Nov. 20, 1951 J. A. ZINN, JR 2,575,544

METHOD AND APPARATUS FOR CLOSING AND SEALING CONTAINERS

Filed Jan. 26, 1949 4 Sheets-Sheet 1

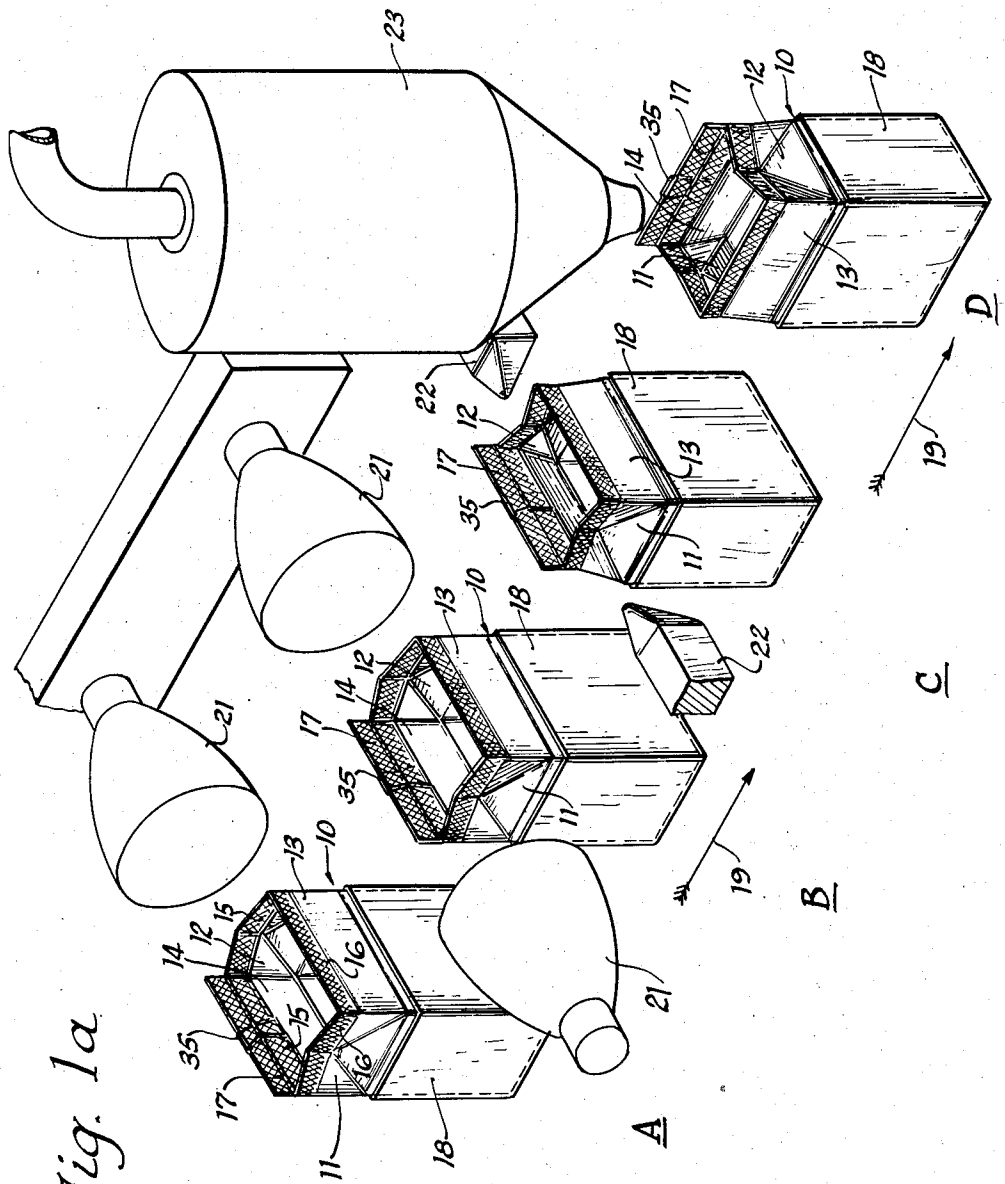


Fig. 1a

