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APPARATUS AND TECHNIQUES FOR EVACUATING AND SEALING A SEMI-RIGID PLASTIC TRAY

Original Filed Dec. 17, 1963 2 Sheets-Sheet 1

Fig. 1

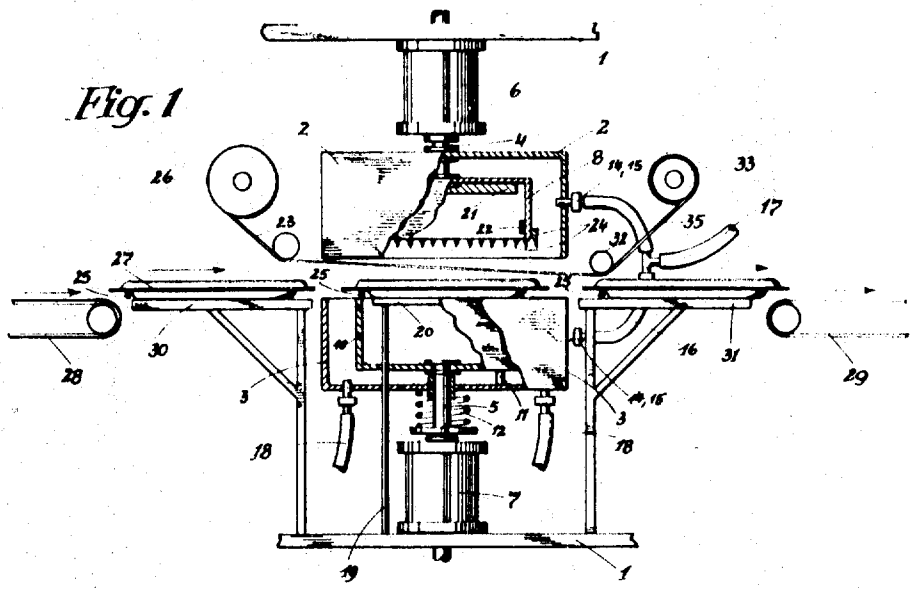


Fig. 2

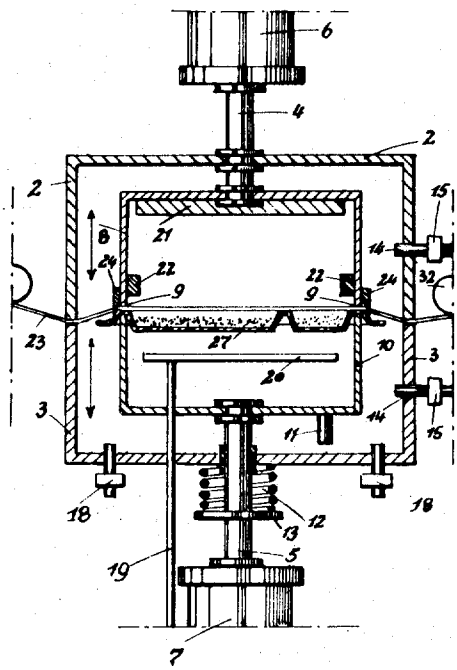


Fig. 3

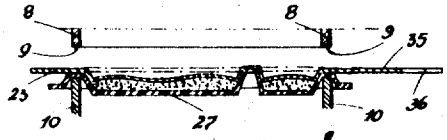


Fig. 4

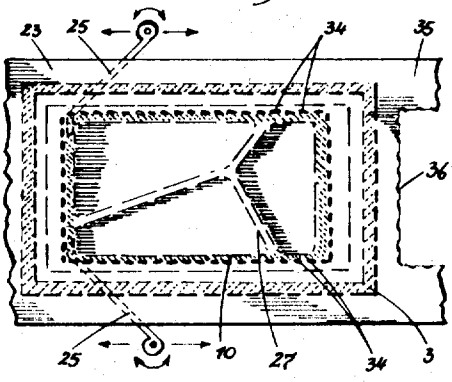


Fig. 5

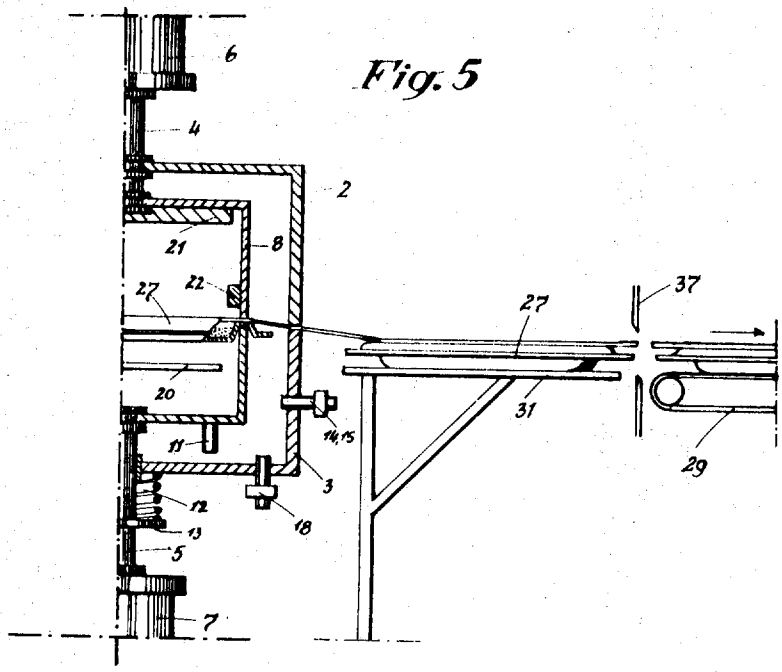
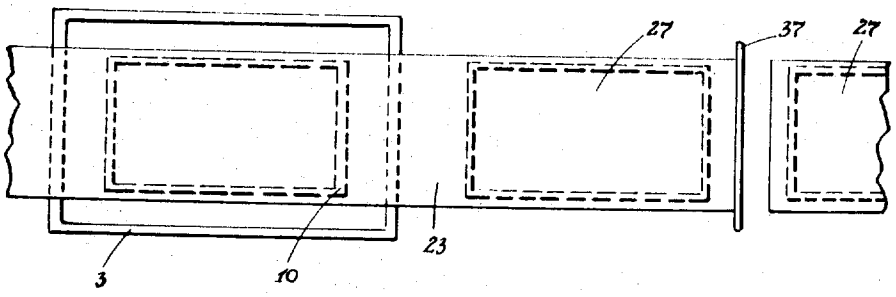


Fig. 6



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APPARATUS AND TECHNIQUES FOR EVACUATING AND SEALING A SEMI-RIGID PLASTIC TRAY

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Int. Cl. B65b *31/02*

U.S. Cl. 53—22 13 Claims

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

ABSTRACT OF THE DISCLOSURE

Packaging apparatus and techniques for forming evacuated packages of the type comprising a semi-rigid (form-retaining) container tray carrying a product to be packaged, and a cover sheet of plastic material heat-sealed to the tray periphery and drawn (stretched) down into the tray to effect a tight engagement with the upper surfaces of the packaged product. The apparatus comprises reciprocable members defining a chamber within which the package is evacuated, and the cover sheet heat-sealed to the tray. The heating means in the chamber is arranged to supply heat to the cover sheet while the package is evacuated, so that when the chamber is vented, atmospheric pressure stretches the heated plastic into the tray.

This invention relates to a method of and an apparatus for the preservation and sealing of a serving tray or similar receptacle containing prepared foods generally referred to as frozen foods.

It is, of course, known to provide means by which prepared foods are automatically introduced into serving trays of synthetic material, then sealed with a cover sheet by a welding or fusing operation, and subsequently punching the cover from the sheet. The cover sheet closes the tray along the raised peripheral edge or rim and is removed only shortly before the food, which has been heated to the proper temperature for consumption, is to be served.

