Oct. 29, 1963 H. F. COX, JR 3,108,901

FILLING APPARATUS

Filed Jan. 19, 1960 4 Sheets-Sheet 1

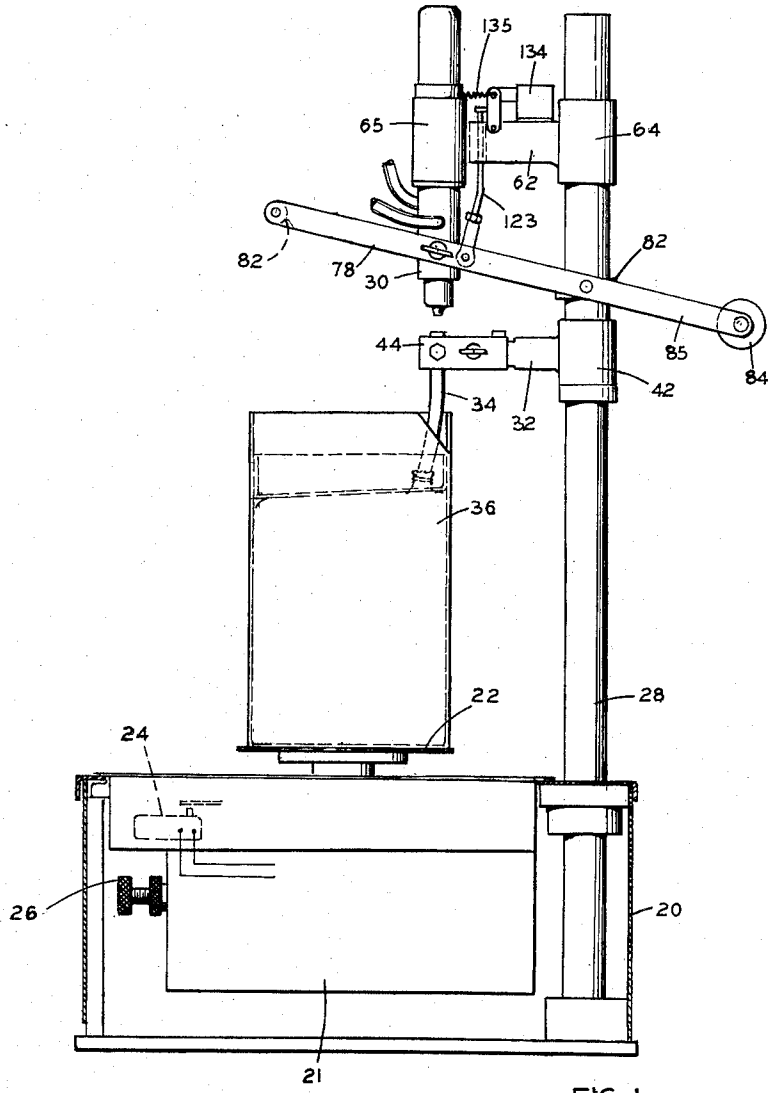


FIG. 1

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FILLING APPARATUS

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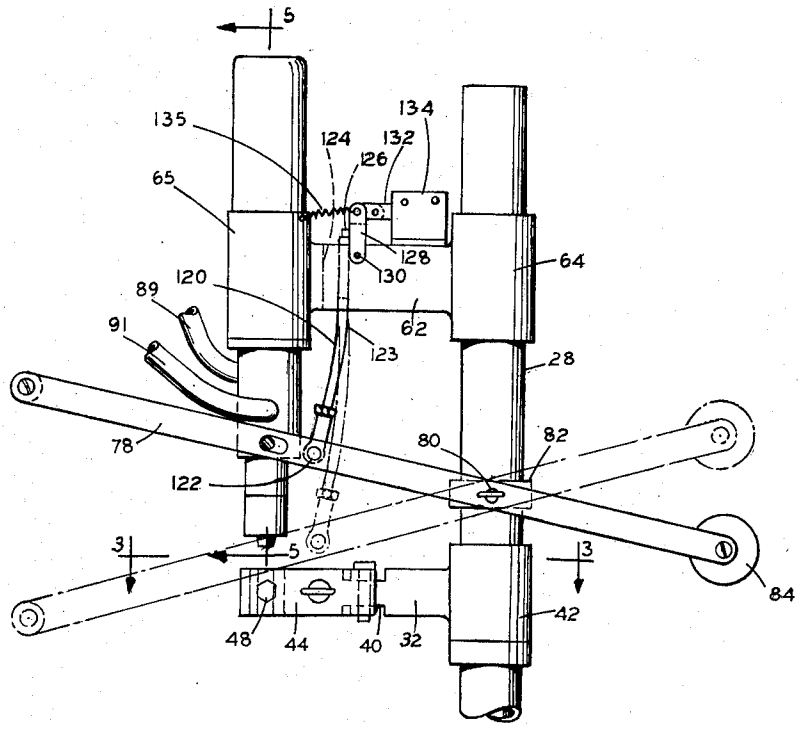