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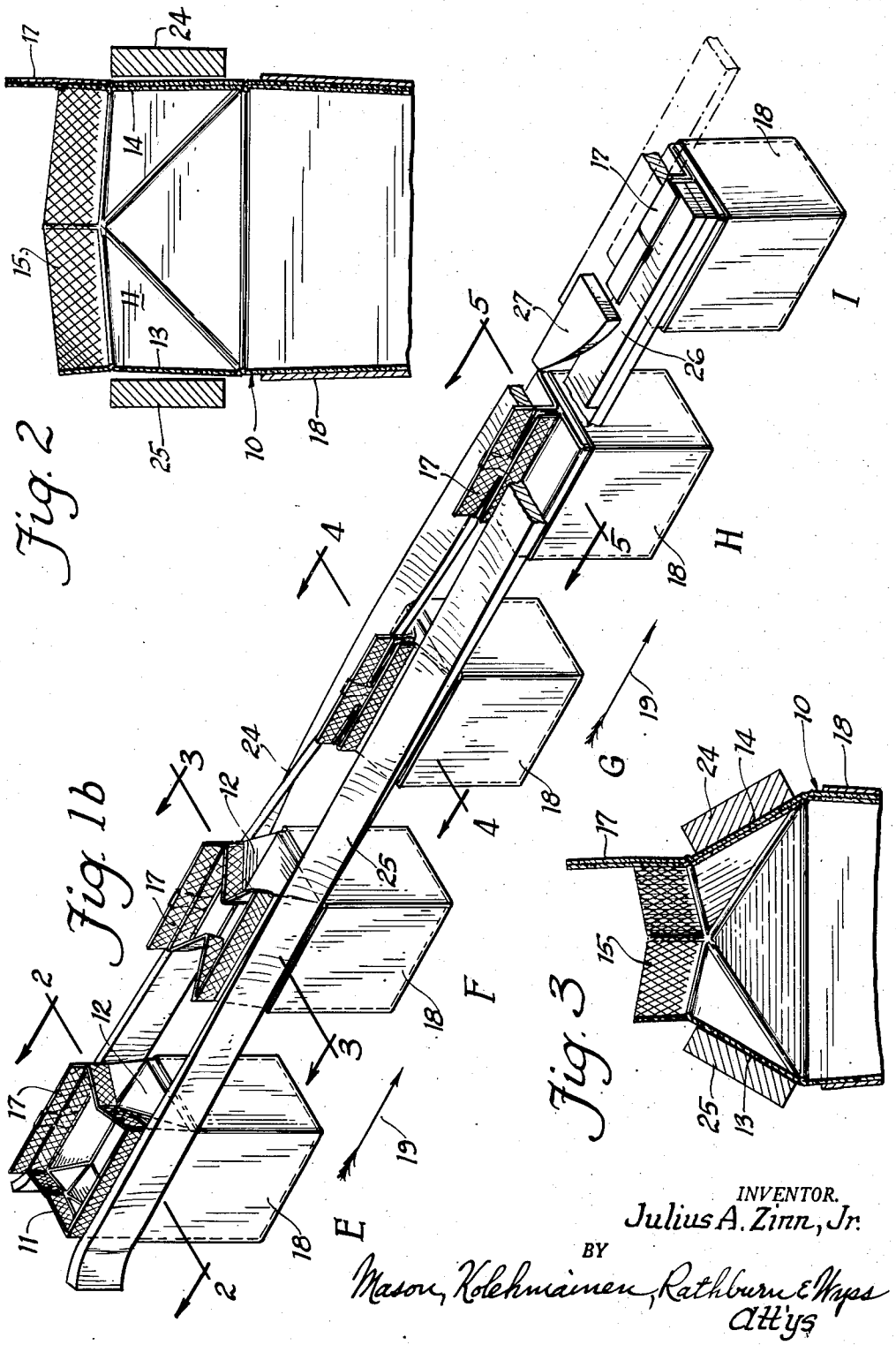
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Filed Jan. 26, 1949 4 Sheets-Sheet 2



