Dec. 5, 1939. O. W. LANG ET AL 2,182,383

MEANS AND METHOD OF PROCESSING CANNED FOODS

Filed Sept. 28, 1936 2 Sheets-Sheet 1

Fig. 1.

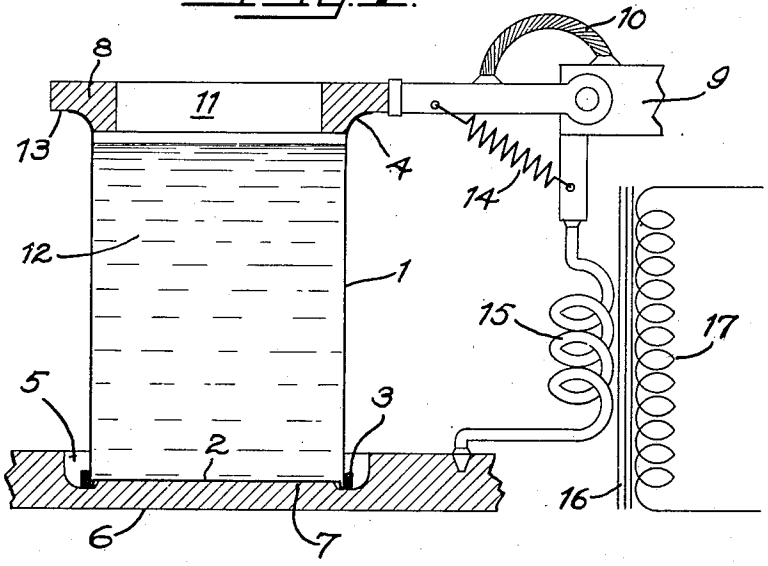


Fig. 2.

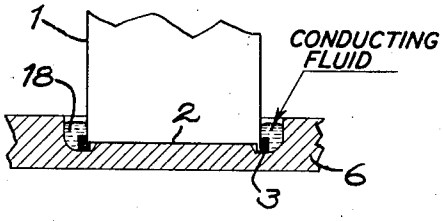


Fig. 3.

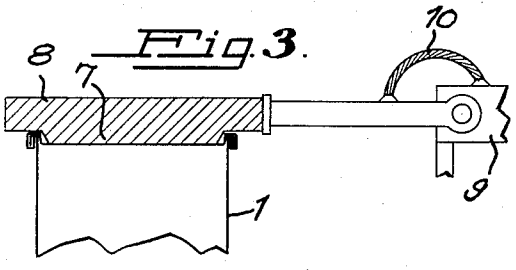


Fig. 5.

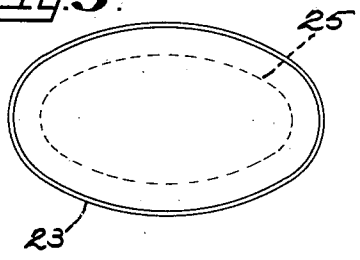


Fig. 4.

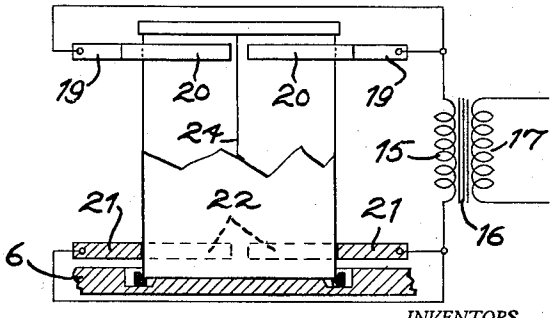
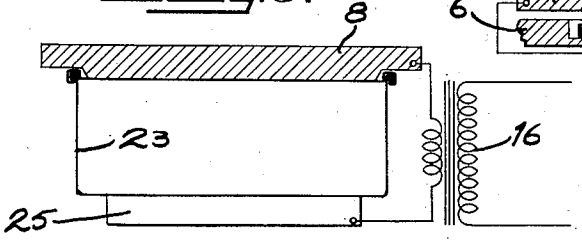


Fig. 6.



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Filed Sept. 28, 1936 2 Sheets-Sheet 2

Fig. 7.

