Nov. 5, 1968 M. MUELLER 3,408,787

METHOD FOR CAPPING CONTAINERS

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Fig. 1

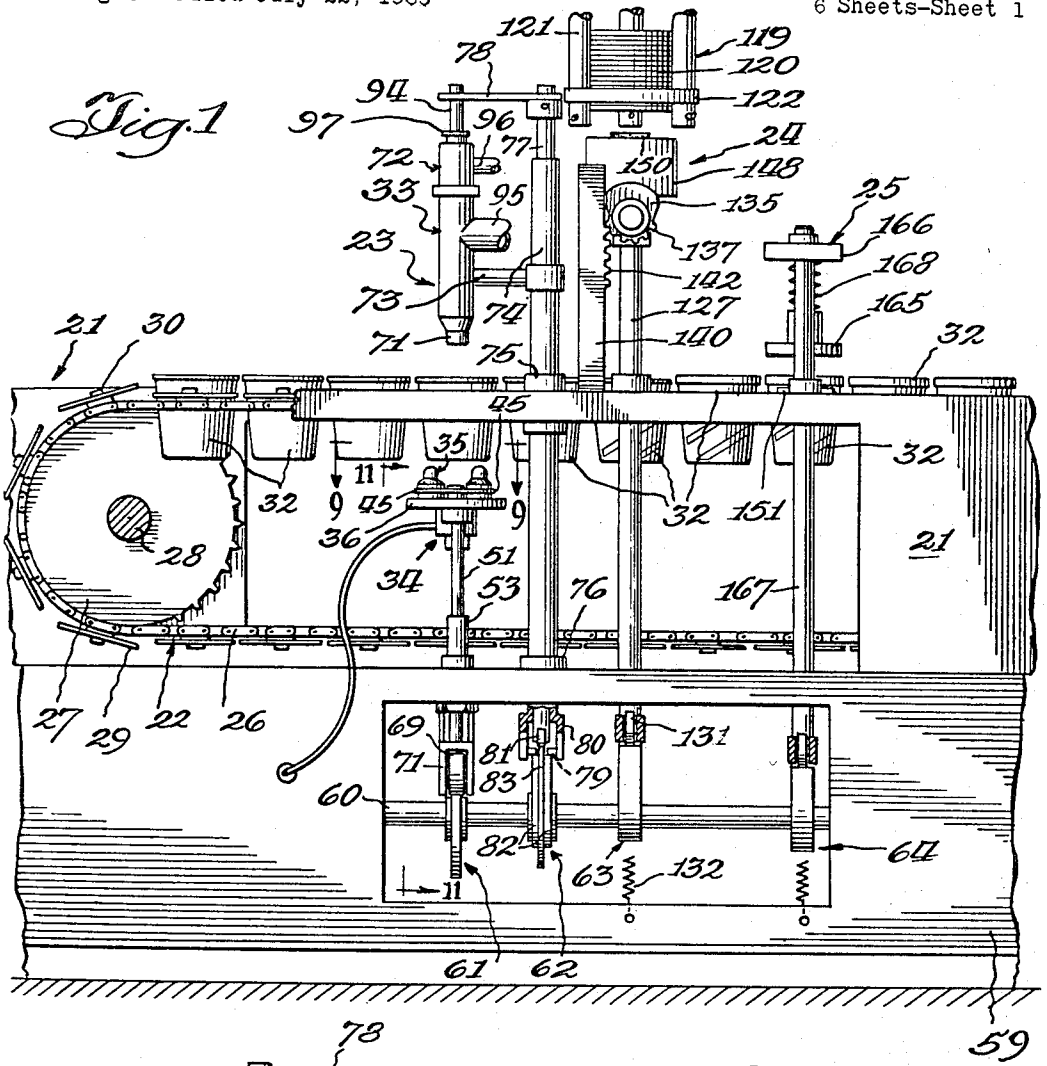


Fig. 2

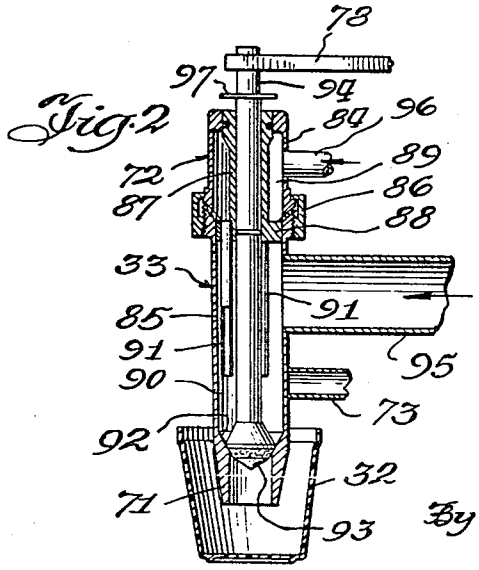
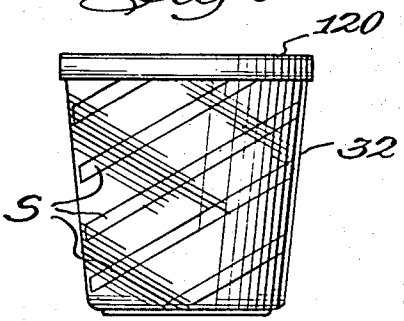


