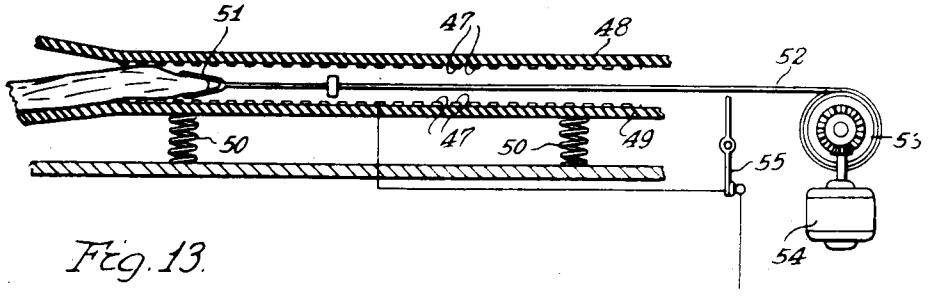


Fig. 13.

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Patented June 3, 1941

2,243,993

UNITED STATES PATENT OFFICE

2,243,993

ELECTRIC COOKER

Glenn W. Watson, Detroit, Mich., assignor to Penweld Corporation, Detroit, Mich., a corporation of Michigan

Application December 5, 1938, Serial No. 243,923

4 Claims. (Cl. 219—19)

The present invention pertains to novel apparatus for the preparation of food by the use of electric currents passed therethrough and over the surfaces, and reside in various improvements and simplifications of the devices shown in my copending application Serial No. 217,941, filed July 7, 1938, now Patent No. 2,200,406, and in the co-pending application of Glenn W. Watson and Earl C. Brannas, Serial No. 213,197, filed June 11, 1938, now Patent No. 2,200,405. Some of these applications disclose means whereby the food is subjected to current in four directions, namely, two currents through the food in opposite directions, and a current on each of the two principal surfaces for browning. I have previously used two different types of conductors in this operation, namely, a conductor of comparatively low resistance for the currents to be passed through the food, and a heat-radiant conductor for browning the surfaces by radiation as well as by the currents thereby caused to flow on the surfaces of the food.

One of the improvements introduced by the present invention resides in the use of only one type of conducting material for performing all the functions named above. The conducting elements are nevertheless arranged and connected to provide the four currents previously referred to. The conducting material here employed is one that radiates heat when current is passed therethrough, and may consist, for example, of conventional toaster wire, Globar metal, iron, tin, suitable alloys, and in fact any material having the property of radiating heat when subjected to the particular current for which the apparatus is designed. Further, this material is preferably sheathed in tin or a similar conducting material that does not deteriorate by constant contact with the food under cooking temperature. The elements thus constituted are grouped in the apparatus in a manner to engage opposite surfaces of the food and are so connected electrically in the circuit as to perform the two functions of permitting current to pass through the food for cooking the interior and of browning the surfaces by heat radiation as well as by surface currents.

Another object of the invention is to connect the elements in the circuit in such a manner that the current is uniformly distributed throughout their entire length rather than concentrated in only a part of the length.

Still another object is to provide a checkered effect in the browned surfaces. In this respect, the apparatus includes two sections for engaging opposite surfaces of the food. Each element is provided with a number of elongated and parallel elements, the elements in one section being perpendicular to those in the other. The initial browning is therefore in the form of straight and parallel lines on each surface, those on one surface being perpendicular to those on the other. The food is turned over after having been given a preliminary treatment, and in this manner perpendicular lines or a checkered effect are formed on each surface.

Another characteristic of the apparatus is that the food under treatment constitutes an automatic switch controlling the flow of current. The various circuits include the food itself in the current pass. I have observed that the current ceases to flow after a certain period of treatment of the food, from which it must be concluded that the food becomes non-conducting at the end of this interval. This may possibly be explained on the theory that the food loses much of its moisture content during this period, or at least is so changed in its properties that it is no longer a good conductor. However, I have also observed that the flow of current through the food may be resumed if the direction or polarity is reversed. In this connection, another object of the invention is to provide an automatic pole changer that reverses the direction of the current and permits another flow of current after the first flow has ceased.