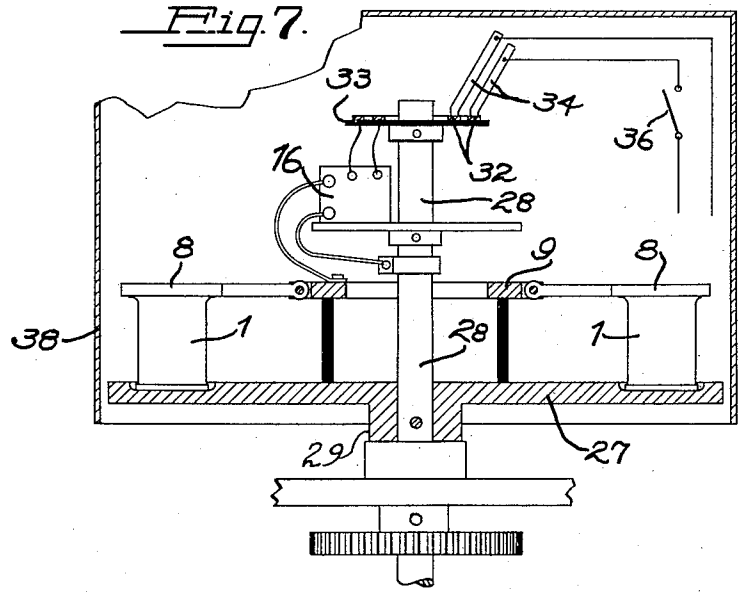
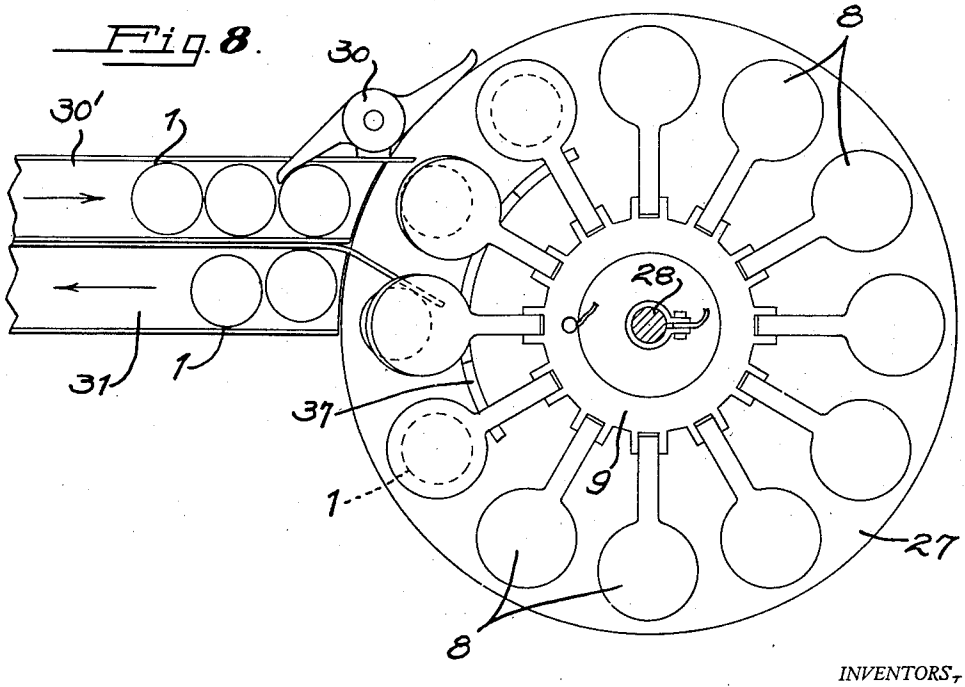


Fig. 8.



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MEANS AND METHOD OF PROCESSING CANNED FOODS

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Application September 28, 1936, Serial No. 102,855

3 Claims. (Cl. 53—20)

Our invention relates to a means and method for processing materials designed to be packed and sold in metal containers, and more particularly to a means and method for pre-heating, pasteurizing or cooking foods packed and sold in tin plate containers commonly known as cans.

Among the objects of our invention are: To provide a fast and economical method of heating food in cans during packing; to provide a simple method of preheating, pasteurizing or cooking food stuffs while being canned; to provide a means and method for heating canned food during processing so as to greatly reduce the space required in the processing plant; and to provide a simple and effective means and method for electrically cooking canned foods, or other organic materials, wet or dry.

Our invention possesses numerous other objects and features of advantage, some of which, together with the foregoing, will be set forth in the following description of specific apparatus embodying and utilizing our novel method. It is therefore to be understood that our method is applicable to other apparatus, and that we do not limit ourselves, in any way, to the apparatus of the present application, as we may adopt various other apparatus embodiments, utilizing the method, within the scope of the appended claims.

Referring to the drawings:

Figure 1 is a longitudinal, sectional view, conventionalized, of one embodiment of our invention as applied to pre-heating canned food.