Fig. 3



By

Inventor
Martin Mueller
Dressler, Goldsmith, Clement & Gordon
Attorneys

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Fig. 4

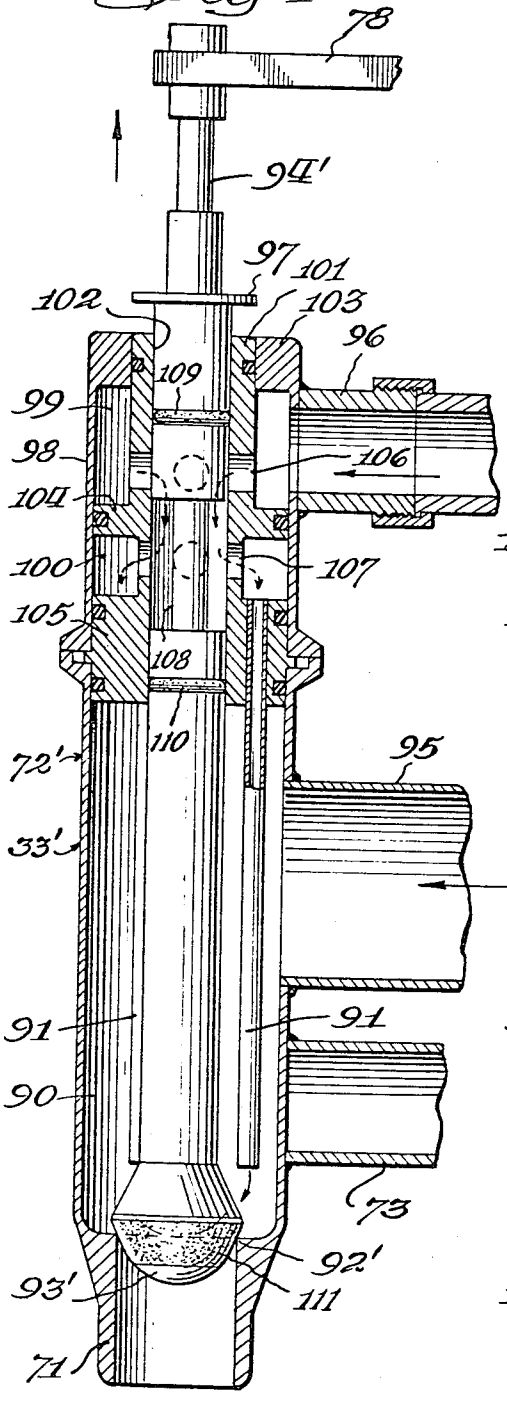
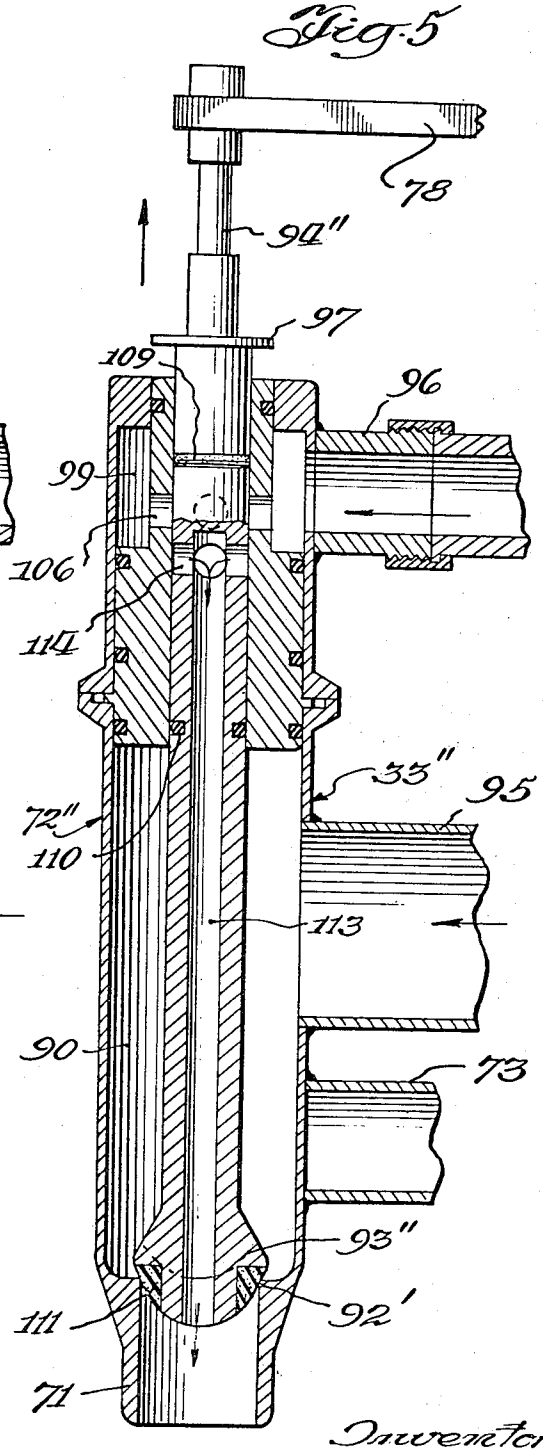


Fig. 5



Inventor
Martin Mueller,
By Dressler, Goldsmith, Clement, & Gordon, Attorneys

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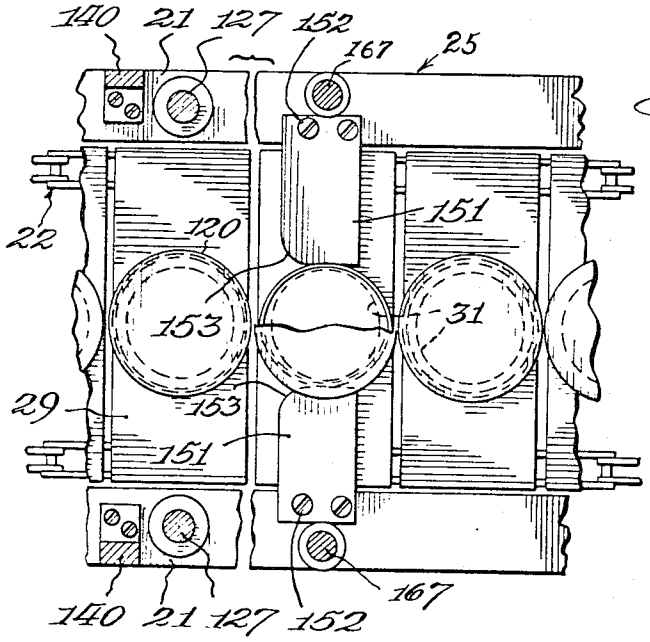


Fig. 16

Fig. 6

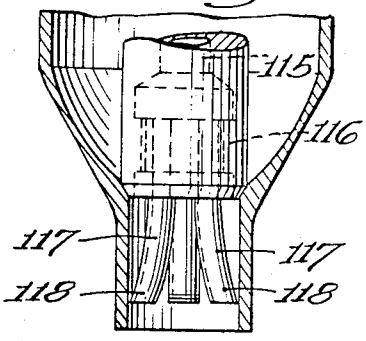


Fig. 7

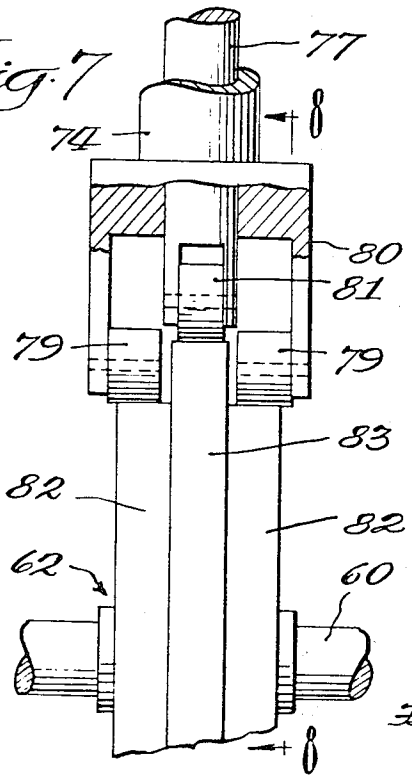
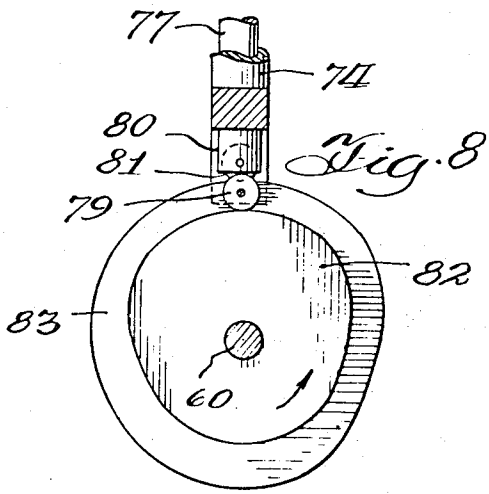