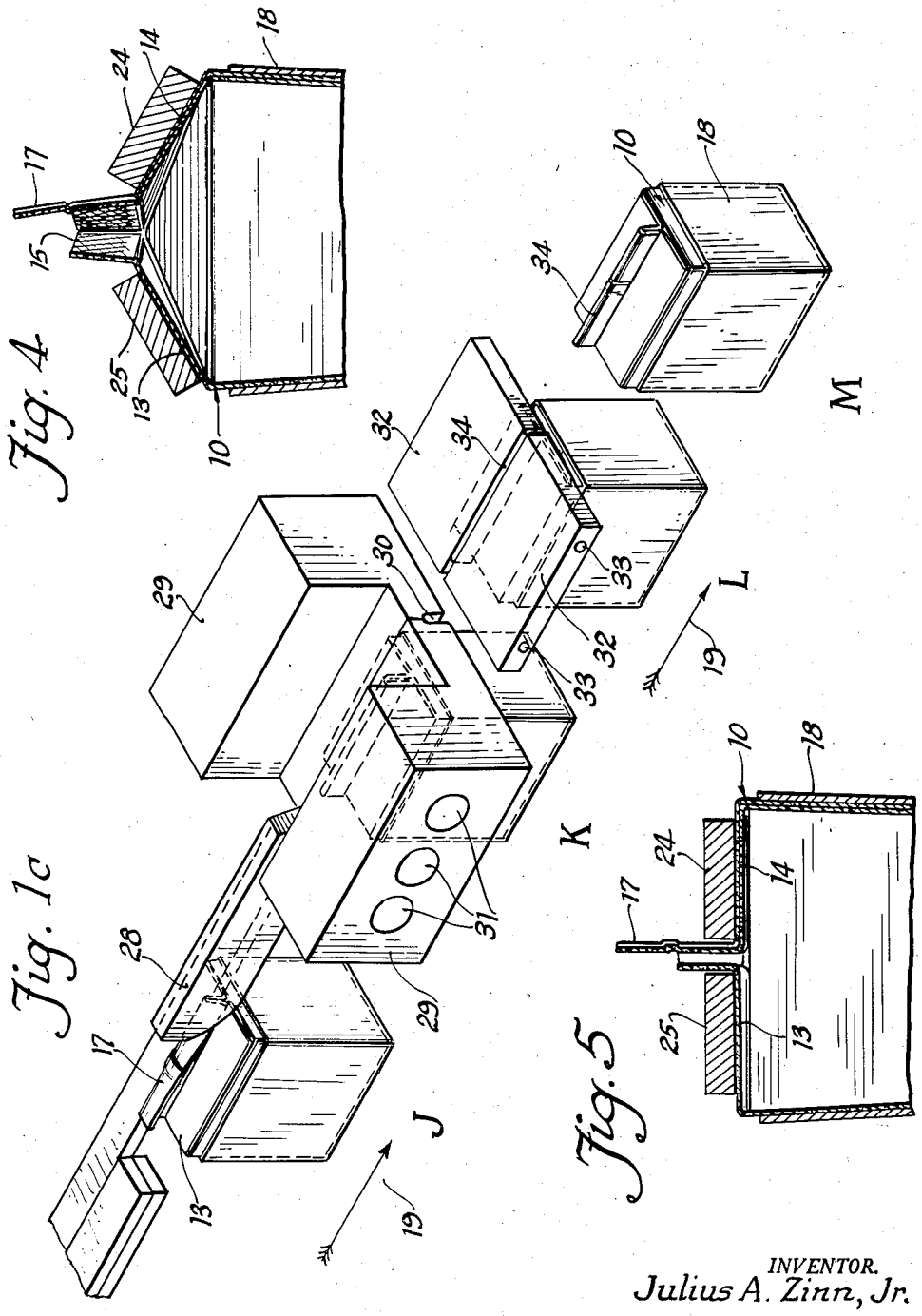
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METHOD AND APPARATUS FOR CLOSING AND SEALING CONTAINERS

