July 30, 1957 G. MEYER-JAGENBERG ET AL 2,801,040

LIQUID-TIGHT CONTAINER OF PAPER, CARDBOARD AND THE LIKE, AND METHOD OF MANUFACTURING, FILLING AND CLOSING THE SAME

Filed March 29, 1954 3 Sheets-Sheet 1

Fig. 1.

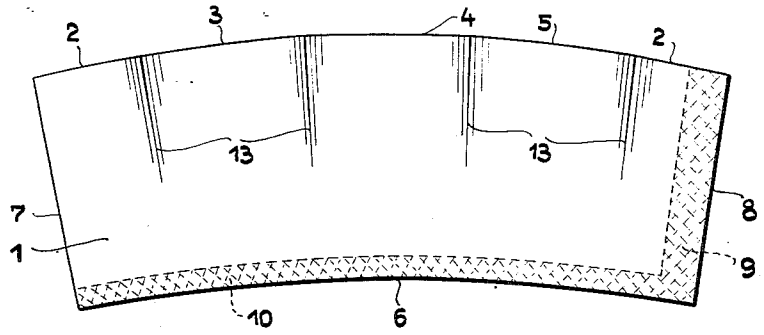


Fig. 2.



Fig. 4.

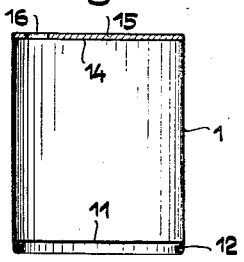


Fig. 3.

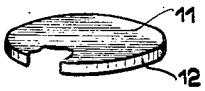
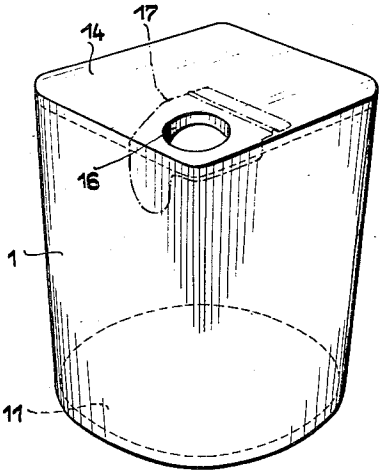


Fig. 5.



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Fig. 6.



Fig. 7.

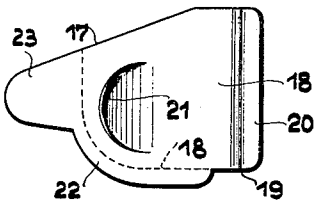


Fig. 11.

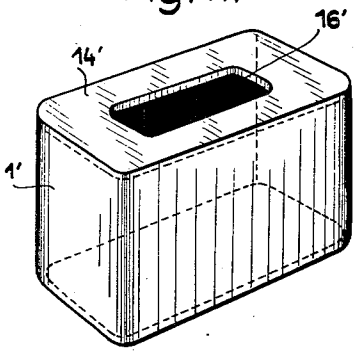


Fig. 12.

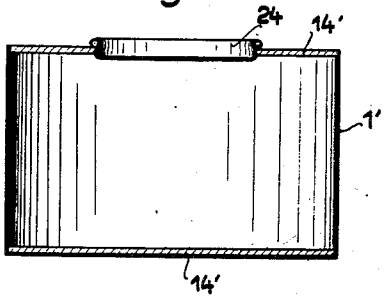


Fig. 8.

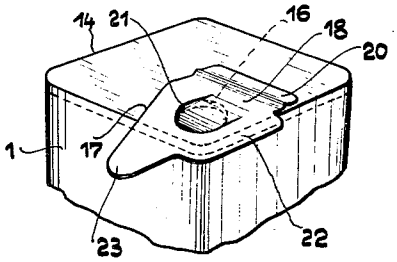


Fig. 9.