Fig. 8



Inventor
Martin Mueller
By Dressler, Goldsmith, Clement & Gordon
Attorneys

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Fig. 9

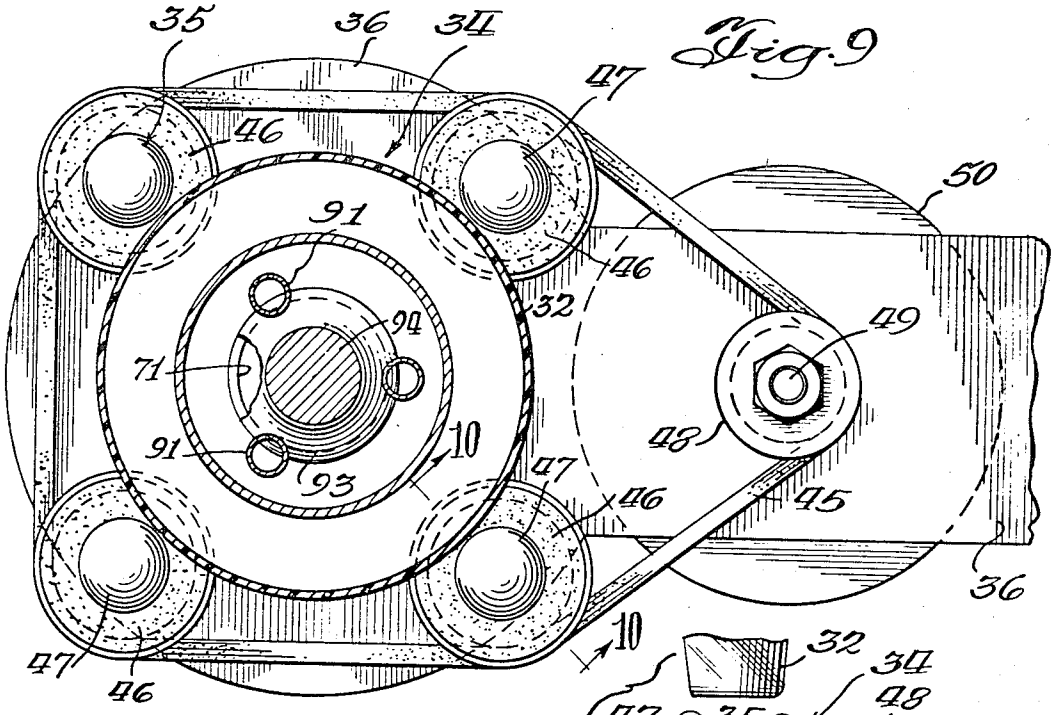


Fig. 10

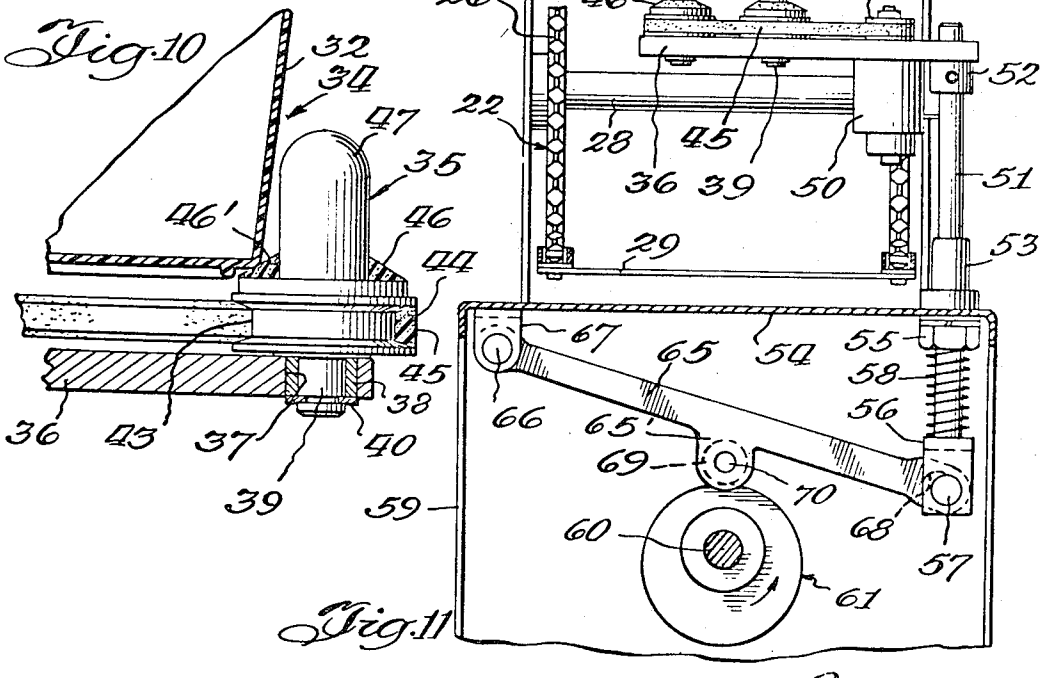


Fig. 11

Inventor
Martin Mueller
By Dressler, Goldsmith, Clement & Gordon
Attorneys

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Fig. 12

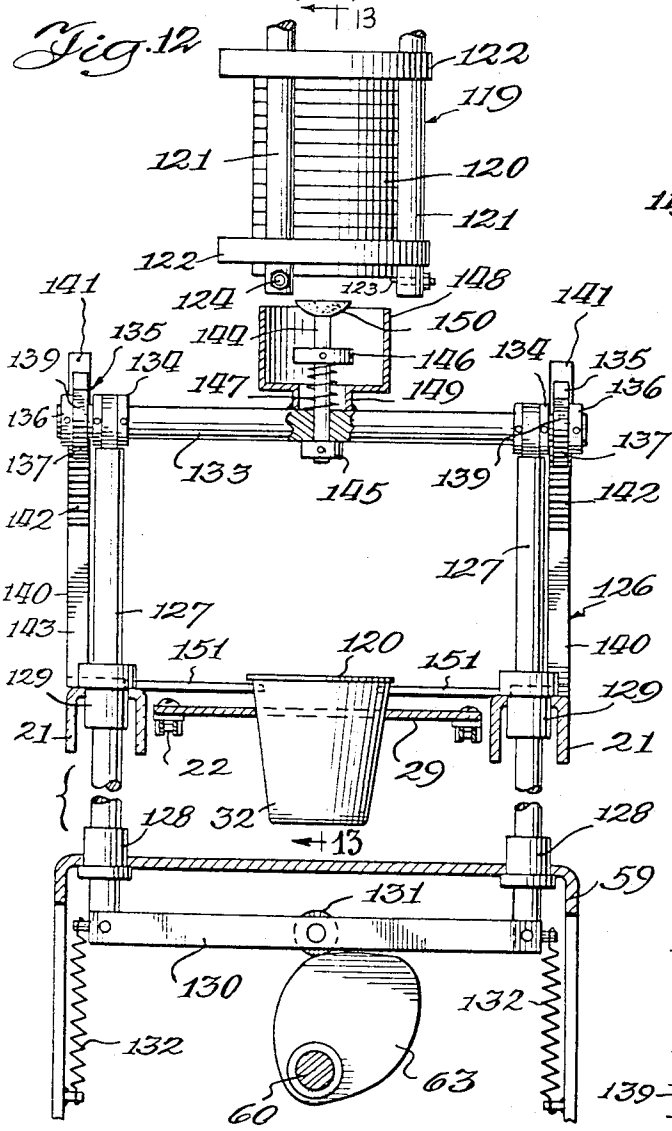


Fig. 13

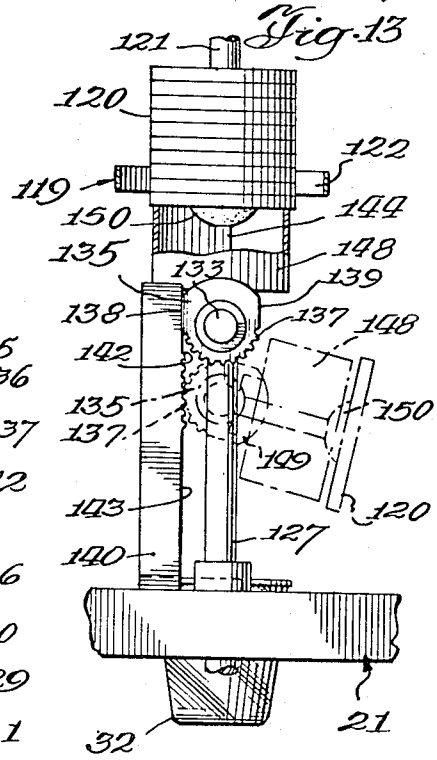


Fig. 14

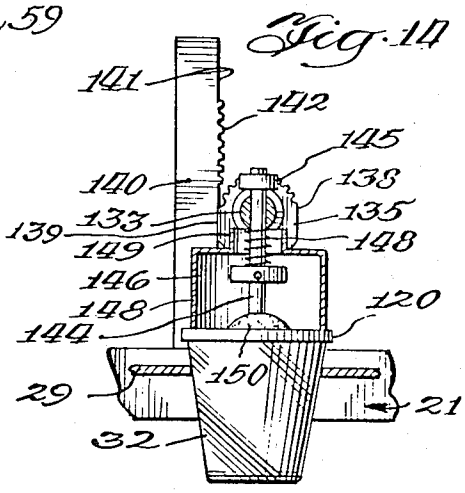
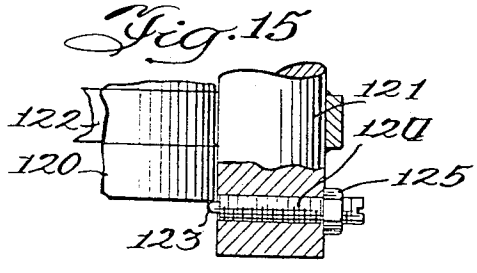