Filed Jan. 26, 1949 4 Sheets-Sheet 3



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METHOD AND APPARATUS FOR CLOSING AND SEALING CONTAINERS

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Fig. 6

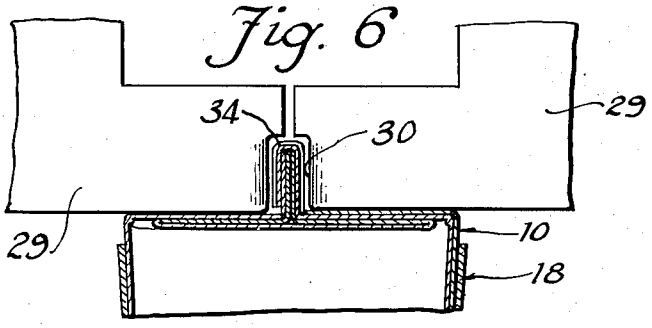


Fig. 7

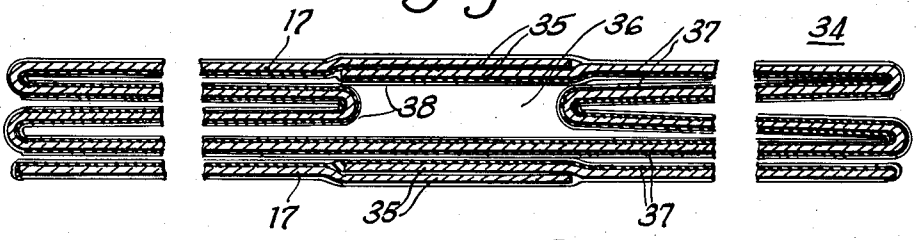


Fig. 8

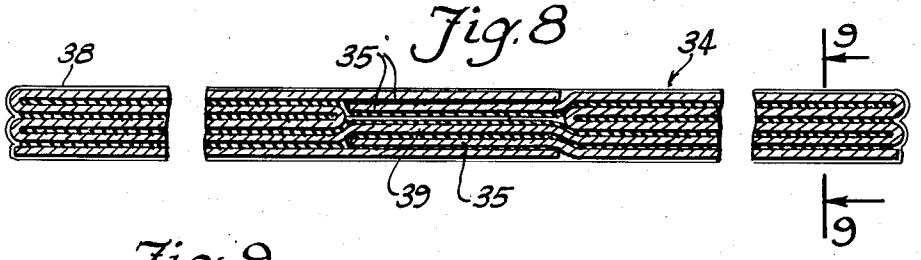
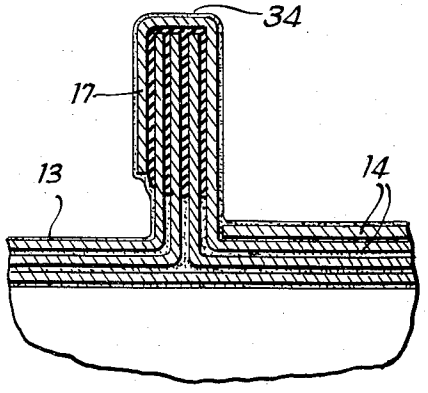


Fig. 9



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METHOD AND APPARATUS FOR CLOSING AND SEALING CONTAINERS

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Application January 26, 1949, Serial No. 72,828

7 Claims. (Cl. 93—6)

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This invention relates to methods and apparatus for closing and sealing containers, more particularly to methods and apparatus for closing and sealing paraffined or similarly treated paperboard containers of the type having an open mouth portion scored along predetermined fold lines to form a fully-depressible bellows-type closure, and the invention has for an object the provision of methods and apparatus for providing uniform liquid-tight closure seals in containers of this character.

Although not specifically limited thereto, methods and apparatus embodying the present invention are particularly designed for use with, and will hereinafter be illustrated and described in connection with, containers of the type disclosed in a prior Patent No. 2,412,666 issued December 17, 1946, to the present inventor. Such containers, which preferably are formed from moisture-proofed and preferably paraffin coated or impregnated paper-board, are provided with fully-depressible bellows-type closures in which the end walls of the mouth portion are tucked inwardly and then folded flat to form, with the side walls of the mouth portion, an elongated upstanding closure rib. The closure rib thus formed is preferably closed or covered by folding thereover a flap formed as an extension of one of the side walls of the mouth portion. In order to minimize the obvious danger of leakage through the space formed between the inner folded edges of the bellows fold formed by the end panels, the closing flap or tab, as fully explained in the said prior patent, is formed of a double thickness at the area corresponding to this open space, so that upon closing of the folding flap or tab and compression thereof, the double thickness of the flap will substantially compensate for and cause such space to be filled up, thus eliminating a possible source of leakage.

It has been found, however, that even with containers thus constructed leakage difficulties may be encountered unless the closing and sealing operations are correctly performed through the utilization of proper methods and apparatus. Although proper closure and sealing may be insured by manual manipulation of each container, such practices are uneconomical and unsatisfactory from the standpoint of quantity production. Accordingly it is a further object of this invention to provide an improved method for properly closing and sealing cartons of this type on a quantity production basis.

A further object of the invention is the provision of a fully automatic apparatus for quickly and efficiently closing and sealing containers of this character.