Still another object of the invention is to provide apparatus wherein the food is propelled between opposed series of elements and cooked by these elements. As far as I am aware, I am the first to cook food by conveying it through an apparatus of this character.

The invention is fully disclosed by way of example in the following description and the accompanying drawings, in which:

Figure 1 is a front elevation of the apparatus, with the lid raised;

Figure 2 is an end view thereof;

Figure 3 is a plan section on the line 3—3 of Figure 1;

Figure 4 is a cross section of the lid on the line 4—4 of Figure 1;

Figure 5 is a bottom plan section on the line 5—5 of Figure 1;

Figure 6 is a section on the line 6—6 of Figure 5;

Figures 7 and 8 are detail perspective views illustrating the formation of the elements;

Figures 9 and 10 are similar views pertaining to a modified form of element;

Figure 11 is a wiring diagram;

Figure 12 is an elevation, partly in section, of a modified form of apparatus through which the food is propelled, and

Figure 13 is a similar view of a modification of this type of apparatus.

Reference to these views will now be made by use of like characters that are employed to designate corresponding parts throughout.

In Figures 1 and 2 the apparatus is shown as comprising a base section 1 having a lid 2 attached by means of a variable hinge 3 permitting variation in the elevation of the lid 2 in its lowered position. The top of the base 1 and the bottom of the lid 2 carry electrical units, described in detail below, for conducting current to the food and distributing it in several paths, as will appear more fully hereinafter. A trough 4 is formed around the lower unit and is inclined downwardly and forwardly, as shown in Figure 2, and discharges into a spout 5 through which the juices emitted from the food during cooking are conveyed to a suitable receptacle 6 mounted on the forward wall of the base 1.

The electrical units are made up of elements of the character shown in Figures 7–10. The construction shown in Figures 7 and 8 includes a flat strip 7 of a material adapted to conduct current and to radiate heat when subjected to the current for which the apparatus is designed. Any material having these properties may be employed. Examples thereof are conventional toaster wire, Globar metal, iron, tin, and various alloys. It has been found that at least some of these materials deteriorate by constant contact with the food under the cooking temperature, and to obviate this difficulty I enclose each strip in a sheath 8 of a more durable conducting material such as tin. The sheath is initially in the form of U or V, as in Figure 7 and the ends thereof firmly clamped together as at 9 in Figure 8. It will be understood that these operations may be performed very rapidly and inexpensively by suitable automatic machinery.

In a modification of the element, the inner conducting and radiating material is in the form of a wire 10 and is sheathed in a tube 11 having the properties of the sheath 8. The tube is then rolled flat as in Figure 10. In most cases, the ends of the inner member are exposed, for a purpose that will presently be described, and the sheath is pressed fluid tight around the portion it surrounds.

Each of the units previously mentioned includes a panel 12 of suitable insulating and supporting material of such size as to be fitted in the base or the lid, as the case may be. The elements are inserted therein to form series of parallel lines, the base being formed with lined slots 13 to receive the ends of adjacent elements. It will be seen by reference to Figures 1 and 3 that the slots of alternate lines form parallel rows, each such row being distinct or spaced from the others and no two rows coinciding. In other words, the slots or joints of alternate lines of element are staggered with respect to the joints or slots of the intermediate elements.

For the purpose of clarity in description, the two sides of the circuit will be designated as A and B. Alternate lines A of elements are connected to the side A, and the intermediate lines B are connected to the side B. To effect this arrangement, the various elements are turned down into the slots 13, the bare ends previously mentioned being exposed at the rear or concealed surface of the panel 12. At the exposed surfaces of the panels, the elements are fully sheathed. The slots 13 are also sealed by solder dropped therein which also joins the bare ends of alined elements.