Fig. 15



Inventor
Martin Mueller
By Dressler, Goldsmith, Clement, & Gordon
Attorneys

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Fig. 17

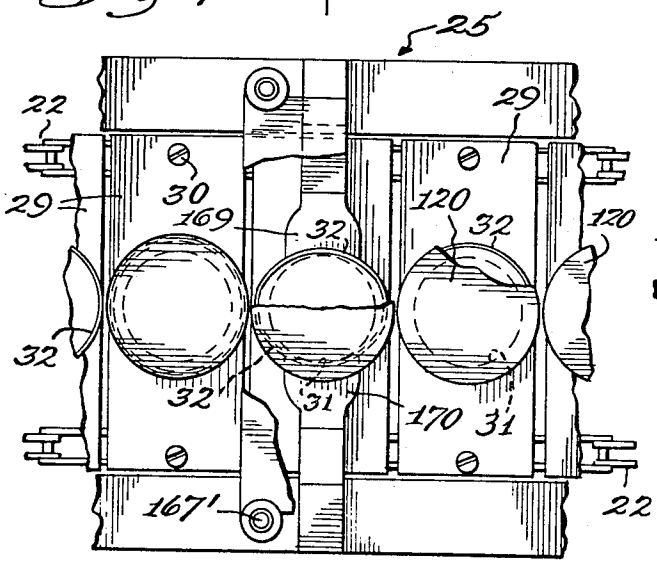


Fig. 19

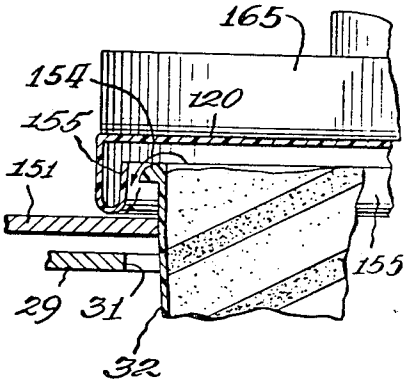


Fig. 20

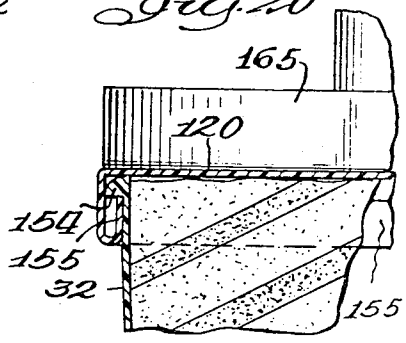


Fig. 18

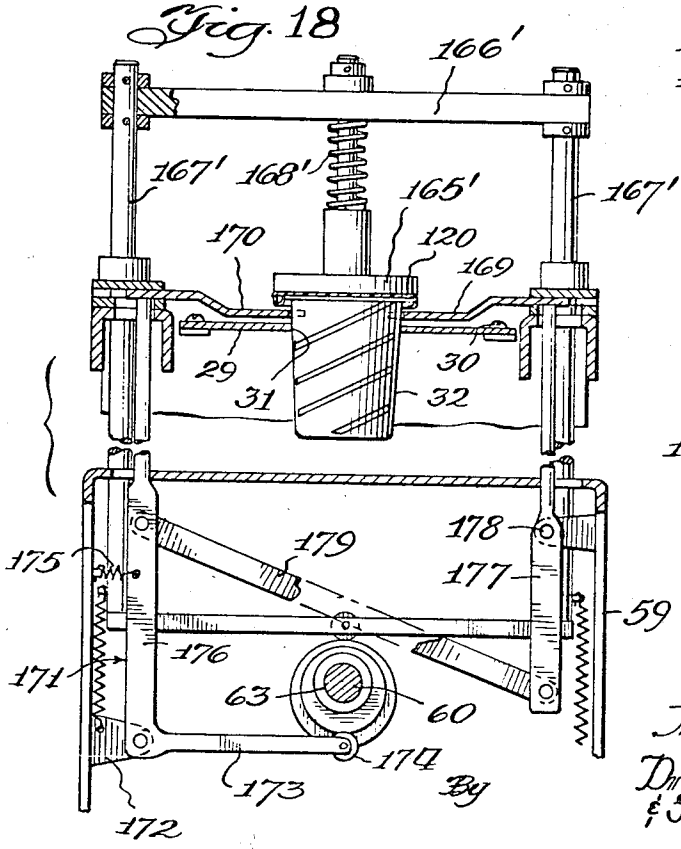
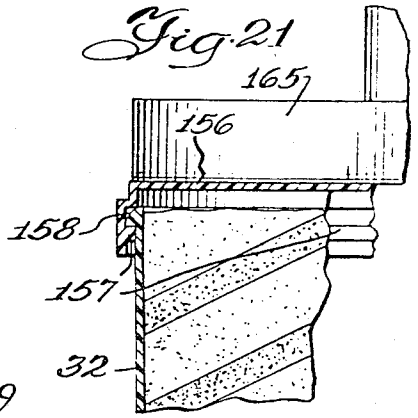


Fig. 21



Inventor
Martin Mueller
Dressler, Goldsmith, Clement & Gordon
Attorneys

United States Patent Office 3,408,787 Patented Nov. 5, 1968

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METHOD FOR CAPPING CONTAINERS

Martin Mueller, Chicago, Ill., assignor to Lily-Tulip Cup Corporation, New York, N.Y., a corporation of Delaware

Continuation of application Ser. No. 560,754, June 27, 1966, which is a division of application Ser. No. 296,563, July 22, 1963, now Patent No. 3,267,971, dated Aug. 23, 1966. This application Dec. 19, 1967, Ser. No. 691,745

5 Claims. (Cl. 53—37)

ABSTRACT OF THE DISCLOSURE

The method is directed to applying a cover to a container in such a manner as to provide an air-free sealed package. The removal of air from under the cover of the container permits the container to be fully packed without any unsightly bulging which would impair the esthetic appeal of the package and which would also make it harder to pack the sealed packages in a carton or a freezer. The air is removed by engaging opposite sides of the container near the upper edge thereof and squeezing them toward each other to form a path for the escape of any air trapped beneath the cover.

This application is a continuation of my copending application No. 560,754, filed June 27, 1966, now abandoned, which in turn is a division of application No. 296,563 filed July 22, 1963, now U.S. Patent No. 3,267,971.

This invention relates to a packaging apparatus and process, and is particularly concerned with a means and a process for mechanically packaging flowable material of two different colors in a cylindrical, conical or frusto-conical transparent container in such a manner as to produce a spiral effect visible through the outside of the container.

While the apparatus is capable of packaging different types of products, it is particularly designed for packaging pressure flowable food products, such as, for example, ice cream, sherbet and the like, and, for convenience, the invention will be described with reference to ice cream and syrup.

Packages containing ice cream with syrup or other flavoring material arranged to form a spiral design around the outer surface of the ice cream are not new, but heretofore such packages have been produced only when the materials are packed by hand. In hand packing, a composite downflowing stream of ice cream and syrup is maintained in a steady flow while successive packages are inserted into the stream and twisted during the filling process. Packing in this manner is relatively slow and requires the constant attention of an operator of skill and agility. It is therefore much more costly than the packing of containers without the spiral effect.