Another object of the invention is the provision of methods and apparatus for closing and sealing containers wherein the containers are

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locally heated to facilitate an initial and partial closing operation.

Still another object of the invention is the provision of such methods and apparatus wherein the bellows type top is fully formed and is firmly retained in its formed position during the sealing operation.

Further objects and advantages of the present invention will become apparent as the following description proceeds, and the features of novelty which characterize the invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

For a more complete understanding of the invention reference should now be had to the drawings, in which:

Figs. 1*a*, 1*b* and 1*c*, when arranged in staggered relation in the order indicated, with Fig. 1*a* at the upper left hand corner, illustrate a preferred form of apparatus for carrying out a closing and sealing method embodying the present invention;

Figs. 2, 3, 4 and 5 are respectively fragmentary sectional views taken along the lines 2—2, 3—3, 4—4 and 5—5 of Fig. 1*b*;

Fig. 6 is a fragmentary end view of the heating and pressure-applying apparatus shown in Fig. 1*c*, and a container associated therewith, the container being shown in cross section;

Fig. 7 is a horizontal sectional view taken through the closure rib after the mouth portion of the container has been fully formed but before the sealing operation;

Fig. 8 is a sectional view similar to Fig. 7 taken through the closure rib after the closing and sealing operation has been fully completed; and

Fig. 9 is a fragmentary vertical sectional view taken substantially along the line 9—9 of Fig. 8.

Referring now to the drawings, the invention is shown as applied to a series of containers 10 of the type disclosed in the aforesaid prior patent, which containers are preformed to provide a substantially rectangular body portion surmounted by an open mouth portion comprising suitably scored inwardly collapsible end panels 11 and 12 and suitably scored inwardly foldable side panels 13 and 14, each of the panels having an upper edge portion of the inner surface thereof coated with a suitable adhesive of the "hot melt" type, as indicated by the reference numeral 15. In addition, the end panels 11 and 12 and the side panel 13 are provided with a similarly coated portion on the outer surface thereof, as indicated by the reference numeral 16, and the side panel 14 includes an upwardly extending closure flap or tab 17, the inside surface of which is likewise coated with the "hot melt" adhesive. It is the usual practice, particularly where the containers are to be employed for liquids or semi-liquid materials, to form the container from suitably shaped blanks to which the adhesive has been

applied in the zones 15 and 16, and to then coat by dipping or other suitable impregnating process, the entire container with paraffin or similar water-proofing materials.

The water-proof container thus formed is then ready for filling, closing and sealing and, as explained in the aforesaid prior patent, the closing and sealing operation is accomplished by collapsing the end panels 11 and 12 inwardly and folding the side panels 13 and 14 inwardly so that the adhesive coated edge portions of the panels form an upstanding closure rib over which the flap 17 is then folded preparatory to the final sealing operation. It has been found, however, that the initial inward folding of the end and side panels when the container is paraffin coated or impregnated may result in cracking or distorting the container and further difficulties may be encountered in the event that the final sealing of the closure rib is not properly performed.

Although in Figs. 1*a*, 1*b* and 1*c* a series of containers has been illustrated, it will be assumed for purposes of description that only a single container is shown in a plurality of positions during the closing and sealing operation, the various positions being identified by the letters A to M, inclusive. In accordance with the present invention, the closing and sealing apparatus comprises suitable container supporting members 18 which are in the form of cups shaped to receive the body portion of the containers so as rigidly to support the container walls against bulging or similar deformation, and it will be observed that the cups 18 extend to a point closely adjacent the fold lines defining the lower edges of the open mouth portion of the containers. The container supporting cups are secured in any suitable manner to a suitable conveyor (not shown) so as to be moved at a predetermined rate along a definite path. The conveyor mechanism, types of which are well known in the art, may constitute either a continuously moving or an intermittently moving mechanism, the details of the conveyor having been omitted in order to simplify the drawing, and the path of the conveyor being indicated by the various arrows 19. Likewise any suitable mechanism may be employed for initially depositing the preformed open mouth containers in the supporting members 18.

After having been thus deposited in one of the supporting members 18, the container 10 first moves through a heating zone constituting positions A and B in Fig. 1*a*, wherein heat is locally applied to the open mouth portion of the container extending above the supporting cup 18 so as to soften the paraffin coating on the container sufficiently to permit ready collapsing and folding of the end and side panels without breaking or deformation of the container along the fold lines. Various types of heating means may be employed, but for purposes of illustration a plurality of infra-red heat lamps 21 have been diagrammatically illustrated disposed along opposite sides of the path of travel of the conveyor mechanism so that the heat rays emitted by the lamps 21 will impinge upon the mouth portion of the container, being somewhat concentrated on the end panels 11 and 12.