However, in the case of prepared foods having a relatively liquid consistency, such as soups, sauces and the like, problems have arisen in that these substances tend to float about in the space provided by the cover sheet which imparts an unsightly appearance to the clear cover sheet.

Therefore, the cover sheet must be positioned tightly against the contents of the serving tray with a prior evacuation of the entrapped air.

Furthermore, it is most desirable that food products stored under the so-called "deep freeze" conditions be preservable for a longer period but without loss of flavor of such products. It has been demonstrated that due to inadequate cooling of the food within the tray, sometimes water condensation occurred which, over a period of time rendered the food unpalatable.

An important object of the present invention is to solve the above-mentioned problem.

Broadly, the invention comprises opening a two part vacuum bell jar, positioning a serving tray with an applied cover sheet within the bell jar, closing the two parts, exhausting the air from the jar, applying heat for plasticizing the cover sheet, welding the sheet to the peripheral rim of the tray, and opening the two parts whereby the surrounding air presses the cover sheet tightly against the food in the tray.

Additional objects and advantages of the invention will become more readily apparent from the ensuing detailed description and annexed drawings, and in which drawings:

FIG. 1 is a view in elevation, partly broken away and partly in cross section of the apparatus showing the vacuum bell jar open, the welding means, punch means, feeding of the cover sheet and a serving tray in position;

FIG. 2 is a view in elevation and partly in cross section and on an enlarged scale illustrating the welding operation with the vacuum bell just closed;

FIG. 3 is a fragmentary view in cross section of a serving tray after the opening of the vacuum bell jar;

FIG. 4 is a top plan view of the cover sheet and tray after the welding operation;

FIG. 5 is a fragmentary elevational view partly in cross section illustrating the welding operation with the vacuum bell jar closed and cut-off means located exteriorly of the bell jar, and,

FIG. 6 is a top plan view of the cover sheet arrangement illustrated in FIG. 5.

Referring to the drawings, it will be noted that a vacuum bell jar **J** is mounted on a frame **1**, and includes upper and lower parts **2** and **3** capable of vertical movements in opposite directions. Such movements are effected by means of compressed air cylinders **6** and **7**, and piston rods **4** and **5** which extend through the upper and lower parts **2** and **3**. Within the parts **2** and **3**, the piston rods **4** and **5** carry an upper welding tool **8** and welding frame **9** and lower welding support **10**, respectively. The support **10** is provided with a separator **11** which becomes effective upon the actuation of the cylinder **7**, as will later be more fully described.

In order to promote the sealing necessary for effecting a vacuum and for the welding operation within the bell jar, a pressure spring **12** surrounds the piston rod **5** and is positioned between spring plate **13** and the bottom wall of the lower part **3**. During the several stages of the working cycle, the spring **12** together with the plate **13** augments the working pressure when sealing the bell jar and during the welding operation. It will be noted that pipe sections **14** having shut-off valves **15** communicate with the interior of the bell parts **2** and **3**, and are connected via hoses **16** and a T-fitting **16'** to main conduit **17**. Conduits **18** are provided with shut-off valves **18'** and the conduits communicate with the interior of lower part **3** for admitting, if desired, nitrogen into the bell jar in the event the type of food or the necessity of an extra long period of preservation should make special preservation with this gas appear to be advantageous.

The lower welding support **10** is provided with a horizontal platform **20** carried by one or more vertical standards **19** for the temporary support of serving trays **27** as such trays are fed into the apparatus, as clearly shown in FIG. 1. It can be seen that at least the peripheral rim of the tray projects beyond the perimeter of the suport **20** for subsequent engagement by the welding support **10**.