FIG. 2

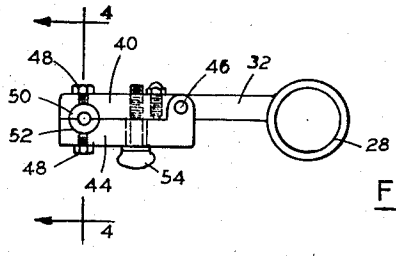


FIG. 3

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FILLING APPARATUS

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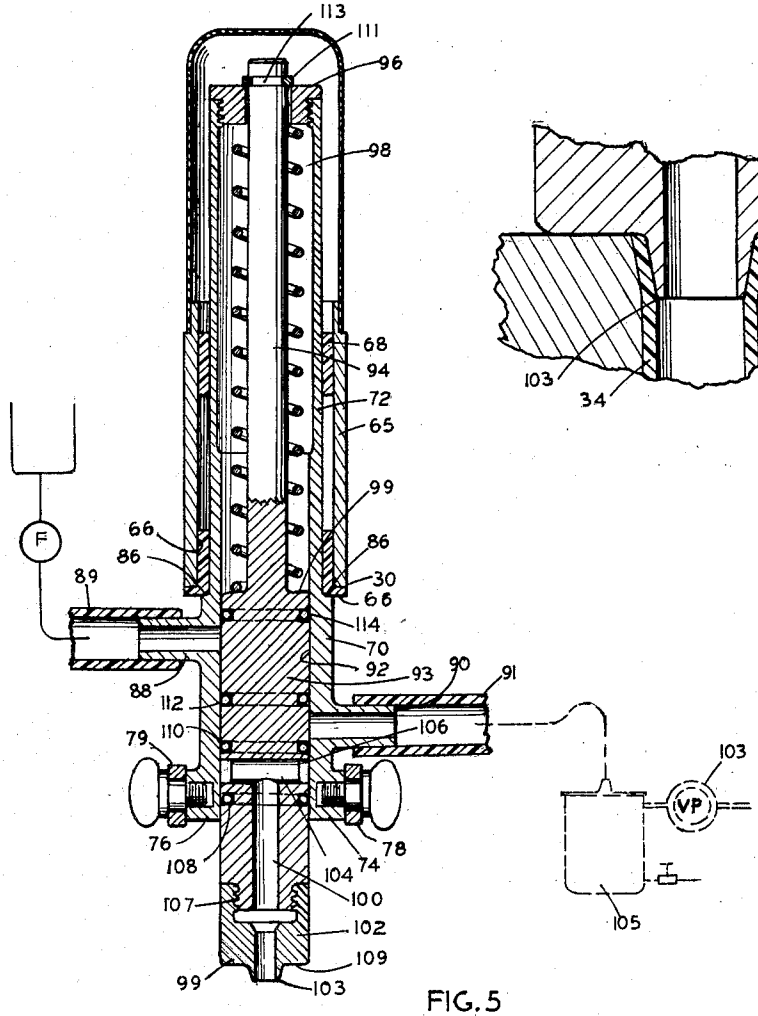


FIG. 5

FIG. 6

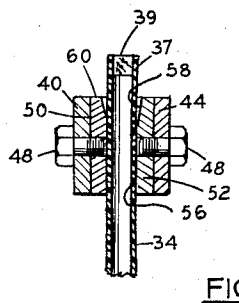


FIG. 4

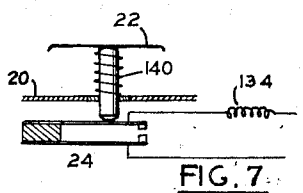


FIG. 7

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FILLING APPARATUS

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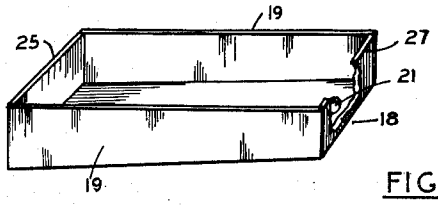