Figure 2 is a fragmentary, sectional view of an alternative method of making connection to the lower part of the can.

Figure 3 is a fragmentary view in section of a top electrode as applied to a closed can.

Figure 4 is a view partly in section and partly in elevation of a can showing side contact electrodes.

Figure 5 is a plan view of an oval can indicating electrode contact area.

Figure 6 is a diagrammatic sectional view showing the can of Figure 5 positioned between two electrodes.

Figure 7 is a schematic sectional view of a pre-heating turntable.

And Figure 8 is a plan view partly in section looking down on the top of the turntable illustrated in Figure 7.

At the present time cannery practice consists broadly in placing food in cans which are formed from tin plate; the latter being usually a thin iron sheet protected on both sides thereof by a film of pure tin. The cans have many shapes, but are usually formed with the side walls in the shape of a cylinder, the top and bottom being rolled or crimped in place to form an airtight seal.

Inasmuch as the majority of canned foods are cooked during the packing process, the raw food is usually placed in the can and the can and its contained food are then pre-heated to definite temperatures to drive out gases and air contained therein, before closure. The top is then put on, spun into place, and the cans are given final cooking. The removal of the gases before the final cooking step prevents the covers from being strained by expansion of gas. Sometimes, however, as for example, in the case of condensed milk or canned beer, the covers are spun on and the can is then given a pasteurizing heating without pre-heating.

In prior practice it has been customary, in the pre-heating, pasteurizing or cooking steps, to conduct the can into steam boxes on conveyor belts, so that continuous progression may be obtained during the heating step. This necessitates rather large steam volumes to accommodate the long length of conveyor belt so that the cans may remain in the box for the proper length of time. Furthermore, the live steam supplied to these cabinets is continually escaping through the entrance and exit holes of the cabinet, and in order that even partial efficiency may be obtained the cabinets must be completely and rather heavily insulated.

Our invention, broadly, comprises eliminating the steam cabinet either for pre-heating, pasteurizing or cooking and substituting therefor electrical heating of the contents of the can by utilizing the tin plate side walls of the can itself as a resistance element, and passing therethrough electrical current of extremely high densities at low voltages until the desired heat is developed in the contents of the can. Our method is therefore not adapted to containers having insulating walls such as glass jars.

We are aware of the fact that it has previously been proposed to heat packaged foods by passing an electrical current through the food itself; and we are also aware of the fact that it has previously been proposed to place the food in special containers, such as graphite cooking pots, and pass a current through these containers to heat the food, thereafter transferring the heated food to the can. We have found, however, that such prior practices do not produce the advantages herein to be set forth, as in many cases it is highly detrimental to the food to pass a current

through it, and, again, the food itself may be so non-conducting as to make such a procedure impossible. Furthermore, we do not have to provide any special crucibles or cooking pots; we utilize as a resistance element the identical container in which the food is later to be sold, and it never has to be removed from that container after heating. Consequently there is no chance for the food, after sterilization, pasteurization or cooking, to become contaminated.

Furthermore, we have found that by utilizing this electrical method of heating, temperatures can be very strictly controlled, there is a high efficiency of energy conversion, and the heating may take place in a relatively short time and in a space which is relatively small compared to the steam cabinets heretofore deemed necessary.

There are several means by which we apply current to tin cans, several of which are illustrated in the drawings to which we will now refer.

In Figure 1 we have shown in a conventionalized manner a tin can comprising the usual cylindrical side wall 1, closed at the bottom by bottom disc 2 with the usual rolled seam 3. The top of the can, not yet being closed, is provided with a rolled edge 4 which will later enter into a top rolled seam similar to seam 3. We prefer to position the can in a depression 5 on a lower plate 6, which may well be a copper plate forming a portion of a traveling belt, or, as will later be described, the bed plate of a turntable. Depression 5 is so cut that a central boss 7 projects upwardly to contact the raised can bottom 2, thus affording a wide electrical contact over the entire bottom of the can.

The top of the can is contacted by a swinging electrode 8 hinged to a conductor bar 9, and preferably provided with a flexible jumper 10 to carry current around the bearing. Top electrode 8 is preferably provided with a central aperture 11 over the can to allow escape of gases from the contents 12 of the can, and on its under surface is provided with a circular channel 13 shaped to fit the rolled edge 4 of the top of the can. We prefer to place considerable pressure between the top and bottom electrodes, and this pressure may be supplied by a spring 14 or, if desired, by making electrode 8 of sufficient weight to provide pressure by gravity alone, or both. Base 6 and conductor bar 9 are connected to the low voltage secondary 15 of a step-down transformer 16, whose primary 17 is connected to the alternating current mains in any convenient manner, preferably through a switch, as will later be described.