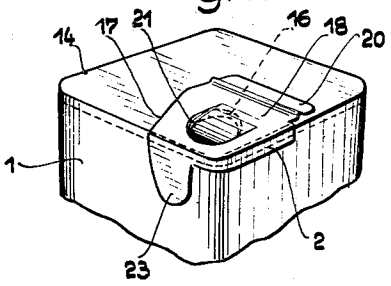
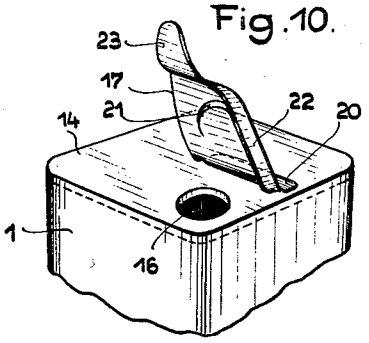


Fig. 10.



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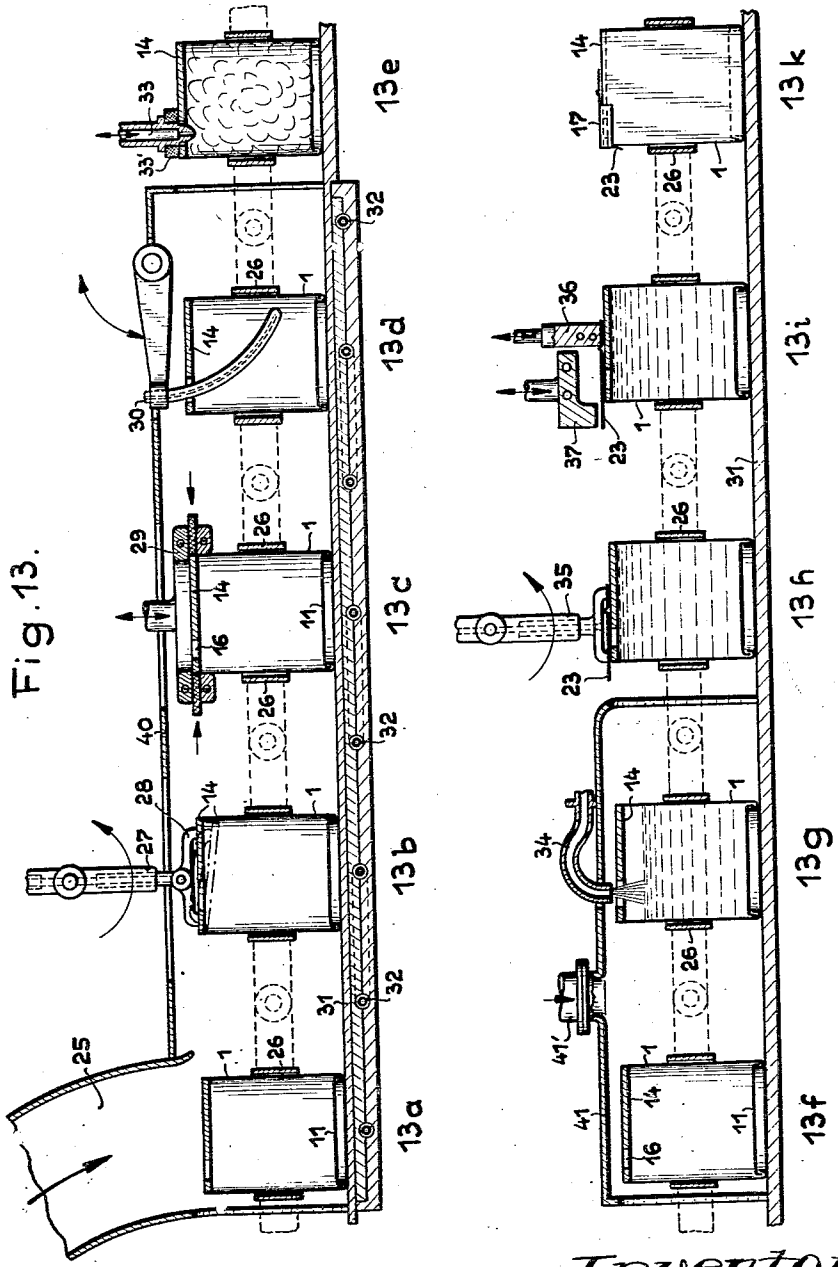
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LIQUID-TIGHT CONTAINER OF PAPER, CARDBOARD AND THE LIKE, AND METHOD OF MANUFACTURING, FILLING AND CLOSING THE SAME

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Fig. 13.