The apparatus of the present invention enables the manufacturer to package ice cream with the desired spiral effect much more rapidly and efficiently and at substantially the same price as ice cream without the spiral effect. The apparatus also includes means for applying a cover to the container in such a manner as to provide an air-free sealed package. The removal of air from under the cover of the container permits the container to be fully packed without any unsightly bulging which would impair the esthetic appeal of the package and which would also make it harder to pack the sealed packages in a carton or a freezer.

The structure by means of which the above mentioned and other advantages of the invention are attained will be fully described in the following specification, taken in conjunction with the accompanying drawings showing a

preferred illustrative embodiment of the invention, in which:

FIG. 1 is a fragmentary side elevational view of the apparatus embodying the invention;

FIG. 2 is a vertical sectional view showing one embodiment of the dispenser or discharge nozzle;

FIG. 3 is a detail perspective view of a package produced by the apparatus;

FIG. 4 is a vertical sectional view of a preferred embodiment of the discharge nozzle;

FIG. 5 is a vertical sectional view of another preferred embodiment of the discharge nozzle;

FIG. 6 is a fragmentary view, partly in section and partly in elevation, showing another preferred embodiment of the discharge nozzle;

FIG. 7 is a fragmentary side elevational view of the cam mechanism for operating the discharge nozzle;

FIG. 8 is a vertical sectional view, taken along the line **8—8** of FIG. 7;

FIG. 9 is a cross sectional view, taken generally along the line **9—9** of FIG. 1, but with the discharge nozzle within the container at the start of the container filling operation;

FIG. 10 is a cross sectional view, taken along the line **10—10** of FIG. 9;

FIG. 11 is a vertical sectional view, taken along the line **11—11** of FIG. 1;

FIG. 12 is a fragmentary vertical view, partly in elevation and partly in section, showing the cover applying mechanism;

FIG. 13 is a fragmentary vertical view, partly in elevation and partly in section, taken generally along the line **13—13** of FIG. 12, and showing the cover applying mechanism in its uppermost position in solid lines and in an intermediate position in dotted lines;

FIG. 14 is a view of the mechanism shown in FIG. 13, except that the mechanism is in its lowermost position;

FIG. 15 is a fragmentary detail view, partly in elevation, showing the adjustable means for holding a stack of covers in a receptacle before they are applied to the filled containers;

FIG. 16 is a fragmentary top elevational view showing the mechanism for freeing the container of entrapped air before the cover is secured in place;

FIG. 17 is a view similar to FIG. 16, showing another embodiment of the mechanism shown in FIG. 16;

FIG. 18 is a fragmentary vertical sectional view taken along the line **18—18** of FIG. 17;

FIG. 19 is a diagrammatic view showing howing how entrapped air is released from the container before the cover is secured in place;

FIG. 20 is a diagrammatic view showing the cover of FIG. 19 secured to the container; and

FIG. 21 is a view, similar to FIG. 20, showing a different form of cover.

Referring to the drawings, the apparatus comprises a suitable frame **21**, an endless conveyor **22**, a filling station **23**, a cover applying station **24**, and a sealing station **25**. The conveyor comprises a pair of laterally spaced endless chains **26** each of which extends around a pair of sprockets **27** at opposite ends of the frame. The sprockets at each end are mounted on a rotatable shaft **28**, one of the shafts being driven by a motor (not shown). A series of flat plates **29** secured at opposite edges to chains **26**, as indicated at **30**, each have a centrally disposed opening **31** for receiving a transparent or translucent container **32**. A container is manually positioned in each opening **31**, but automatic means may be provided for this purpose. The container is preferably of frusto-conical shape, and the opening **31** has a diameter slightly smaller than the diameter of the top portion of the container, so that the container is supported just below its upper edge, as shown in FIG. 18.

Although the apparatus shown in the drawings has means for supporting only one row of containers, it will be understood that the chains may be spaced any desired distance from each other, and each plate **29** may be provided with a plurality of openings for holding a plurality of rows of containers. The containers of each row would then be filled simultaneously. Cylindrical containers may be used in the same apparatus if they have a lateral flange adjacent the upper edge. If the containers to be filled are cylindrical, and do not have any lateral flange, they may be supported by inturned fingers depending from plates **29**.

The conveyor is moved intermittently by any suitable means (not shown), and is stopped each time one of the plates **29** reaches the filling station with the open top of the container carried thereby positioned beneath the discharge nozzle **33**. The movement of the conveyor is so timed that each container beneath the discharge nozzle is filled before the conveyor resumes its movement. A spinning mechanism **34** in vertical alignment with the discharge nozzle is located beneath the container when the container is being filled.

The spinning mechanism, as shown in FIGS. 9 to 11, comprises a plurality of spindles **35** rotatably mounted in a flat horizontally disposed plate **36** having an aperture **37** for receiving each spindle. Although the number of spindles may be varied, the preferred embodiment has four. The apertures in plate **36** are spaced equidistant from a common center and each aperture is provided with a bushing **38** in which the shank **39** of the spindle fits. The shank **39** is held in the bushing by a C-spring **40**. The intermediate section of the spindle has a circumferential recess **43** with bevelled edges **44** for a frictional fit with an endless belt **45**. The spindle also has a beveled surface **46** above the recess, for frictional engagement with the lower edge of the container **32**. Preferably the surface **46** is formed by a ring **46'** of rubber or other similar resilient material that is fitted over the spindle **35**. As shown in FIG. 10, the ring **46'** has a triangular cross section.

The apertures **37** are so spaced that the center to center distance between diagonally opposite apertures is slightly greater than the diameter of the bottom of the container. The intermediate section of each spindle extends laterally beyond the circumference of its aperture to such an extent that the distance between the adjacent edges of diagonally opposite spindles is less than the diameter of the bottom of the container, and the bevelled surfaces **46** of each spindle engage the lower edge of the container when the plate **36** is raised, as hereinafter described. The upper portion of the spindle is in the form of an upright projection **47** spaced slightly from the upright wall of the container **32** to prevent displacement of the container as it is spun around its own vertical axis by the frictional engagement of its lower edge with the four spindles that are rotated constantly by the endless belt **45**.

The belt **45**, which frictionally engages the circumferential recess of each spindle, is driven by a pulley **48** which is fixed to the output shaft **49** of a motor **50**. The motor is preferably an air motor, but any suitable motor may be used. The motor **50** is mounted on the bottom of plate **36** in any suitable manner with its output shaft **49** projecting through said plate for driving engagement with the endless belt **45**.

The plate **36** is fixed at one end to a vertical shaft **51** by means of a collar **52**. The shaft **51** is slidably mounted in a bushing **53** that extends through a flat plate **54** and is secured thereto by a nut **55**. An inverted channel member **56** mounted on the lower end of the vertical shaft **51** carries a transverse pin **57** for a purpose hereinafter disclosed. A coiled compression spring **58** encircling shaft **51** between the nut **55** and the top of channel member **56** urges shaft **51** downwardly. The plate **54**, through which the shaft **51** extends, forms the top of a housing **59** that encloses a main drive shaft **60**. The shaft **60** is driven continuously by a motor (not shown) to rotate a series of cams **61**, **62**, **63** and **64** mounted on the shaft in axially spaced relationship.

The vertical movement of shaft **51** in the upward direction is controlled by a lever **65** that is pivotally secured at one end to a pin **66** mounted in a bracket **67** mounted on the underside of plate **54**. The opposite end of the lever has an elongated slot **68** through which the pin **57** extends. A cam follower roller **69** is rotatably mounted on a pin **70** fixed to a pair of ears **65'** extending downwardly from the lever **65** at approximately its midsection. The spring **58** urges the cam roller **69** downwardly into peripheral surface engagement with the cam **61**. As the cam **61** rotates, its thick section forces the lever **65** upwardly about its fixed pivot **66** to raise the shaft **51** and plate **36** against the force of the spring **58**. The spring **58** forces the shaft **51** downwardly as the rotation of the cam moves its thin section between the shaft **60** and the cam roller **69**. The cam **61** is set to provide a predetermined timing relationship between the vertical movement of the spinner mechanism and the feeding mechanism.