In operation the cans are fed with their bottoms in contact with lower electrode 6 onto a traveling belt or turntable, and the upper electrode 8 is lowered to make contact to the top of the can. The low voltage current of the transformer 16 is then passed through the side walls 1 of the can, and we have found in practice that for a one-pound tall can a current of 400 amperes at .1 volt applied for 7 minutes develops sufficient heat in the exterior walls to heat a can filled with water to the boiling point. Other foods or materials contained in the can may take longer or shorter periods of applied heat. The cans then pass from the belt or turntable to the sealer where the top is crimped on, and thence to the final cooker.

It often happens, however, that cans are lacquered on their inner surface in order to better preserve the container walls from certain corrosive actions of the contained food. In this case, standard practice is to thinly lacquer the cylinder 1 and the bottom 2 before the bottom is crimped to the cylinder. When the seam 3 is formed, we have found that under these circumstances a lacquer film may be included between the material of bottom 2 and cylinder 1, there creating a high resistance path. It is obvious that inasmuch as low voltage current is used that such resistance will develop excessive heating with consequent loss of the seal at the seam, and we have therefore provided, as shown in Figure 2, a different arrangement for the bottom of the can, where the recess 5 is filled with a good conductor, such as brine 18, for example, which will contact the can above the seam 3. The thin lacquered seams never form a totally insulating joint, and the conductivity of the brine is sufficient to prevent heating of the seam as a large portion of the current is passed into the can through the brine contacting the side walls directly.

In case, however, heavier films of lacquer are necessary within the can and an extremely high resistance is developed, I may prefer not to utilize the top or bottom of the can for contact points, but to make contact directly to the upper and lower portions of the side walls as shown in Figure 4. Here, lateral arms 19 carry substantially semi-circular contacts 20, which may be moved radially toward the axis of the can to clamp the can immediately below the top rolled edge. Similarly, the bottom may be clamped by contact arms 21, having contact electrodes 22 attached thereto in exactly the same manner as the upper set of electrodes. Inasmuch as the contacting is done above and below the seam planes, it is obvious that a totally insulating seam could be used on both top and bottom of the can, irrespective of the conductivity of the top and bottom seams. It should be pointed out in this respect that the lateral seam 24 of the can, which joins the edges of the side walls so that the cylinder 1 may be formed, is not across the path of the current, as the current flows parallel to the seam and therefore this seam is never damaged. In clamping the can tightly with the lateral type of clamps it is obvious that the seam 24 may be positioned between two opposing electrodes so that the electrodes can contact the entire contour of the can.

In Figure 3 we have shown a swinging electrode 8 mounted on bar 9 as in Figure 1, and in this case we have shown it applied to a closed can. Under these circumstances aperture 11 may be omitted and channel 12 may be changed in contour to a recess of the same shape as recess 5 on the bottom electrode, there being also in this case a projection 7 so that the entire top of the can may be contacted.

So far we have shown our new invention as applied to "tall" cans, these cans being very satisfactory for heating because they provide a relatively long resistance path for the low voltage current.

There are, however, cans which are rather short in height, where, if contact should be made to the entire top and bottom, there would not be sufficient resistance in the side walls to properly and efficiently heat the contained food. We have shown an example of this type of can in Figure 5 and Figure 6, the example being the well known oval sardine can 23. In order to provide a longer path for the current we prefer to form a lower electrode 25 smaller than the area of the

bottom of the can but having the same contour, and position it so that all current paths from this electrode to top electrode 8 will be substantially the same length. Thus the current travels for a considerable extent through the bottom of the can as well as the side walls, and this extra extent provides the desired resistance. Furthermore, while in this case we have shown top electrode 8 as applied to the entire top of the can, it is obvious that the top electrode 8 may be made the same shape and size as lower electrode 25.