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LIQUID-TIGHT CONTAINER OF PAPER, CARDBOARD AND THE LIKE, AND METHOD OF MANUFACTURING, FILLING AND CLOSING THE SAME

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Application March 29, 1954, Serial No. 419,442

4 Claims. (Cl. 229—7)

The present invention relates to the art of containers and their manufacture. More particularly, the invention relates to a liquid tight container of paper, cardboard or the like material, and to methods of manufacturing, filling and closing the same.

The invention relates to a container of paper, cardboard, and the like carton-forming material adapted to receive liquids, and which container is of the type constituted by a tubular body portion and closure parts or members mounted adjacent the ends of the body portion.

Containers of this type generally consist of an initially flat, blank which has been cut and scored and is folded and adhesively interconected into the form of a tubular body, the upper and lower ends of which are closed by either the insertion of separately formed closure members or by changing the shape of the blank where closure flaps have been incorporated therewith.

Containers of this type are known in which the lower end is closed by an inserted closure member or a closure formed from flat extensions of the body and in which the upper end closure is also formed of folded flaps that are integral with the body blank, and in which instance the folded closure is usually disposed above the level of the material filling the container.

Apart from the increased cost eminating from additional material forming the folded closure, the production of such folded closures entails increased labor costs, and the flap parts which mutually overlap in forming the closure do not always insure a perfect liquid tight closure.

Additionally, folded closures for liquid containing cartons usually have a roof-shape such as is prevalent in milk cartons, which results in an unused air space lying above the liquid level, which shape not only does not permit stacking of containers on top of one another, but also provides a useless increase in the total volume of the container. Furthermore, due to the enclosed air, the quality of easily spoiled materials such as milk or the like is unfavorably influenced.

For these reasons, efforts have been directed to utilize flat top closures or closure parts in which the upper closure is located directly above the plane of the liquid level, so as to avoid any inclosed air space and to fully utilize the capacity of the container. Furthermore, a container with flat closure members is suitable for stacking or piling in vertical relationship. In the manufacture of containers with flat closures, the production of a flat bottom closure generally does not involve any particular difficulties, since the production of such closures may be effected on a mandrel, which provides an effective reaction bearing for the insertion of the tools used in the shaping of the closure. However, the production of an upper closure part is fraught with difficulties, since no effective reaction bearing is present to receive the pressure of the tools. This drawback is especially noticeable if the upper end of the container is to be closed by a cap-like closure, and the rigidity of the closure member and the upper portion or margins of the container body is insufficient to withstand the pressure required for providing a tight or sealed joint.

Furthermore, the reverse arrangement of a closure element, that is, the insertion of an element in such a manner that the rims of the lid are directed outwardly, that is, away from the bottom, is not satisfactory, since in this case a closure member results which lies lower than the upper edge of the container body, again providing an arrangement in which the total volume of the container stands in an unfavorable ratio to its actual capacity.

It has also been proposed to use a rimmed-lid like closure which includes a reinforcement engaging within the container body opening for the purpose of receiving the pressure that arises during the insertion of the closure. This arrangement has, corresponding to the aforementioned one, the disadvantage that the rims that embrace the marginal edges of the container body project beyond the walls of the container and thus provide a joint of body with closure part that is easily damaged by external causes. Furthermore, the essential tightness of the rim joint of external rims that have to be shaped and pressed presents difficulties, since by positioning rims or flanges of the closure about the edges of the corners of the container body, several layers of material accumulate, thus increasing the pressure required to effect the proper closure and minimizing the liquid tightness of the joint.