As the spinning mechanism is moved upwardly, the beveled surfaces **46** of all of the spindles **35** engage the lower edge of the container and spin it rapidly. The upright projections **47** of the spindles are so close to the upstanding wall of the container **32** that they restrict the lateral movement of the container to a distance less than the lateral overlap between the outer edge of the container and the periphery of the base of the beveled surface **46**. The spatial relationship between the spindles and the vertical axis of the container insures continuous frictional engagement between the beveled surface **46** of each of the spindles and the lower edge of the container whenever the spinning mechanism is raised high enough for such engagement.

As the shaft **51** is raised, the spinning mechanism raises the container until the bottom of the empty container is in proximity to the outlet **71** at the lower end of the discharge nozzle **33**. The operation of the apparatus is so timed that the nozzle is closed when the spinning mechanism is in its uppermost position. By means of mechanism hereinafter described, the nozzle **33** is opened to dispense the food products into the container at the same time as the spinning mechanism starts moving downwardly. As previously stated, the spring **58** forces the spinning mechanism downwards. The weight of the container and the food products dispensed into it force the container downwardly to keep it in contact with the spinning mechanism as the spinning mechanism is moved downwardly, thus insuring continuous spinning of the container as it is being filled. When the container is completely filled, the discharge nozzle is closed.

The diameter of the aperture **31** in plate **29** is smaller than the diameter of the container at its upper edge portion. Accordingly, the container stops moving downwardly when its peripheral surface engages the edge of the plate **29** defining the aperture **31**. At this point the upper edge of the container is lower than the bottom of the nozzle **71**. The spinning mechanism continues its downward movement until it reaches its lowermost position. At this point the thinnest portion of the cam **61** is between the cam roller **69** and the shaft **60**. As soon as the spindles **35** of the spinning mechanism move downwardly far enough to clear the bottom of the container, the conveyor starts to move the containers toward the discharge end of the conveyor. The movement of the conveyor is timed so that the most recently filled container reaches the cover applying station **24**, and the next container reaches the filling station **23** in vertical alignment with the spinning mechanism before the spinning mechanism moves upwardly far enough to engage the bottom of said next container.

The discharge nozzle **33** comprises a housing **72** connected by means of a bracket **73** to a vertically reciprocable sleeve **74** slidably mounted in axially spaced bushings **75** and **76**. A rod **77**, slidably mounted in the sleeve

74, has a cross bar 78 secured to its upper end. The other end of the cross bar is operatively connected to a plunger structure, hereinafter described, for controlling the operation of the nozzle 33. As shown in FIGS. 7 and 8, a pair of cam rollers 79 are rotatably mounted in a bifurcated bracket 80 depending from the lower end of the sleeve 74. A cam roller 81 is rotatably mounted in the lower end of the rod 77.

The cam rollers 79 and 81 are engaged with the cam 62, which is a double acting cam comprising a pair of identical cam plates 82 fixed to the drive shaft 60 adjacent opposite sides of a central cam plate 83. The cam plates 82 are each in vertical alignment with one of the cam rollers 79, and the cam plate 83, which is also fixed to shaft 60, is in vertical alignment with the cam roller 81. The cam roller 81 is moved upwardly by the cam plate 83 to raise the cross bar 78. The cross bar 78 and the plunger structure connected thereto may be moved downwardly by gravity, following the configuration by the periphery of the cam plate 83, but a spring mechanism, such as that shown in FIG. 11, may be provided, if necessary to insure downward movement of the cross bar and its associated plunger tructure.

The cam rollers 79 move the sleeve 74 upwardly as they are moved upwardly by the configuration of the peripheries of cam plates 82. The cam plates 82 are shaped to provide an abrupt rise in the movement of sleeve 74 substantially simultaneously with the termination of the downward movement of the cross bar 78. The significance of the timed relationship between the abrupt upward movement of the sleeve 74 and the completion of the downward movement of the cross bar 78 will be discussed later in connection with the description of the specific operation of the discharge nozzle 33.

In the simplest form of the discharge nozzle 33, as shown in FIG. 2, the housing 72 comprises an upper section 84 and a lower section 85 secured in axial alignment by a threaded collar 86. A cylindrical tube 87 depending from the top of section 84 has an annular flange 88 engaging the inner wall surface of the housing to divide the annular space between the tube 87 and the inner wall surface of the housing into an upper chamber 89 and a lower chamber 90. A plurality of narrow conduits 91 extend through the flange 88 to allow one food product, such as syrup, to pass from the upper chamber to the lower chamber for discharge through the discharge outlet 71 simultaneously with the discharge of a different food product, such as ice cream, from the lower chamber into a container 32. In FIG. 9 three conduits are shown, but it will be understood that any desired number of such conduits may be provided. The rapid spinning of the container as the ice cream and syrup flow into it in an unblended stream causes the syrup to assume a spiral pattern near the outer wall of the container, as indicated at S in FIG. 3. It is preferred to have the conduits 91 equally spaced radially of the dispenser to provide uniformity to the spiral pattern of the completed package, but the conduits may be spaced unequally to provide different spiral patterns.

The interior of the lower chamber has an inwardly extending annular shoulder forming a valve seat 92 just above the discharge outlet 71. A valve 93 is mounted on a plunger 94 which has its upper end connected to the cross bar 78. The valve 93 is shaped to seal the discharge outlet 71 of the nozzle 33 when it is seated on the valve seat 92. A conduit 95 leading into the lower chamber 90 is connected to a source of supply of the basic food product, such as ice cream. Means is provided to force the ice cream or other food product through the conduit by pressure. The conduit is flexible, or is provided with a flexible connection, to allow the dispenser to move vertically. A conduit 96 is connected to the upper chamber 89, and the second food product, such as syrup, is forced from a supply source into the upper chamber by pressure. The conduit 96 is similar to, but preferably smaller than the conduit 95.

When the container is moved upwardly into position to be filled, the valve 93 is moved upwardly, and the ice cream from the lower chamber and the syrup from the upper chamber are forced into the rapidly rotating container in four unblended streams. The ice cream stream is comparatively thick, and the streams of syrup are thin. The container is rotated constantly during the filling operation, and is lowered gradually as it is filled. The constant rotation and the downward movement of the container as it is being filled causes the syrup to assume a spiral pattern within the ice cream and near the outer periphery of the container which is made of transparent plastic. With three streams of syrup spaced equally radially of the axis of the plunger 94, the spirally arranged streams of syrup are equally spaced vertically from each other in the container.

At substantially the same instant that the container is filled to its capacity the sleeve 74 is raised abruptly by cam plates 82 to provide a clean break in the flow of the ice cream and syrup and thus prevent the contents of the downwardly moving container from pulling the ice cream and syrup below the valve of the discharge nozzle into the container. The clean brake in the flow avoids forming a mound at the top of the ice cream in the container. The upward movement of the housing 72 is limited by a flange 97 secured to the plunger 94. Simultaneously with the upward movement of the housing 72 the valve 93 engages its seat 92 to close the discharge outlet 71 of the nozzle 33.

The discharge nozzles 33' and 33'', shown in FIGS. 4 and 5, respectively, differ from the discharge nozzle shown in FIG. 2 in that in the embodiments of FIGS. 4 and 5 a separate cutoff is provided for the syrup. The different valve structure will be described, but the duplicate structure in each embodiment will be indicated by identical reference numerals, and the description of such structure will not be duplicated.