Bus bars 15 lying transversely of the elements are connected to the joined ends of series A, which joined ends are alined as previously set forth. These bars are connected at one end to the A side of the circuit. Similarly, another set of bus bars 16 perpendicular to the lines of elements is connected to the alined joined ends of the B series; and these bars are each connected at one end to the B side of the circuit.

The inwardly protruding or adept ends of the two series of elements are preferably at different levels, as shown in Figure 6, to avoid interference of the bus bars with each other and to facilitate assembly. The lines of elements of each unit are perpendicular or at a different angle to those of the other unit, although the lines in a given unit are parallel to each other and interconnected in like manner by bus bars and alternately to opposite sides of the circuit. This relation is illustrated in Figures 1 and 3 and also diagrammatically in Figure 11.

In the operation of the device as thus far described, let it be assumed that current of proper voltage is applied to the circuit. The various accessories in the circuit will subsequently be described. It will be evident by examination of the Figure 11 that there is no means of conveying current between elements of the same unit or opposite units, so that there is no closed circuit unless such means is provided.

The food to be prepared is laid on the base element, and the upper element is brought down upon the food, and the current started through a suitable switch. The food then becomes a conductor between elements A and B on each surface of the food as well as between elements A and B at opposite surfaces. Four paths of current are thereby provided, namely, a current on each surface and two currents in opposite directions through the food, as fully explained in my copending application.

The surface currents brown the food, and the currents flowing through the food cook the interior thereof. The electrical conductivity of the food is due to certain properties. In meats, for example, it is the liquid and mineral content. I have observed that these properties disappear as the food undergoes treatment, and with the disappearance of these properties the current ceases to flow in any direction, moreover, in the case of many foods, the food becomes non-conductive when it has been cooked to a sufficient degree for edibility.

I have also observed that the flow of current may be resumed if its direction or polarity is reversed. Accordingly, I provide an automatic pole changer that operates on the stoppage of current in the first instance. This device comprises a solenoid 20 in series with the circuit and having an armature 21 normally withdrawn from the core 22 by a spring 23. A pair of spaced contacts 24 and 25 are provided in the B side of the circuit, and between them is a single contact 26 in the A side.

A pair of fingers 27 and 28 are pivotally mounted, and insulated from a common support 29 and are adapted to engage the intermediate contact 26 and either one of the remaining contacts 24 and 25. The fingers are connected respectively to the A and B sides of the circuit.

The common support 20 is joined by a link 30 to the armature 21.

When there is no current flowing, or when the apparatus is idle, the spring 23 withdraws the solenoid 21 and brings the fingers 27 and 28 into engagement with the contacts 26 and 24, as illustrated in Figure 11. As soon as the circuit is closed through the manual switch 31 and through the food as previously set forth, the magnet is energized, the armature attracted, and the fingers swung into engagement with contacts 25 and 26. When current ceases to flow through the food by the vanishing of the conductive properties of the latter, the armature is again withdrawn by the spring 23, and the polarity or direction of current thereby reversed. Under these conditions current again flows through the food and although it also flows through the solenoid, it has a lower value than in the first operation and is too feeble to attract the armature 21 against the tension of the spring 23. After an interval, the current ceases to flow entirely. This apparatus is used only for food requiring the second treatment.

The armature 21 may also carry a hammer 32 adapted to strike bells 33 at opposite sides thereon to indicate reversal of the current. By using this means as an indicator, the food may be removed after the first current treatment, if so desired.

The circuit may also contain a pilot light 34, a visible ammeter 35 and a time switch 36 for specifically controlled operation. The operating current is preferably supplied through a transformer 37 that alters the line voltage according to the requirements of the apparatus.