In all of the above-mentioned instances, the container body and/or the closure member are subjected to some deformation in order to provide the joint, and the formation of a tight joint between a container body and closure member adjacent generally sharp-edge corners necessitates extensive deformation.

The present invention, therefore, has for an object to overcome the disadvantages set forth hereinbefore, and to provide a liquid tight container in which the closure is joined to the body portion with no deformation, and the full volumetric capacity of the container is utilized.

Thus, the present invention has for an object to provide a liquid tight container of prismatic or slightly conical shape, including a body portion of tubular form that has been erected from a flat blank, and upper and lower closure members arranged parallel to one another. In accordance with the invention, one or both closure members constitutes a flat, stable plate, that is, one that is fairly rigid, which is inserted into the container body so that the upper surface of this closure plate lies in the same plane as the upper marginal edges of the body. The outer sides of the closure conform to the shape of the inner walls of the container at the upper edge thereof, and the walls support the closure and are adhesively secured thereto.

Within the concept of the present invention the construction of the container may be such that independently of the size and shape of the body, the upper body opening is the only one closed by a planar closure member, while the lower body opening or bottom may be closed by any well known closure part. Thus, in this connection, one of the body openings, such as the bottom, may be closed by a planar closure formed by folding and gluing flaps provided on the body blank.

The invention further comprehends the concept of providing both upper and lower closures of planar stable plates.

In view of the ease of manufacture and of the stability provided, it is advisable that the container be of a shape that tapers from an upper square cross-section toward a bottom having a round cross-section, with the upper end of the container being closed by a flat closure part or plate having preferably four rounded points. The lower end of the container is provided with a round closure part, the upper surface of which is parallel to the upper or top closure plate, and which bottom closure is located inwardly of the lower marginal edges of the container body. This precise arrangement is of particular utility,

since in the event of an unavoidable or accidental lowering or dropping of the container onto a supporting surface, the lower closure part being inset from the bottom edge of the body does not directly contact the support.

In order to make it possible to arrange filled and closed containers alongside one another in a space saving manner, the diameter of the round lower cross-section or bottom and the diameter of a circle inscribed into the finely square upper portion or top are substantially equal.

Also, in order to manufacture the container with the expenditure of the least amount of material, the ratio of the diameter of the round bottom and the diameter of the circle inscribed at the top to the height of the container is so selected that a maximum container volume results from a minimum container surface.

In accordance with the invention, the planar upper closure member constituting the top is provided with an opening for filling and dispensing of the contents of the cartons, and which opening after filling is closed by a closure flap that is readily movable away from the opening.

As a further feature of the invention, that part of the closure flap that is to be lifted up from the opening is secured by a readily detachable binding medium, while that part of the closure flap which after opening is to remain on the upper surface of the closure plate is secured by a binding medium that is more adherent, so that the flap cannot be completely detached from the closure plate, except with considerable difficulty. With this arrangement, the closure flap may be opened without difficulty, so as to fully expose the dispensing opening while a portion of the flap remains firmly secure to the closure, which permits the flap to be used for reclosing after a portion of the contents have been dispensed.

The invention further has for an object to provide a method in the production of and filling and closing of the container which includes moving the container body, having its bottom thereon, through a plurality of successive stages or steps in which the top is closed, by inserting a planar closure member having an opening therein, the interior of the container is spray coated with an impregnating material such as paraffin, and thus simultaneously sterilized, following which in direct sequence, the container is filled, and the opening in the closure plate effectively closed by the flap.

Further, from a method standpoint, the flat closure plate is inserted in a slanting position relative to the axis of the container body to such an extent that the uppermost edge, as viewed in slanting relation, aligns with the plane of the top of the container, whereupon the closure plate is pivoted back to a horizontal position until the entire upper surface of the closure plate lies in the plane of the upper edges of the container. This inserting step facilitates the introduction of the closure plate into the upper body opening, and upon the return of the closure to horizontal, insures a tight fitting engagement between the inner surfaces of the body at the upper edges, and the external marginal faces of the closure plate.