From the heating zone represented by the positions A and B, the container with the paraffin in the desired softened condition passes to a prefold zone represented by the position C, wherein a pair of folding fingers 22 are provided, which fingers are adapted to be intermittently moved inwardly and outwardly so as to engage the opposed end panels 11 and 12 and force these panels inwardly, substantially to the position shown in position C, thereby initially to provide a partial fold of both the end panels 11 and 12 and the side panels 13 and 14. Any suitable means operated by cams, or otherwise, in properly timed relation may be employed for operating the pressure exerting fingers 22, as will be clear to those skilled in the art. Upon completion of the prefolding operation in position C, the container 10 may pass to a filling zone represented by the position D, wherein the container may be filled through the now partially closed mouth portion by means of any suitable filling apparatus, such for example as the filling head 23 diagrammatically illustrated in position D of Fig. 1*a*. Any suitable filling means, either of the straight-through-type or of the turret-type may, of course, be employed, but the arrangement should be such that the container 10 at some point in the filling operation, either before, during or after, is rotated approximately 90 degrees from the position occupied during travel through the heating and pre-folding zones.

It will, of course, be understood that in some cases it will be desirable to fill the containers while the mouth portions thereof are in the fully open position, and prior to passage of the containers through the heating zone of positions A and B. In such cases the container will pass directly from position C to position E of Fig. 1*b*.

In order efficiently and rapidly to complete the closing operation, the apparatus as shown in Fig. 1*b* is provided with oppositely disposed plows 24 and 25 arranged along the opposite sides of the path of travel of the conveyor mechanism carrying the container 10 and, as will be apparent upon inspection of Fig. 1*b* in conjunction with Figs. 2, 3, 4 and 5, the plows 24 and 25, which are illustrated as being in the form of twisted bars, successively engage the outer surfaces of the side panels 13 and 14 so as to force these panels inwardly and downwardly to a substantially flat position, shown as position H, and it will be understood that during this folding of the side panels 13 and 14 the end panels 10 and 11 are collapsed to a substantially flat position while the adhesive coated upper edges of the side and end panels assume the final upstanding position shown in position H and in Fig. 5 with the adhesive coated portions 15 and 16 in face-to-face relation. Although the plows 24 and 25 have been shown as constituting simple twisted bars, it will, of course, be understood that any suitable plow mechanism including container engaging rollers or the like may be employed if desired.

From position H the container 10 passes successively to positions I and J in which means are provided for folding the flap 17 of the side wall panel 14 over the closure rib formed by the adhesive coated portions 15 and 16. Thus, as shown somewhat diagrammatically, the plow 25 is provided with a superimposed supporting plate 26 for supporting the closure rib on one side throughout substantially its entire height, and a suitable plow 27 is provided for folding the rib 17 from the vertical position shown in container position H to the horizontal position shown in container position I. Likewise, at position J a further plow member 28 is provided for folding the flap 17 downwardly on the opposite side of the closure rib, thereby to complete the folding and forming operation. It will be observed that upon the completion of the folding and forming opera-

tion, the side panels 13 and 14 have been forced to a substantially flat position, in which position they are held by the various plows during the folding of the flap 17. From position J the container is moved by the conveyor mechanism to a sealing position K, wherein there is provided a suitable pair of inwardly and outwardly movable heating and pressure applying members 29. As shown, the inner lower edges of these pressure applying members are shaped to provide a groove 30 for receiving the upstanding closure rib on the container 10, and the lower walls of the members 29 are disposed at a predetermined height so as to engage the flattened side wall panels 13 and 14 and forceably retain these panels in the desired flattened position.