Figures 12 and 13 illustrate apparatus through which the food is propelled in cooking. In Figure 12 is illustrated a rigid frame 40 in which are journaled rollers 41 geared together at their ends at 42. Adjacent thereto is a resiliently mounted frame 43 carrying similar rollers 44 also geared to one another but normally spaced from the rollers 41 a sufficient distance to receive the food. The bodies of the rollers consist of conducting and heat-radiating properties as described above and are connected in the manner already described to furnish four currents through and on the surfaces of the food. A motor 45 is geared to a roller of one of the groups to drive that group and is connected by a flexible cable 46 to a roller of the other group.

In the construction shown in Figure 13, there are two spaced units similar to the units shown in Figure 11. The elements 47 of the units 48 and 49 are, however, parallel to one another and transverse to the direction in which the food is moved. Thus, the food is browned over the entire extent of both surfaces rather than along parallel lines as would be the case if the elements were parallel to the line of movement. One of the units is preferably rigid and the other resiliently mounted on springs 50. A hook 51 is provided between the units for grasping the food and is fastened to a cable 52 wound on a pulley 53 which is geared to a motor 54. A suitable switch 55 in the circuit governs the flow of current.

Referring again to the principal construction illustrated diagrammatically in Figure 11, it will be noted that the elements, because of their heat-radiating property, brown the surfaces of the food by radiation, and at the same time deliver the two surface currents and the two currents through the food in the manner described. Parallel browning lines are formed on each surface, but those on one surface are perpendicular or at different angle to those on the other. Thus, if the food is turned over, a mesh or checkered browning effect is formed on each surface, and this is the reason for the perpendicular arrangement of the elements.

Another important property of the invention is that current flow only through those bars that are engaged by the food. Thus, there is no waste of current in idle elements, as in other electrical devices.

The provision of the plurality of bus bars connected to intermediate points between the ends of each line of elements distributes the current more uniformly than a smaller number of bars connected merely at the ends of each line. In the latter arrangement the current would take the half of least resistance through and on the food, in close proximity to the bars, and the remaining area of the food would be neglected. This objection is avoided by the arrangement herein described.

Although specific embodiments of the invention have been illustrated and described, it will be understood that various alterations in the details of construction may be made without departing from the scope of the invention, as indicated by the appended claims.

What I claim is:

1. An electrical cooking apparatus comprising two units adapted to engage opposite surfaces of an article of food, each unit comprising a panel, parallel lines of conducting members thereon adapted to radiate heat at food-cooking temperatures, means electrically connecting alternate lines transversely at points intermediate their ends, dividing said lines into comparatively short lengths, means similarly connecting the intermediate lines, said two means being adapted for connection respectively to opposite sides of a circuit, the lines on one panel being at an angle to those on the other panel.

2. An electrical cooking apparatus comprising two units adapted to engage opposite surfaces of an article of food, each unit comprising a panel, parallel lines of conducting members thereon adapted to radiate heat at food-cooking temperatures, means electrically connecting alternate lines transversely, means similarly connecting the intermediate lines, said two means being adapted for connection respectively to opposite sides of a circuit, the lines on one panel being at an angle to those on the other panel.

3. An electrical cooking apparatus comprising two units adapted to engage opposite surfaces of an article of food, each unit comprising a panel, parallel lines of conducting members thereon adapted to radiate heat at food-cooking temperatures, means electrically connecting alternate lines transversely at points intermediate their ends, dividing said lines into comparatively short lengths, means similarly connecting the intermediate lines, said two means being adapted for connection respectively to opposite sides of a circuit, the lines on one panel being at an angle to those on the other panel, said members being sheathed in a conductive material resistant to repeated contact with food under cooking temperature.

4. An electrical cooking apparatus comprising two units adapted to engage opposite surfaces of an article of food, each unit comprising a panel, parallel lines of conducting members thereon adapted to radiate heat at food-cooking tem-

peratures, means electrically connecting alternate lines transversely at points intermediate their ends, dividing said lines into comparatively short lengths, means similarly connecting the intermediate lines, said two means being adapted for connection respectively to opposite sides of a circuit, the lines on one panel being parallel to those on the other, and means for propelling food between said units at a direction angular to said lines.

GLENN W. WATSON.