Further, in order to obtain an efficient layer of paraffin on the interior of the container with the expenditure of the least amount of material, the invention has for another object the step of heating the container prior to spray coating the inside thereof. This heating of the container body can be effected by contact or radiation heat applied within and/or externally of the body. The heat is applied to a temperature which lies above the melting point of paraffin, and which temperature is maintained only long enough to insure that the paraffin particles applied in uniform and finest distribution have consolidated to a closed film. Following the application of heat to the container body and the spray coating thereof, the container is cooled until the paraffin film has set. These steps insure that the sprayed on paraffin film cannot enter or flow into the walls or body of the container, and thus provide the necessary conditions to insure a uniform, closed and structure-free film of paraffin.

Furthermore, in accordance with the invention, at the initiation of the spraying step, the filing and dispensing opening in the closure part or plate is sealed for the duration of the spraying step, and the spraying is effected with substantial exclusion of air. In this manner a superatmospheric pressure is generated for a short time with the formation of air whirls within the interior of the container body, whereby the paraffin particles effect a uniform and finely divided distribution or precipitation onto the entire inner surface of the container.

Further and more specific objects will be apparent from the following description and accompanying drawings having reference to constructional examples of two forms of the container, and the method of manufacturing, filling and closing the same.

In the drawings, Figure 1 illustrates a flattened container blank that is erected into a tubular body form,

Figure 2 illustrates a flat, generally square closure plate having rounded corners,

Figure 3 illustrates a pre-shaped, dish-like round bottom closure,

Figure 4 is a longitudinal sectional view of the container with top and bottom closures in place,

Figure 5 is a perspective view of a container,

Figure 6 is a sectional view through a closure flap,

Figure 7 is a top plan view of the flap illustrated in Figure 6,

Figure 8 illustrates the closure flap in the initial position of mounting the same on the container,

Figure 9 illustrates the closure flap in fully applied position,

Figure 10 is a fragmentary perspective view illustrating a container with the closure flap,

Figure 11 is a perspective view illustrating a further form of container in which the upper and lower ends of the body are closed by planar closure members,

Figure 12 is a longitudinal sectional view of the container shown in Figure 11, and

Figure 13 illustrates the several method steps embodied in producing, filling and closing a container.

The constructional example hereinafter described is predicated upon a container of slightly conical formation tapering from an upper generally square cross-section having rounded corners to a lower round cross section. The upper end or top of the container body is closed by a flat or planar closure member constituted by a stable plate of cardboard or the like, which is inserted into the container body so that the top surface of the closure plate lies in the plane determined by the coordinated upper marginal edges of the container body. The lower or bottom end of the container is closed by a round closure member that is inset relative to the bottom edge of the container.

As illustrated in Figures 1 and 5, the container body which is formed from an initially flat blank which is bounded by upper body edge portions **2**, **3**, **4** and **5**, and by a lower body edge **6** and lateral edges **7** and **8**. The edges **7** and **8** provide the vertical height of the container. The edge **8** that forms the longitudinal seam of the body is provided with an adhesive carrying strip or with a band of adhesive indicated at **9**, and the lower edge **6** of the blank is provided with an adhesive carrying strip or band of adhesive **10**. The adhesive portion **10** serves solely for securing the pre-shaped, dish-like closure part **11** in place. The erection of the flat blank **1** into a tubular container body is preferably effected by the utilization of a mandrel in a known manner, with the lower closure part **11** being simultaneously inserted into the lower opening of the body with a portion of the lower edge **6** having adhesive thereon being folded over the depending rim or flange **12** of closure member **11**, and by means of pressure being joined thereto. In order to facilitate the formation

of the generally square upper edge of the container body, score lines 13 are formed in the blank so that a better adaptation or fitting of the upper edge of the body with the top closure plate 14 is insured.