After the container K has passed into a position wherein the closure rib is received within the groove 30, the members 29 move inwardly so as to clamp the rib and supply to the opposite surfaces thereof sufficient pressure to compact the rib, as will be more fully explained in connection with Figs. 7 and 8. The members 29 may be heated by any suitable means as diagrammatically indicated by the inlet and outlet passages 31, through which a suitable heating medium, liquid or gaseous, may be supplied to the interior of the members 29. Application of heat and pressure to the closure rib of the container is effective to melt the adhesive applied on the adjacent faces of the rib forming portions, as previously explained, and under the pressure exerted by the members 29 any paraffin which may be present over the adhesive will be squeezed out and expelled so that an adhesive-to-adhesive bond is obtained between the various thicknesses of the closure rib. After the desired application of heat and pressure, the containers pass immediately to a cooling zone represented by position L in Fig. 1c, wherein suitable cooling elements 32 adapted to be supplied with cooling medium through suitable inlet and outlet ports 33 are arranged to engage the flattened top portion of the container 10 and opposite surfaces of the closure rib, which is identified in position L by the reference numeral 34, so as to retain the various parts of the closure rib and the container top in the desired flattened position until such time as the adhesive has cooled and set. The finished container, which is indicated in the position M with the top tightly closed and sealed, then passes to a suitable discharge station wherein the container may be removed from the supporting cup 10 in any desired manner.

In Fig. 7 the closure rib of the container is shown in the condition which obtains at the time that the container is passing from position J into the heating and pressure applying means of position K, that is with the closure rib fully formed but before heat and pressure has been applied thereto. It will be observed that the two outer layers of the closure rib which are formed by the flap 17 include double thickness portions 35 which are disposed opposite the space 36, which exists between the inner ends of the bellows fold provided by the adhesive coated portions of the end panels 11 and 12. Likewise, as shown in Fig. 7, the adjacent faces of each of the thicknesses of material forming the closure rib 34 is provided with a layer of adhesive 37, which, as previously indicated, is of the hot melt type, and this layer of adhesive is covered by an overlayer 38 of paraffin.

In Figs. 8 and 9 the closure rib 34 is shown in its final condition after the application of heat and pressure thereto and it will now be observed that the double thickness portions 35 have been forced inwardly so that these portions in conjunction with a portion 39 of the side wall 13 completely close the space 36 shown in Fig. 7. It will be observed that the paraffin layer shown in Fig. 8 has disappeared, having been squeezed out by the application of pressure to the rib 34, and consequently a compact tightly sealed closure rib is obtained. The application of heat and pressure by the members 29 throughout substantially the entire length and height of the closure rib 34 assures a uniform bonding together of the various thicknesses of the rib so as to substantially eliminate the possibility of leakage.

While a particular embodiment of the invention has been shown, it will be understood, of course, that the invention is not limited thereto since many modifications may be made and it is therefore contemplated by the appended claims to cover any such modifications as fall within the true spirit and scope of the invention.

What is claimed and desired to be secured by Letters Patent of the United States is:

1. The method of closing and sealing paraffined or similarly treated paper-board containers of the type having a preformed body portion surmounted by an open mouth portion scored along predetermined fold lines to form a fully depressible bellows type closure, which comprises rigidly supporting said body portion against outward bulging, locally heating said mouth portion to soften the paraffin thereon, applying inwardly directed forces to predetermined end areas of said mouth portion while said paraffin is in softened condition partially to fold said mouth portion along said score lines, progressively forcing opposed side wall panels of said mouth portion inwardly to a substantially flat position, applying heat and pressure to adjacent edges of said side wall panels to seal said edges together while maintaining said side wall panels in said flat position, and then cooling said sealed edges before releasing said side wall panels.

2. The method of closing and sealing paraffined or similarly treated paper-board containers of the type having a preformed body portion surmounted by an open mouth portion scored along predetermined fold lines to form a fully depressible bellows type closure, which comprises rigidly supporting said body portion against outward bulging, locally heating said mouth portion to soften the paraffin thereon, applying inwardly directed forces to predetermined end areas of said mouth portion while said paraffin is in softened condition partially to fold said mouth portion along said score lines, progressively forcing opposed side wall panels of said mouth portion inwardly to a substantially flat position, wherein the inner edges of said side wall panels extend upwardly in parallel relation to provide a multiple thickness adhesive coated closure rib, applying heat and pressure to opposite surfaces of said closure rib while maintaining said side wall panels in said flat position, and then cooling said closure rib before releasing said side wall panels.