FIG. 9

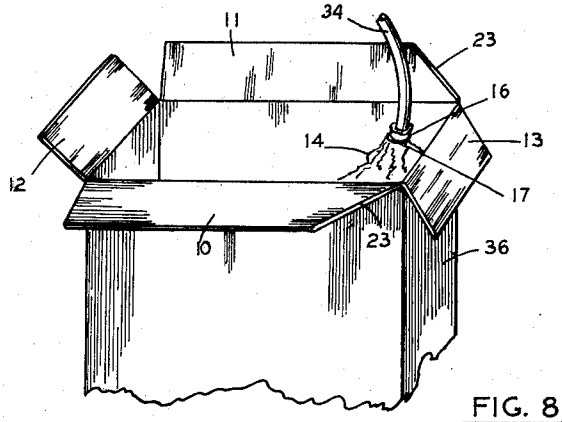


FIG. 8

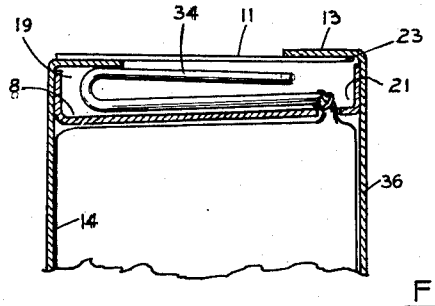


FIG. 10

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United States Patent Office 3,108,901 Patented Oct. 29, 1963

3,108,901

FILLING APPARATUS

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Filed Jan. 19, 1960, Ser. No. 3,344
18 Claims. (Cl. 177—118)

This invention relates to liquid filling apparatus, and more particularly to apparatus for filling liquid tight containers of flexible material.

In an application, Ser. No. 599,958, filed July 25, 1956, now Patent No. 3,007,608, issued Nov. 7, 1961, there is disclosed a liquid carton suitable for milk employing a relatively rigid container structure, having a flexible liquid tight liner of flexible material such as thin polyethylene. Such liner material is manufactured in elongated tubular fashion, and to provide individual liners, suitable lengths of such tubular material cut from stock are selected, and the open cut ends thereof closed off as by forming a seam across the end or immediately adjacent thereto by heat and momentary fusion of the plastic. In the above application, containers so formed and sealed at one end and provided with an outlet hose at the other end secured to the liner by gathering and compressing the liner material around an end of the outlet hose have been found to provide a satisfactory leak tight liner with a dispensing hose, which may be employed within a relatively rigid sustaining carton, milk can or the like.

It has been proposed to fill such liners from one end, and heat seal the material thereafter, or fill the liner from an opening in one end, after which the material adjacent the opening is gathered around one end of a length of hose and tightly bound to the hose. The hose becomes the means of emptying such container. Each of these methods, while satisfactory in many respects, have their drawbacks. In the filling of any container having air, and this is particularly true of milk and milk products such as ice cream mix, the inflowing liquid foams in the presence of air, and the degree of such foaming depends in part with the speed of filling. The formation of foam interferes with the sealing of the open end, or of the sealing of the open end by attachment of a hose. In addition the presence of any air within the sealed package, particularly in respect of milk products, has a direct bearing on the length of time milk products may be stored under usual refrigeration conditions.

The present invention is directed to apparatus for filling flexible liners in cartons, through a small hose previously connected to the liner. The invention contemplates the employment of liners made from thin tubular plastic stock which are heat sealed and supplied with a small filler hose preferably at the original place of manufacture where such tubular stock is extruded. It is the practice to reel such extruded stock immediately into rolls in flat form with air completely removed. From such rolled stock, the tubular plastic is withdrawn in flat form, and sections of suitable length are cut, and each section heat sealed at their opposite ends, with a short length of hose attached to one end, as for example by the gathering method disclosed in the aforesaid application. A multiplicity of such liners in flat form substantially devoid of air, and with the hose end sanitarily sealed may be shipped to any place where filling is to be effected, it being understood that such liner remains sanitary because

sealed and devoid of exposure to ambient air for all practical purposes from the time of original extrusion of the tubular liner material.

The apparatus of the present invention is adapted to couple with the tube of such a liner, withdraw from said liner and said tube substantially any and all air or gases that may be present therein by subjecting the liner and tube to a high degree of vacuum, and immediately thereafter fill the liner with milk, a fluid milk product, or such other liquids as may be packaged in an impervious flexible liner supported within a semi-rigid container, such as a corrugated carton or the like.