The top or upper closure plate 14, as shown in Figure 2, is constituted by a perfectly planar plate of stiff cardboard or the like so that it is stable. This plate is coated on all its sides, preferably by dipping, with a thermoplastic binding medium. As shown in Figure 4, the closure part is inserted in the upper opening of the container body so that the upper surface of plate 14 lies in the plane determined by the upper edges 2, 3, 4 and 5 of the body, and the lateral or marginal face 15 of plate 14 abuts the inner surface of the container body immediately adjacent the edges thereof. The connection between the closure part 14 and the inner wall of the body 1 is effected by the binding medium applied to the marginal face 15 of the closure plate which becomes plastic and bonds under the influence of heat and pressure. For economy in manufacture of a container, and with particular regard to the most favorable ratio between capacity and the amount of material used, the dimensions of the container are so selected that the diameter of the lower round closure member 11 corresponds substantially to the diameter of the inscribed circle of the upper, generally square, closure part 14. The ratio of this diameter to the height of the container is so chosen that a maximum container volume and a minimum container surface results.

The upper closure part is, as shown in Figure 2, provided with a filling and dispensing opening 16. As shown in Figure 5, after filling, the container is provided with a closure flap 17 that closes the opening 16. This closure flap, as shown in Figures 6 and 7, consists of aluminum foil-backed paper or cardboard blank, which on its under surface is provided with a paraffin coating. The shape of the closure flap blank is such that it provides a body part 18, including a rounded edge 18' that conforms to the shape of the corner of the container body, and a depression 21 is impressed into the body part 18, so that in closed condition, the vertical extension 21' of this depression engages the inner edge of the opening 16. A score line 19 divides the body part 18 from a securing part 20, and foldable flap portions 22 and 23 extend outwardly of the curved line 18', so that, as shown in Figure 9, these portions lie flat against two adjacent sides, and the corner of the container body. The flap portion 23 is elongated, so that it can be grasped for opening purposes.

As shown in Figure 8, the flattened closure flap is first mounted adjacent the filling opening 16 on the top of closure plate 14. The securing of the closure flap 17 to the top to effect closure of the opening is so effected that the panel 20 of the flap is subjected to a stronger and longer lasting pressure by a heated tool, so that in this region, due to heat and pressure, the paraffin layer on the underside of the panel 20 of the closure flap is melted, and the stronger and now sticky thermoplastic binding medium on the upper surface of closure part 14 becomes effective to securely bind panel 20 to the top of closure plate 14. The remaining surface of the closure flap 17, constituted by the body part 18 and the marginal flap portions 22 and 23, is exposed to heat and pressure such as to only render plastic the paraffin layer on the underside of the closure flap, whereby a close and tight but readily detachable connection of the portion 18 of flap 17 to the upper surface of closure plate 14 is effected. By suitably shaping the pressing tool that applies the closure flap portion other than the panel 20, the end flaps 22 and 23 are folded down about the adjacent sides and corner of the container body.

Figures 11 and 12 illustrate a modification in which both the upper and lower ends of the container body 1' are closed by flat closure plates or panels 14', and which flat plates, in a manner similar to the previously described form, are inserted into the upper and lower forms of the body. In this form, one of the closure plates, as illustrated, the upper closure plate is provided with a filling and dispensing opening 16' which, as shown in Figure 12, is closed by a tightly fitting, clamping cover 24 of paper, metal or other suitable material.

The method of producing, paraffining and closing the container is explained by the working steps or stages diagrammatically illustrated in Figure 13. The container body that has been erected and had its dish-like bottom part 11 inserted therein is delivered, for example, by a pneumatic conveyor, which includes an air pressure duct 25 to the cells 26 of a conveyor mechanism that is intermittently actuated. The container bodies enter the cells at station 13*a*, whereupon the conveyor is moved to station 13*b*, so that the flat closure plate 14 can be inserted in the top opening of the body. The insertion step is effected so that the closure plate 14, removed from a pile, not shown, is grasped by a suitable suction tool 27 held thereby, and inserted in such a manner in the upper body opening that initially the closure plate occupies the slanting position shown in dotted lines whereupon by a corresponding guiding motion of the suction head 28 that holds the closure plate 14, the same is returned to horizontal position until its top face lies in the plane determined by the container body edges, whereupon suction is released, and the closure plate 14, while not secured to the inner faces of the body, is of such fit that it remains at a level with the upper edges. The conveyor mechanism moves again, and the container body 1 arrives at station 13*c*, where it is operated upon by reciprocal pressing tools 29, which, under the influence of heat and pressure, render the thermoplastic coating on the marginal edges 15 of the closure plate 14 effective, and secure the closure plate to the body 1. Upon further travel of the conveyor, the successive cells 26 arrive at station 13*d*, at which, for a short interval of time, a heating element, denoted generally at 30, is introduced through the filling opening for heating the interior of the container.