The upper welding tool **8** is provided in a known manner with heating elements **21** and **22**, and the heating element **21** serves to raise the temperature of cover sheet **23** which travels transversely of the apparatus to a plasticizing temperature before and during the welding cycle. The heating element **22** which is arranged around the inside of the frame **9** simultaneously heats the welding edges and separating member **24** is located exteriorly of the tool **8**. As clearly shown in FIG. 1, the member **24** is formed with a series of pointed teeth or projections **24'**, and hence functions in the nature of a perforating tool.

The cover sheet **23** is withdrawn indirectly from a supply roll **26** by means of a timed actuation of hori-

zontally operating grippers **25** in such a fashion that the grippers push the tray **27** out of the welding means while it is still connected with the cover sheet. The feeding of the trays to the apparatus and the removal therefrom is accomplished by endless conveyors **28** and **29**, respectively. Stationary work tables **30** and **31** are located at the infeed and outfeed sides of the apparatus for supporting the incoming trays and the outgoing sealed trays, and also providing for a maximum of trouble-free operation of the pairs of grippers **25**.

In operation, the upper and lower parts **2** and **3** are in the open position shown in FIG. 1, and an open serving tray **27**, preferably filled with frozen food is moved to the table **30** via the conveyor **28** and by means of the first pair of grippers **25** is pushed onto the platform **20**. By the admission of compressed air into the cylinders **6** and **7**, the parts **2** and **3**, together with welding components **8** and **10** move vertically and uniformly toward each other with the lower component **10** engaging the tray **27** along its undercut peripheral rim and raising the tray. While the upper part **2** and upper welding component **8** are fixedly secured without change in spacing to the piston rod **4**, the lower part **3** and lower welding component **10** are, by virtue of the spring **12** raised at the same speed at a distance from each other determined by the separator **11**, but the part **3** is yieldingly and axially slidably mounted on the rod **5**. The closing movement terminates as soon as the peripheral edges of the parts **2** and **3** engage, and during this cycle, the sheet **23** is withdrawn from the supply roll **26** and lies tightly against the tray opening and is clamped firmly against the lateral peripheral edges of the parts **2** and **3** so that the interior of the bell jar is sealed air tight.

The upper and lower welding components **8** and **10** have not made contact when the peripheral edges of the parts **2** and **3** engage since the air must first be evacuated by means of the pipe sections **14**, valves **15**, hoses **16**, and conduit **17**. However, the heating elements **21** and **22** of the upper welding component **8** are constantly operating so that in the interim the plasticizing of the portion of the sheet **23** lying against the tray opening can be effected. Immediately thereafter as will be appreciated from FIGS. 2 and 3, there is achieved, after an additional push from the cylinder **6** a firm placement of the frame **9** upon the cover sheet and upstanding rim of the tray thereby heat welding the respective parts together.

The foregoing operation is made possible due to the fact that the lower piston rod **5** maintains the lower welding component **10** on which the tray **27** is positioned stationary at the height to which it has been raised and that the upper piston rod **4** continues to press the part **2** and the upper welding component **8** downwardly. The impact of the welding components on the tray rim is made further possible since the lower part **3** of the bell jar can be displaced downwardly against the action of the spring **12**. When the welding components come together, the teeth **24'** of the member **24** perforate the cover sheet **23** along the upstanding rim of the tray with the member **24** and teeth having been heated by the heating element **22** for making the teeth more effective.

After the foregoing, the welding cycle is completed and the upper and lower parts **2** and **3** are returned to their starting positions by retracting the piston rods **4** and **5** into the cylinders **6** and **7**. Since the tray is now exposed to outside air, the cover sheet **23** which has been heated to processing temperature is pressed tightly against the food contained in the tray, as best disclosed in FIG. 3.