In Figures 7 and 8 we have shown, greatly conventionalized and simplified, a turntable on which the cans may be electrically heated. A turntable base 27 is mounted on a shaft 28, the latter being supported by bearing 29. Conductor bar 9 here is in the form of a ring concentric with the periphery of the turntable, and upper electrodes 8 are hinged to this conductor bar as before recited. The bottom of the cans are placed in depressions 5 as described in Figure 1. The cans are fed to the turntable from the conveyor line through entrance chute 30' by star wheel 30 and leave by exit chute 31, the turn table rotating at a speed which will give the required heating between the time of entrance and exit. The conductor bar 9 and base 27 are energized from transformer 16, which in this case is mounted to rotate with the turntable so that the low voltage secondary leads will not have to be brushed. Brush rings 32 are mounted on insulating block 33, carried on shaft 28, and are contacted by stationary brushes 34 which lead to the mains through a switch 36. Switch 36 is utilized to cut the current through the transformer at the instant the cans enter and leave the turntable so that the primary circuit may be broken when secondary contact across the can is made or broken by the movements of electrodes 8 actuated by lifting cam 37. Switch 31, of course, may be automatically operated, and those skilled in the art will easily understand proper connections. The intermittent excitation of the cans will, of course, lengthen somewhat the time the cans are on the turntable, but as the connection and disconnection may be made rapidly the time is not greatly prolonged. In order that heat may be conserved we may prefer to cover the entire turntable with an insulating cover 38.

We have found that our system of can heating greatly reduces space in canning lines, reduces heat losses, and provides an accurately controllable heating for either open or closed cans for pre-heating, pasteurizing or cooking. We have found that the final product is in all ways fully equal to steam heated products and in some ways even better, as there is no chance for condensation of steam in the open cans, thus diluting the contents, and also, that the efficiency of heating is much higher than in steam boxes. For example, we have found that for continuous run in pre-heaters the pre-heating may be accomplished with one-pound tall cans with a total expenditure of electrical energy of 40 watts per can. Furthermore, the sanitary conditions surrounding our electrical heating apparatus are far better than that which may be obtained with steam boxes. Steam boxes are continually leaking steam and this steam condenses on every object surrounding the packing line, providing ideal conditions for the growth of bacteria and fungus. Everything is continually wet, also leading to rust of machinery. The elimination of such leaking steam allows the surroundings and machinery to be dry, thus greatly reducing the chances of contamination of food and prolonging the life of the equipment.

Another extremely important advantage of our process lies in the fact that we are able to attain cooking temperatures which cannot be attained by the use of steam. For example, in packing sardines it is highly desirable that the cooking be carried on to the point that the layer of fat directly under the skin is at least partially tried out. A temperature sufficiently high to do this, however, cannot be attained in steam boxes, because it is not possible to apply steam to the cans under pressure because of leakage. It is also impractical to retort the open cans, and therefore it has heretofore not been possible to process sardines as sardines grilled in the can. For example, even when steam is admitted to a steam box under super-heated conditions, leakage prevents the applied temperature from rising over 210°. Our process, however, will provide a sufficiently high temperature so that the sardines may be fried or grilled in the can before the cover is placed upon it, and a superior product results. Other foods may be treated in the same manner with high temperatures.

It is to be distinctly understood that our process applies to any heating of the cans, whether open or closed, including cooking, pre-cooking, exhausting, processing, pasteurizing, sterilizing, blanching, concentrating foods or vegetables or liquids, frying, grilling or toasting, either wet or dry organic materials, and in this regard our process is applicable to the heat treatment of any organic material, wet or dry, whether or not it is being processed for human or animal consumption. Our process is, of course, equally adaptable for the heat treatment of liquids, as exemplified by condensed milk and beer.

It is also to be distinctly understood that our process is fully adapted for use in conjunction with containers formed of materials other than tin plate. For example, certain novelty packs may be packaged and sold in special containers formed of thin walled metals such as, for example, aluminum, stainless steel, "dural", or other aluminum alloys. Such packages are relatively new but are becoming increasingly popular. While some of these latter metals have a lower resistance than tin plate, it is well within the knowledge of those skilled in the art to apply the proper heating currents. We consider, therefore, that our process is adaptable to any thin walled conductive container having sufficient resistance to generate heat during the passage of electrical currents of high densities.

We claim:

1. The method of processing relatively non-conductive organic material processed and sold in tinned iron containers known to the trade as tin cans, having a seam between side walls and end thereof, which comprises contacting said side walls and said end, passing a heating current between the points of contact, and providing an auxiliary current path around said seam during the passage of said heating current.

2. The method of processing relatively non-conductive organic material processed and sold in tinned iron containers known to the trade as tin cans, having a side seam and an end seam, which comprises heating said container when filled by applying a heating current to the walls of said container across said end seam and parallel to said side seam, and providing an auxiliary current path around said end seam during the passage of said heating current.

3. The method of processing relatively non-conductive organic material processed and sold in tinned iron containers known to the trade as tin cans, which comprises filling said containers with said material, conveying the filled containers over a predetermined path, applying a low voltage heating current to top and bottom of said containers at a predetermined point in said path to heat the entire side walls of said container, maintaining said current until said material is processed, and removing said containers from the end of said path.

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