3. The method of closing and sealing paraffined or similarly treated paper-board containers of the type having a preformed body portion surmounted by an open mouth portion scored along predetermined fold lines to form

a fully depressible bellows type closure, which comprises rigidly supporting said body portion against outward bulging, locally heating said mouth portion to soften the paraffin thereon, applying inwardly directed forces to predetermined end areas of said mouth portion while said paraffin is in softened condition partially to fold said mouth portion along said score lines, progressively forcing opposed side wall panels of said mouth portion inwardly to a substantially flat position wherein the inner edges of said side wall panels extend upwardly in parallel relation to provide a multiple thickness adhesive coated closure rib, applying heat and pressure to opposite surfaces of said closure rib throughout substantially the entire length of said rib to form a compact seal therebetween while maintaining said side wall panels in said flat position, and then cooling said sealed rib before releasing said side wall panels from said flat position.

4. The method of closing and sealing paraffined or similarly treated paper-board containers of the type having a preformed body portion surmounted by an open mouth portion adapted to form a fully depressible bellows type closure, said mouth portion comprising scored inwardly collapsible end panels and inwardly foldable side panels, each of said panels having an upper edge portion coated with hot-melt adhesive, said coated portions upon closure of said mouth portion forming an upstanding multiple thickness closure rib, which method comprises rigidly supporting said body portion against outward bulging, locally heating said end panels to soften the paraffin in the scored areas thereof, applying inwardly directed forces to said end panels partially to collapse said end panels along the score lines thereof while said paraffin is in softened condition, thereafter progressively forcing said side panels inwardly and downwardly to form a flat top with said coated edge portions in upstanding face-to-face relation, applying heat and pressure to said upstanding portions while maintaining said panels in said flat position thereby to melt said adhesive and compact said edge portions into said rib, and then cooling said rib to set said adhesive before releasing said panels from said flat position.

5. The method of closing and sealing paraffined or similarly treated paper-board containers of the type having a preformed body portion surmounted by an open mouth portion adapted to form a fully depressible bellows type closure, said mouth portion comprising scored inwardly collapsible end panels and inwardly foldable side panels, each of said panels having an upper edge portion coated with hot-melt adhesive, said coated portions upon closure of said mouth portion forming an upstanding multiple thickness closure rib, which method comprises rigidly supporting said body portion against outward bulging, locally heating said end panels to soften the paraffin in the scored areas thereof, applying inwardly directed forces to said end panels partially to collapse said end panels along the score lines thereof while said paraffin is in softened condition, thereafter progressively forcing said side panels inwardly and downwardly to form a flat top with said coated edge portions in upstanding face-to-face relation, applying heat and pressure throughout substantially the entire length and height of said upstanding portions while maintaining said panels in said flat position thereby to melt said adhesive and compact said edge portions into said rib, and then immediately cooling said rib to set said adhesive before releasing said panels from said flat position.

6. The method of closing and sealing paraffined or similarly treated paper-board containers of the type having a preformed body portion surmounted by an open mouth portion adopted to form a fully depressible bellows type closure, said mouth portion comprising scored inwardly collapsible end panels and inwardly foldable side panels, each of said panels having an upper edge portion coated with hot-melt adhesive, said coated portions upon closure of said mouth portion forming an upstanding multiple thickness closure rib, which method comprises rigidly supporting said body portion against outward bulging, locally heating said end panels to soften the paraffin in the scored areas thereof, applying inwardly directed forces to said end panels partially to collapse said end panels along the score lines thereof while said paraffin is in softened condition, thereafter progressively forcing said side panels inwardly and downwardly to form a flat top with said coated edge portions in upstanding face-to-face relation, folding an upstanding tab on an outer one of said coated portions over the others of said portions to form said closure rib, applying heat and pressure to said rib while maintaining said panels in said flat position to melt said adhesive and compact said rib, and then cooling said rib to set said adhesive before releasing said panels.

7. Apparatus for closing and sealing paraffined or similarly treated paper-board containers of the type having a preformed body portion surmounted by an open mouth portion adapted to form a fully depressible bellows type closure, comprising a rigid cup supported for movement along a predetermined path and adapted to receive the body portion of a container, means disposed along said path for locally heating the open mouth portion of a container supported in said cup, means disposed on opposite sides of said path beyond said heating means and movable inwardly to engage and press inwardly opposed end panels of said heated mouth portion, plow means extending along said path beyond said last mentioned means for progressively folding the opposed side panels of said mouth portion inwardly to form a substantially flat top having a transversely extending closure rib upstanding therefrom, means for exerting sealing heat and pressure on said rib while restraining said flat top against upward movement, and means adjacent said heating means for continuing said restraint on said top and for cooling said rib.

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