With the placement of the tray on the table **31** after the welding operation, the cover sheet **23** is guided upwardly by a guide roller **32** and is wound on a reel **33** in a known manner. Because of the change of direction of the cover sheet **23** upwardly from the horizontal at the guide roller **32** and by reason of the perforations, the sheet becomes separated along perforations **34** so that the remainder of the sheet identified **35** and which now constitutes waste is provided with rectangular window openings **36**. The completed food package moves from the table to the conveyor **29**, and is moved to a freezer for storage or directly for consumption.

In lieu of perforating the cover sheet and subsequently tearing off the completed food packages, the invention also comprehends the use of a knife or shears for cutting the same in conjunction with the apparatus. In such an embodiment, a take-up reel mechanism is unnecessary since there is no waste sheet material.

After completion of the welding operation as described above, the feeding of the tray on the table **31** to cutting means **37** for separating the cover sheet **23** between adjacent trays **27** can be accomplished by a pair of grippers.

This particular arrangement has the advantage that cover sheets corresponding substantially to the width of the trays can be used which eliminates the waste of material.

In addition, the upper and lower parts **2** and **3** need not grasp the long sides of the sheet, but it is sufficient that the passage of the sheet through the bell jar be in the manner disclosed in FIG. 6. This form does not require the pipe section **14**, valve **15** and hose **16** for the upper part **6** which is only necessary if the sheet **23** is of such width as to divide the interior of the closed bell jar into two separate chambers with the side edges of the sheet extending beyond the bell jar as illustrated in FIG. 4.

The invention is not to be confined to any strict conformity to the showings in the drawings, but changes or modifications may be made therein so long as such changes or modifications mark no material departure from the spirit and scope of the appended claims.

What I claim is:

1. An apparatus for preserving and sealing a serving tray of thermoplastic material containing frozen food with a cover sheet, comprising a vacuum bell jar, said bell jar including upper and lower parts, means operably connected to said upper and lower parts for effecting relative movement between said upper and lower parts for closing and opening said bell jar, respectively, means for supporting the tray and cover sheet within the closed bell jar, valve controlled conduit means communicating with the interior of said bell jar adapted to be connected with a source of suction for evacuating said bell jar, welding means within said upper part and cooperable with the tray and cover sheet for welding the cover sheet to the peripheral edge of the tray, said welding means including a frame mounted within the upper part, a first heating means carried by said frame for plasticizing the portion of the cover sheet located therebeneath, and a second heating means so located on said frame as to weld the cover sheet to the peripheral edge of the tray.

2. The apparatus as claimed in claim **1**, including further valve controlled conduit means communicating with the interior of the bell jar for introducing a preserving gas into the bell jar.

3. The apparatus as claimed in claim **1**, in which the means for effecting relative movement between said upper and lower parts includes an air cylinder for each part and a piston rod operably related to each cylinder and each part, said piston rod for the cylinder for said lower part being slidable relative to said lower part, an abutment on said last-mentioned piston rod, and spring means biased between said abutment and said lower part whereby said lower part is yieldingly and axially slidable upon said last-mentioned piston rod.

4. The apparatus as claimed in claim **1**, including

cutting means for severing the cover sheet between adjacent trays located exteriorly of the bell jar.

5. The apparatus as claimed in claim 4, in which said cover sheet has a width dimension corresponding to the width of the serving tray.

6. An apparatus for preserving and sealing a serving tray of thermoplastic material containing frozen food with a cover sheet, comprising a vacuum bell jar having upper and lower parts, means operably connected to said upper and lower parts for moving said parts toward and away from each other for closing and opening said bell jar, respectively, means for supporting the tray and cover sheet within the closed bell jar, and welding means within said upper part cooperable with the tray and cover sheet for welding the cover sheet to the peripheral edge of the tray, said welding means including a frame mounted within said upper part, first and second heating elements carried by said frame, frame means mounted within said lower part constituting said supporting means for the tray and cover sheet, said first heating element being so carried by the frame as to plasticize the portion of the cover sheet located therebeneath, and said second heating element being so located on the frame as to weld the cover sheet to the peripheral edge of the tray.