During the travel of the conveyor through stations 13*a*, *b*, *c*, and *d*, the container is guided through a casing 40, partly or entirely surrounding the path of movement, and this casing is heated by heating elements 32 mounted in the base plate 31. The container, after having been heated, both internally and externally, to a temperature above the melting point of the paraffin, reaches station 13*e*, at which point a paraffin-spraying device, including a nozzle noted at 33, is introduced into the opening 16. The nozzle 33 has a gasket 33' thereon, which is pressed against the top of the container closure plate 14 to seal the opening 16. The paraffin is sprayed through the nozzle in finely divided form, and precipitates on the inner surfaces of the container, and due to the previous heating of the container, the paraffin coagulates to provide a closed film. In order to preserve the degree of distribution of the paraffin that has been thus obtained, the container is moved to the station 13*f*, which is surrounded by a cooling chamber denoted at 41, that has a cool air inlet 41' communicating therewith. During further travel of the container it is moved to station 13*g*, where it is filled by filling device 34 up to the level of the undersurface of closure plate 14. Subsequent movement of the conveyor moves the successive cells 26 to station 13*h*, where it receives closure flaps 17 that have been removed from a pile, not shown, by a suction head 35. The flaps are still in a flat condition, and are applied to the top of the closure plate 14 with the vertical wall portion 21' of the body portion 18 of the flap fitting into the opening 16.

To secure the closure flap 17 to closure plate 14, and thus finally close the container, reciprocatory pressing tools 36 and 37 are effective at station 13*i*. The tool 36, as previously described, engage the panel 20 of the closure flap 17 prior to engagement of tool 37, and thus the heat and pressure applied to panel part 20 is of longer duration, and is effected to securely fasten panel 20 to closure

plate 14 by a thermoplastic adhesive bond. The pressing tool 37 then becomes effective to secure the body portion 18 of the closure flap to the top of closure plate 14, and also close down the flap portions 22 and 23 about the adjacent edges of the container. The manufacture of the container has thus been completed, and the filled and closed container is removed to station 13*k*, whereupon it can be removed from the cells of the conveyor.

The invention, therefore, provides a method of filling, closing and sealing a container in successive stages or steps, which include a heat and pressure bonding of the closure to the container, the heating of the container body internally and/or externally, spray coating of the interior of the container body to waterproof the same, a cooling of the coated container to set the coating, a complete filling of the container followed by a heat and pressure sealing of a removable closure flap on the dispensing opening.

The invention further provides the combination of a tubular container body with a planar, relatively stiff, closure plate secured to the upper inner surface of the body, with the upper surface of the closure plate lying in the plane determined by the upper edges of the container body.

We are now quoting examples regarding the temperatures to which the containers are exposed and the duration of this exposure, the binding media used and the most favourable container dimensions.

Before the interior is spray-coated, the container is pre-heated to 60–80° C. The cooling temperature depends on the heat and the type of paraffin, but it is at any rate below the melting point of the latter. In the present example cooling down to 30–40° C. would be sufficient. Pre-heating takes 4 steps of the machine, i. e. 4–6 seconds, while 2–3 steps will do for cooling dependent on the method used. For gluing the length and bottom seams a not water-soluble starch glue with plastic additions is most suitable, while the planar closure part is provided, preferably by immersion, with a conventional thermoplastic adhesive for heat-sealing it to the container body.