In FIG. 4, the upper section 98 of housing 72' is divided into two vertically spaced annular chambers, an upper chamber 99 and an intermediate chamber 100 by an insert 101 having a vertical bore 102 in which the plunger 94' is slidably mounted. The upper end of the upper section 98 has a flange 103 extending inwardly to fit tightly against the outer surface of the insert 101 and thus form the top of the upper annular chamber 99. An annular flange 104 extends outwardly from the insert 101 to the inner wall surface of the housing 72' intermediate the length of the insert to form the bottom of the upper annular chamber 99 and the top of the intermediate annular chamber 100. The insert 101 has another lateral flange 105 forming the bottom of the intermediate annular chamber and the top of the lower chamber 90. A plurality of conduits 91, preferably three, extend through the lower flange 105 to permit the syrup to flow from the intermediate chamber 100 into the lower portion of the lower annular chamber 90 and thence through the discharge outlet 71 of the nozzle.

The vertical wall section of the insert 101 is provided with a plurality of apertures 106 interconnecting the upper annular chamber 99 with the vertical bore 102 and a plurality of apertures 107 interconnecting the intermediate annular chamber 100 with the bore 102. The section of the plunger 94' below the flange 97 is constructed as a slide valve cooperating with the insert 101 to control the flow of one of the food products, such as, for example, the syrup. The plunger 94' has an annular recess 108 between an upper O-ring 109 and a lower O-ring 110 each of which forms a seal between the plunger 94' and the bore 102 of the insert 101. The vertical travel of the plunger within housing 72' is so limited that both O-rings engage the inner wall surface of the insert 101 in all positions of the plunger.

The upper annular chamber 99, the apertures 106, the annular recess 108, the apertures 107, and the annular chamber 100 all constitute parts of the conduit that permits the syrup to flow from the source of supply to the end of the lower chamber 90 adjacent the discharge outlet. The annular recess 108 has a vertical dimension long

enough to allow it to register with the apertures **106** and **107** at the same time, thus providing flow communication from the supply conduit **96** to the discharge conduit **91**. When the plunger is in its lowermost position, in which the valve **93'** is seated on its seat **92'**, the solid portion of the plunger above the recess **108** is in register with the apertures **106**, and the conduit is closed to the flow of syrup.

When the container is in position to be filled, the plunger **94'** is raised to lift valve **93'** from its seat and to register recess **108** with both series of apertures **106** and **107**. The valve **93'** and its seat **92'** may be identical with valve **93** and its seat **92**, but in FIGS. 4 and 5 the valve has a resilient annular insert **111** of rubber or any suitable plastic material positioned to engage a sharp annular edge **92'** that forms a valve seat. With the plunger **94'** in its uppermost position, the syrup or other food product flowing under pressure in the conduit **96** flows into the upper annular chamber **99**, through apertures **106**, recess **108** and apertures **107** into the intermediate annular chamber **100**. The syrup flows from the chamber **100** through the conduits **91**, into the chamber **90**, and out the nozzle **71** along with the ice cream or other food product as in the embodiment of FIG. 2.

When the container is filled and the housing **72'** is moved upwardly, as described in connection with the embodiment of FIG. 2, the plunger **94'** is in the position shown in FIG. 4. In this position the upper end of recess **108** is below the plane of apertures **106**. The solid portion of the plunger **94'** cuts off the flow of syrup from conduit **96**, since said syrup cannot pass through the apertures **106** into the recess **108**.

In FIG. 5, the valve structure is similar to that shown in FIG. 4 except that the plunger **94''** is provided with a conduit **113** in the form of an axial bore extending upwardly through the valve **93''**. A plurality of transverse apertures **114** extending through the wall of plunger **94''** lie below the apertures **106** when the plunger **94''** is in its lowermost position. When the plunger **94''** is raised, in the same manner as described in the embodiment of FIG. 2, the transverse apertures **114** move into axial register with the apertures **106** so that all parts of the conduit are in flow communication, and the syrup can flow from the conduit **96** through apertures **106** and **114** into conduit **113**. The pressure flowing the syrup through conduit **96** will force the syrup through the nozzle **33''** as long as the apertures **106** and **114** remain in axial alignment. However, when the valve **93''** is on its seat **92'**, the parts of the conduit are not in flow communication because the apertures **114** are not in register with the apertures **106**, and the flow of syrup is effectively cut off.

The embodiment of FIG. 6 is similar to that of FIG. 5 except that the conduit **113** is replaced by a conduit **115** in the form of a vertical bore of larger diameter. A plug **116** fitted into the lower end of the conduit **115** has three conduits **117** extending therethrough to divide the flow of syrup from the conduit **115**. The lower ends of the conduits **117** are flared outwardly, as indicated at **118**, to direct the streams of syrup toward the outer edges of the container.

After a container has been filled, it is automatically moved to the cover applying station **24**. At this station an open ended receptacle **119** holds a stack of flat, flanged covers **120** in vertical alignment, with each cover being arranged in position ready to be applied to a filled container. The receptacle **119** comprises three vertical rods **121** held in spatial relationship by horizontally extending bands **122**. The covers are held in the receptacle **119**, with their flanges extending upwardly, by spring pressed pins **123** projecting inwardly from screws **124** threaded through the rods **121** and held in place by nuts **125**. As shown in FIG. 15, the spring pressed pins extend under the peripheral edge portions of the covers only a very short distance. Although the pins hold the covers securely in the receptacle **119**, the pins may be retracted to permit removal of the covers from the receptacle by a slight downward pressure against the pins.

The mechanism for applying covers to the filled containers comprises a vertically disposed rectangular frame **126**, as shown in FIG. 12. The frame **126** comprises two vertically disposed posts **127** each of which is slidably mounted in vertically aligned bushings **128** and **129**. The bushings **128** are mounted in the top wall of housing **59**, and the bushings **129** are mounted in the frame **21** of the machine. The lower ends of the posts are tied together by a cross bar **130** on which a cam roller **131** is rotatably mounted. Springs **132**, each having one end secured to housing **59** and the opposite end secured to the bar **130**, urge the bar downwardly to keep the cam roller in engagement with the peripheral surface of cam **63** which is fixed to drive shaft **60**. A cross shaft **133** is rotatably mounted in apertures provided therefor in the upper ends of posts **127**.

The cross shaft **133** is held against axial displacement of a pair of collars **134** fixed to the shaft on opposite sides of each post **127**. A segmental pinion **135** is secured adjacent each end of shaft **133** and is held in place by another collar **136**. Each pinion is provided with teeth **137** over a portion of its periphery, a flat peripheral surface **138** contiguous to one end of the toothed portion, and a similar flat peripheral surface **139** contiguous to the opposite end of the toothed portion. A vertically disposed rack **140** is fixed to the frame **21** adjacent opposite sides of the machine and extends upwardly into engagement with the peripheral surface of the adjacent pinion. Each rack has an upper flat surface **141**, an intermediate toothed surface provided with teeth **142** adapted to mesh with the teeth **137**, and a lower flat surface **143**.

Rotation of the drive shaft **60** moves the frame **126** vertically in the upward direction by the action of cam **63** against the cam roller **131**. The springs **132**, assisted by the weight of the frame **126**, move the frame downwardly whenever the cam **63** is in position to permit such movement. The entire movement of the frame **126** is vertical, but during the intermediate portion of the vertical movement of the frame, the teeth **137** of the segmental pinions engage the teeth **142** of the rack to rotate the cross shaft **133** through 180°. The flat surfaces **138** and **141** cooperate to prevent rotational movement of the cross shaft **133** adjacent the uppermost position of frame **126**, and the flat surfaces **139** and **143** cooperate in the same manner adjacent the lowermost position of frame **126**.