Vacuumizing of containers during or prior to filling has been practiced in the case of rigid containers of metal or glass. Such practice tends to collapse the container, and thus restricts the degree of vacuum that can be safely employed, thus leaving a substantial volume of air according to the volume of the container, although such volume of air is quantitatively reduced by being rarified. The present invention employs a container that is supplied in substantially collapsed form, or which may be collapsed by the application of a source of vacuum, so that substantially no air whatsoever exists in the container, even though a low vacuum be employed. The only advantage in using a high vacuum in the present invention, is to remove as much air as possible from the tube, which because of its body and cylindrical form and small diameter is able to withstand any tendency to collapse, when subjected to a high vacuum.

The invention is directed to apparatus adapted to couple to a fill tube of a flexible liner of the type described in a sanitary manner, subject the tube and liner to vacuum, and thereafter while so coupled, fill the liner with the liquid to the extent desired, the liquid being supplied under pressure. The liner is supported within a paperboard carton or other relatively rigid container while being filled.

The invention is directed to apparatus adapted to fill such a liner without foaming, utilizing a pressure supply, whereby filling is expedited, even though a small tube be employed because no air is present. In addition the invention is directed to apparatus adapted to measure the quantity delivered to a package liner of the type described by cutting off the supply when the desired weight has been delivered into the carton supported liner.

The invention is further directed to apparatus of a highly sanitary type having provision for sanitarily closing off the fill tube when filling is completed.

The above and other novel features of the invention will appear more fully hereinafter from the following detailed description when taken in conjunction with the accompanying drawings. It is expressly understood that the drawings are employed for purposes of illustration only and are not designed as a definition of the limits of the invention, reference being had for this purpose to the appended claims.

In the drawings, wherein like reference characters indicate like parts:

FIGURE 1 is a side elevation of the platform scale and valve filling apparatus;

FIGURE 2 is an enlarged side elevational view of the valve and hose support arm;

FIGURE 3 is a top plan view of the hose support arm;

FIGURE 4 is a sectional view of the hose support arm taken on the line 4—4 of FIGURE 3;

FIGURE 5 is a sectional view of the valve taken on the line 5—5 of FIGURE 2;

FIGURE 6 is an enlarged sectional view of the valve nozzle in sealed engagement with a hose end in the support arm.

FIGURE 7 is a diagrammatic scale operated control circuit.

FIGURE 8 is a perspective fragmentary view of the open end of a carton and collapsed liner and fill tube, ready for filling;

FIGURE 9 is a perspective view of a breast or insert for placing in the carton after filling; and

FIGURE 10 is a sectional view through a filled carton, with the carton flaps closed.

Referring to the drawings and more particularly to FIGURE 1, there is shown a base **20**, having therein a scale **21** of standard form, with a scale platform **22**. The scale is provided with a sensitive electrical switch, such as a micro switch, as at **24** and such switch is actuated to close a circuit, responsive to a predetermined weight upon the platform **22**. The predetermined weight may be adjusted as by a screw **26**. The form of the scale and the means for actuating the switch in response to a pre-selected weight upon the platform and the resulting movement thereof will be readily understood by those skilled in the art.

From the rear of the base there extends upwardly a support column **28**. Extending forwardly from the column, and over the scale platform, is a filling valve **30**, and a support arm **32**. The support arm is adapted to receive the free end of a hose **34**, extending from the flexible liner disposed within the open ended carton **36**, resting upon the scale platform **22**.

The scale platform supports the carton of corrugated paperboard or the like, the carton **36**, during filling having its upper end flaps opened as shown in FIGURE 1 (also FIGURE 8). The carton at its upper end may have side flaps **10** and **11**, and end flaps **12** and **13**. Placed within the carton, prior to filling, is a plastic liner **14** in collapsed flat condition. The girth and length of the liner is substantially greater than the inside dimensions of the carton so that the liner when filled rests against the internal wall of the carton, and is not subjected to strain. The liner has a hose **34**, one end of which is secured in a gathered end **16** of the liner and bound by a wire band **17**. The hose is adapted to be used as a fill tube.