The most favourable dimensions for the 1 pint container are a diameter of the round bottom and the inscribed circle of the substantially square closure member of 3" and a container height of 4", the relation being so selected that a maximum container volume and a minimum container surface results.

What is claimed is:

1. A liquid-tight container of paper, cardboard or the like carton forming material comprising a one-piece tubular body having upper and lower ends, said body including an upper portion of substantially square cross section having rounded corners and an external shape tapering uninterruptedly downwardly and inwardly and terminating in a round bottom, the upper closure including a flat plate having rounded corners and of a thickness greater than that of the container body and conforming in shape to the internal cross section of the upper edges of the body so as to provide a stable closure, said plate being inserted within the body so that its top surface lies in the plane determined by the upper marginal edges of the body, said plate having marginal side faces, means adhesively securing said side faces to the adjacent inner surfaces of the body, the said flat closure plate also having a filling and dispensing opening therein, a closure flap including a first panel securely bonded to the upper surface of the flat closure plate and a second panel detachably bonded to the upper surface of said flat closure plate to close the opening and said second panel being hingedly connected to the first panel, said second panel including portions detachably bonded to at least portions of the upper external sides of the container body and a round closure for the lower end of said body.

2. In the method of producing, filling and closing containers comprising initially inserting a planar closure having an opening therein into one end of an erected tubular container in a slanting position until the upper edge thereof as regards the slanting position is substantially at the level of the upper edges of the container, tilting the planar closure until its entire upper surface lies in the plane determined by the upper edges of the container, securing the marginal face of the closure to the upper inner surfaces of the container, heating the container to a temperature above the melting point of an impregnating material, spray coating the interior of the container with an impregnating material to waterproof and simultaneously sterilize the container by introducing a spray heat through the opening in the closure and spraying the material within the container, maintaining the temperature of the container until the particles of the impregnating medium are uniformally distributed on the inner surface of the container to provide a closed film, sealing the opening in the planar closure during spraying to substantially exclude air and provide superatmospheric pressure within the container body to effect uniform distribution of finely divided particles of impregnating material on the entire inner surface of the container cooling the container to set the film, filling the container and subsequently closing and sealing the opening in the closure.

3. A method of closing, filling and sealing containers comprising in succession inserting a planar closure member having an opening therein within one end of an erected tubular container body, securing the closure member to the body with the outer surface of the closure member lying in the plane determined by the adjacent edges of the body, heating at least the interior of the container to a temperature above the melting point of paraffin, spraying the finely divided paraffin into the container through the opening in the closure plate while sealing the opening to exclude air and to develop superatmospheric pressure within the container body to effect formation of a closed paraffin film on the inner surfaces of the body, cooling the coated body, filling the container body and finally applying a closure flap to the closure member to seal the opening therein.

4. In the art of manufacturing, filling and closing containers, the improvements comprising moving a body having an open upper end through a first group of working stations while subjecting the exterior of the body to heat, at said stations successively inserting a planar closure plate having a filling and dispensing opening therein within the open upper end of the body, adhesively securing the inserted closure plate to the interior of the body with the top surface of the closure plate flush with the rim of the body, and introducing a heating element through the filling opening so as to heat the interior of the body whereby the interior and exterior of the body are heated to a temperature above the melting point of an impregnating medium, thereafter removing the heating element and moving the now heated body to an impregnating station, at said station introducnig a spraying nozzle into the opening of the closure while sealing the opening and spraying paraffin impregnating medium in finely divided form into the interior of the previously heated body whereby the paraffin coagulates to provide a closed film, preserving the degree of distribution of the paraffin by moving the now impregnated body into a cooling chamber and introducing a cooling air current into the chamber, subsequently moving the body to a filling station and at that station filling the interior thereof to the level of the under surface of the top closure, and thereafter moving the now filled container to successive closing stations and at said stations first initially applying a removable closure to the top of the now filled body with the removable closure overlying the opening in the top and subsequently securing the closure to the top of the container.

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