A plunger **144** extending through an aperture in the cross shaft **133** is slidable therein, and is held against separation therefrom by collars **145** and **146** fixed to the plunger on opposite sides of the cross shaft. A compression spring **147** encircling the plunger acts against the collar **146** to urge the plunger upwardly, when the parts are in the positions shown in FIG. 12. The upward movement of plunger **144**, as viewed in FIG. 12, is limited by the engagement of collar **145** with the cross shaft **133**. An open ended cylindrical member **148** has a reduced neck **149** fixed on the cross shaft **133**. A suction cup **150**, mounted on the upper end of plunger **144**, has its upper edge projecting above the upper edge of the member **148** with its concave surface facing and in vertical alignment with the bottom cover **120** of the stack of flanged covers in the receptacle **119**.

When the cam **63** moves the frame **126** upwardly from the position of FIG. 12, the suction cup **150** engages the lowermost cover of the stack of covers in receptacle **119** with sufficient force to secure it to the cover. The spring **147** absorbs the shock at the end of the upward movement of the frame **126**. The continued rotation of cam **63** allows the springs **132** to pull the frame **126** downwardly, and the suction cup pulls the lowermost cover **120** downwardly past the spring pressed pins **123** to remove it from the stack. The flat surfaces **138** and **141** are long enough to prevent rotational movement of shaft **133** until after the lowermost cover has been moved

downwardly far enough to clear the spring pressed pins **123**. The teeth of the pinions and the racks engage each other after the lowermost cover clears the pins **123**, and then rotate the shaft **133** through 180° to invert the cover **120** before the frame **126** completes its downward movement. The cover **120**, with its flange extending downwardly, is then moved vertically downwardly just as a filled container **32** is moved into vertical alignment therewith.

The continued rotation of cam **63** moves frame **126** upwardly, and the cross shaft **133** lifts the plunger **144** and rotates it through 180° in the intermediate portion of the upward movement of the frame **126**. During the final increment of upward movement of the frame **126**, the suction cup **150** is in position to engage the lowermost cover **120** and to remove it from the receptacle **119**.

As the cover is being positioned on top of the filled container, some air becomes entrapped between the upper edge of the container and the flange of the cover. The present invention includes means for freeing such entrapped air before the cover is secured to the container. In the preferred embodiment, the frame **21** has a flat plate **151** secured to it on each side of the conveyor **22** at the sealing station **25**, as shown at **152**, FIG. 16. The inner ends of plates **151** are spaced apart a distance less than the diameter of the portion of the container that is in the plane of the plates **151** as the container is seated in plate **29** for movement longitudinally of the machine. As the conveyor **22** moves each filled container from the cover applying station to the sealing station, each container must pass between the spaced inner ends of the pair of oppositely disposed plates **151**.

Preferably the inner end of each plate **151** is rounded on one side, as indicated at **153**, to facilitate entrance of each container into the space between the plates. As each container is moved between the plates **151**, the plates engage opposite sides of the container near the upper edge thereof and squeeze them toward each other to form a path for the escape of any air trapped beneath the cover, as shown by the arrow in FIG. 19. While the container is stopped at the station **25** and the opposite sides are held deflected inwardly by the plates **151**, plunger **165** under the control of cam **64** drops to press the cover towards the container, rising again before the conveyor starts and moves the container beyond the plates **151** to allow the inwardly deflected sides of the container to resume their normal position. Thus, the invention provides means for compressing the sides of the container while simultaneously pressing downward on the cover to provide for the escape of air trapped beneath the cover. A flange **154**, extending laterally from the upper edge of the container, moves between the upstanding inner flange **155** of the cover and the underside of the top of the cover to lock the cover against accidental displacement of the cover from the container.

It may be noted that the method of excluding air from a package described above is not limited to a package of the type herein described, but may be used in packaging any material in a similar container.

In FIG. 21, a slightly different cover **156** is pressed against the upper edge of the container. The cover **156** has an inwardly extending flange **157** spaced from the top of the cover to allow space for an annular flange **158** projecting outwardly between the flange **157** and the top of the container.

Plunger **165** is controlled by the cam **64**, as shown in FIG. 1. The plunger is mounted on a pin (not shown) depending from a cross bar **166**. The cross bar **166** is secured to the upper ends of two vertically upstanding posts **167**. The posts **167** are slidably mounted in the frame of the machine in the same manner as the posts **127** (FIG. 12). A compression spring **168** is interposed between the cross bar **166** and the plunger to cushion the shock as the plunger is moved into engagement with the cover **120**. The mechanism for moving the cross bar **166** vertically is similar to that previously described for imparting vertical movement to the cross shaft **133** in FIG. 12, and the description will not be repeated.

As shown in FIG. 1 of the drawings, the sealing station **25** is separate and is spaced from the cover applying station **24** by an intervening idle station. However, if desired, the sealing station may be adjacent the cover applying station, and the plunger **165** may be supported by the vertically disposed frame **126** and operated by the cam **63** simultaneously with the vertical movement of said frame.

In FIGS. 17 and 18, a different mechanism moves the upper edge portion of the container out of its normal shape to allow escape of air trapped between the upper edge of the container and the flange of the cover. In this embodiment, the fixed plates **151** are replaced by laterally movable plates **169** and **170** that engage opposite sides of the container and press them inwardly. The plates **169** and **170** are moved laterally by a bell crank **171** pivotally mounted on a bracket **172** extending inwardly from one wall of housing **59**. One arm **173** of the bell crank has a cam roller **174** engaged with cam **63** to move it pivotally in one direction. A spring **175** is secured to the housing **59** and the other arm **176** of the bell crank to pull the bell crank back to its original position whenever the shape of the cam **63** permits such movement. The plate **169** is secured to the upper end of the arm **176**. The plate **170** is secured to the top of a lever **177** pivoted intermediate its length, as indicated at **178**, and pivotally connected at its other end to a floating link **179**. The link **179** is pivotally connected at its other end to the arm **176**. The link connection between the bell crank **171** and the lever **177** causes the plate **170** to move inwardly when the plate **169** is moved inwardly, and outwardly when the plate **169** is moved outwardly.

In the embodiment of FIGS. 17 and 18, the mechanism of the sealing station is essentially the same as in the embodiment having fixed plates **151** except that the sides of the container are compressed by the movement of the plates **169** and **170**. For convenience, the structure of the sealing station for the embodiment of FIGS. 17 and 18 is designated by the same reference numerals as the other embodiment except that they are primed.

Although I have described a preferred embodiment of my invention in considerable detail, it will be understood that the description thereof is intended to be illustrative, rather than restrictive, as many details of structure may be modified or changed without departing from the spirit or scope of the invention. Accordingly, I do not desire to be restricted to the exact details of structure disclosed.

What is claimed is:

1. A method of packaging a pressure flowable product in a package that includes an open-top container and a cover thereon, said container being of a type having a flexible side wall and said cover having a depending flange portion surrounding the upper region of said container side wall in adjacent relation thereto, said method comprising substantially filling said container with said product, seating said cover upon the top of said container to locate said flange portion in adjacent relation to the upper region of said container side wall with a limited air space existing between said cover and said product, engaging said side wall to laterally inwardly deflect at least one side wall region of said container and to create a localized lateral clearance between said flange portion and the upper region of said container side wall, pressing the cover towards the container and the product therein while maintaining the localized lateral clearance whereby air is forced from said space through said lateral clearance, and disengaging said side wall to allow expansion thereof to restore the upper region thereof to adjacent the flange portion.

2. The method of claim **1** in which said side wall is engaged to deflect at least one side wall region by

conveying said container against stationary deflecting means.

3. The method of claim 2 in which said side wall is disengaged by conveying said container away from said stationary deflecting means.

4. The method of claim 2 in which the stationary deflecting means comprises at least one flat plate, immovably affixed, projecting into the path along which the container is conveyed, whereby a side wall region of said container is deflected against said plate.

5. The method of claim 1 in which said cover is

pressed towards the container by means of a plunger adapted to deflect said cover.

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TRAVIS S. McGEHEE, *Primary Examiner.*

R. L. FARRIS, *Assistant Examiner.*