7. The apparatus as claimed in claim 6, including pointed projections on said frame for perforating the cover sheet along said peripheral rim.

8. The apparatus as claimed in claim 7, in which said pointed projections are mounted on said frame in proximity to the second heating element for being heated thereby.

9. The apparatus as claimed in claim 8, including a take-up reel for the portions of the cover sheet located outside of the perforations.

10. For making a package of the type comprising a semi-rigid tray with a plastic top sealed thereto, said package being made by a machine comprising a first member having wall means the upper surfaces of which defined first pressure surfaces; a second member arranged for relative movement towards and away from said first member, said second member having means defining second pressure surfaces aligned with said first pressure surfaces and engageable therewith to form a chamber within which an evacuated package may be completed by heat-sealing said top to said container;

the method comprising the steps of: placing in said first member a tray formed of semi-rigid form-retaining material having sealing surfaces around the mouth thereof; and containing a product the upper surfaces of which are below the level of said sealing surfaces at least in the region adjacent the side walls of the tray; positioning over said container a sheet of heat-softenable plastic to serve as the top for the package; moving said two members relatively together to form said chamber with said semi-rigid container sealing surfaces and said sheet of plastic gripped between said first and second pressure surfaces to seal said sheet to said container; establishing a vacuum within said chamber and the package therein; applying sufficient heat to the portions of said top sheet interiorly of said pressure surfaces to soften said portions for stretching; and stretching said heated top sheet portions into the tray by external pressure, the stretching being effected downwardly along said tray side walls between said tray sealing surfaces and the upper surfaces of the packaged product which are adjacent said side walls.

11. The method of claim 10, wherein the package is evacuated while in an evacuated chamber, the chamber being closed during sealing of the top sheet to the tray, and the stretching of the sheet being effected by atmospheric pressure resulting from venting of the chamber to atmosphere after sealing has been completed.

12. For forming evacuated packages containing food products and the like, the steps of: supporting a form-retaining tray having upstanding side walls and containing a product the upper surfaces of which are a significant distance below the level of tray opening of tray opening at least in the regions of the periphery of the tray; placing over the tray a cover sheet of heat-softenable plastic; placing the tray and cover sheet in a chamber provided with means to heat-seal the cover sheet to the periphery of the tray; evacuating the interior of the package while in said chamber; sealing said cover sheet to said tray to effect a hermetic seal of the package while maintaining the interior and exterior of the package at a reduced pressure level and while supplying heat to the cover sheet portions which are located inboard of the tray periphery so as to soften the plastic for stretching under pressure; and stretching the marginal portions of said cover sheet immediately adjacent said tray walls said significant distance interiorly into said tray to effect tight engagement with the product across the upper surfaces thereof.

13. The method of making an evacuated and hermetically sealed package of the type comprising a form-retaining container tray and a cover sheet of plastic sealed to the periphery of the tray and stretched inwardly into contact with the upper surfaces of the packaged product, said method comprising the steps of: positioning the cover sheet over the container tray containing a product the upper surfaces of which are a significant distance below the level of the tray opening at least in the regions adjacent the side walls; reducing the pressure both within and surrounding the package; holding the cover sheet pressed against the tray periphery while said pressure is reduced; effecting a permanent hermetic seal of the package, including a seal of said cover sheet to the tray periphery in the regions thereof which are held pressed together, while the package interior and exterior is maintained in said reduced-pressure state; heating the cover sheet portions inboard of the tray periphery while said permanent hermetic seal is being effected; and stretching the marginal portions of said cover sheet immediately adjacent the tray periphery down into the tray alongside the walls thereof to such an extent that said portions reach and engage the upper surfaces of said product in said regions adjacent said tray side walls, said stretching being produced by increasing the pressure outside of the package while the cover sheet is still hot, the resulting pressure differential stretching the cover sheet inwardly said significant distance to engage entire upper surfaces of the product within the container.

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U.S. Cl. X.R.

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