On filling, the liner is gradually caused to fill out and expand within the confines of the carton. When filled, the hose end is sealed. A breast member **18** having tapered side flanges **19**, and end flanges **25** and **27**, and an aperture **21**, is then threaded over the hose, and placed in the carton end unless the breast was already in position before filling commenced. The hose end which has been sealed is disposed in the space between the flanges **19**. Thereafter the carton end flap **12** is closed, the side flaps **10** and **11** closed, and the end flap **13** closed. The carton end is then suitably sealed as by gummed tape applied over the flaps. When it is desired to dispense the liquid from the carton, the end flap **13** is opened. The cutaway corners **23** of the side flaps **10** and **11** provide an access opening through which can be reached the hose end, after which the hose end may be withdrawn. The carton is then inverted, the hose end extended through a valve as, for example, of the pinch type after which the sealed end of the tube is uncorked or the end cut off. It will be seen that the carton and liner is thus ready for dispensing at will, the liner being supported on the inclined breast **18** to facilitate substantially complete dispensing of the entire contents of the liner. As dispensing takes place, the liner collapses within the carton, and no air at any time enters the liner or contacts the contents within the liner, the liner collapsing as dispensing progresses. The filled carton is adapted to be set in a refrigeration cabinet, and the hose end brought out through a small aperture in such cabinet, and through a suitable valve, all of which is referred to in more detail in the aforesaid application.

The support arm for holding the tube is more particularly shown in FIGURES 2, 3 and 4. As shown, the arm **32** extends from a support sleeve **42**, which may be adjusted for height upon the column **28** to accommodate varying package heights. Such arm at its outer end **40** is provided with a clamp arm or member **44** pivoted to the outer end **40** as at **46**. The outer end **40** of the arm **32** and clamp arm **44** are provided with semicircular sleeve elements **50**, **52** removably held in semicircular recesses in their respective arm portions by studs **48**. When the arms **40** and **44** and the sleeve elements are brought together and held by the thumb-screw **54** the sleeve elements present a vertically extending cylindrical aperture **56** of a diameter adapted to snugly clamp the end of the rubber hose **34** over a sufficient length thereof. The upper end of the aperture formed by the sleeve elements is outwardly flared conically as is indicated at **58**.

In practice, the sealed end **37** of a hose, sealed as by a cork **39**, will be positioned between the arms **40** and **44**, and clamped therein with its sealed end disposed above the arms. When thus held, the sealed end may be severed from the hose end by a transverse cut taken flush with the upper surfaces **60** of the arms **40** and **44**, a sanitary sharp knife being employed for the purpose.

Disposed above the hose support arm **32** is the fill valve assembly **30**, rigidly supported upon an arm **62**, projecting from a sleeve **64** embracing the column **28**. Such arm may be adjusted as to height. The arm has affixed to its outer end, a cylindrical guide sleeve **65**, coaxially disposed above the aperture **56** of the sleeve portions **50**, **52**, and the end of a hose supported therein. Within the guide sleeve are spaced annular bushings **66** and **68**, in which is slidably mounted the hollow shank portion **72** of a valve sleeve body **70**. The lower end of the valve sleeve body is provided with radially extending trunnions **74** and **76** which extend into slots in lever arms such as **78** and **79** disposed on opposite sides of the valve body. The lever arms are pivoted upon trunnions **80** projecting radially from the opposite sides of the trunnion sleeve **82** mounted on the column **28**. The lever arms **78** and **79** extend forward of the valve body and are connected by a transverse handle **82**. A weight **84** disposed on the opposite ends **85** of the lever arm behind the column **28** serves to bias the valve body to its uppermost position, with the shoulder **86** at the lower end of the shank **72** in engagement with the lower bushing **66**.

The valve body is provided with a radial liquid inlet nipple **88** connected by a hose **89** extending to a pressure source of liquid, and a radial vacuum nipple **90**, adapted to be connected to a vacuum pump, the nipple being disposed below the inlet nipple. A hose **91** extends to a vacuum pump **103**, through a trap **105**. Within the cylindrical bore **92** of the valve body is a slidable valve element **93**, the upper end of which has an integral shank **94** extending upwardly and projecting through and slidably disposed within a collar **96** threaded in the upper end of the hollow valve body shank **72**. A preloaded compression spring **98** is disposed around the shank **94**, and extends between the collar **96** and the shank shoulder **99**. The upper end of the shank **94** beyond the collar **96** is provided with a split ring or clip **111** disposed in an annular groove **113**, which ring **111** acts as a shoulder to limit relative movement between the shank **94** and collar **96**.

The valve element is provided with an axial outlet passage **100**, capped at its lower end by a nozzle **102** threaded upon the element as at **107**. The lower end

of the nozzle as at **103** is tapered to nicely enter the open end of the open hose end cut flush with the surface **60**, and held in the clamp arms **40** and **44**. The upper end of the passage **100** terminates in a transverse passage **104** leading to a peripheral annular channel **106** around the valve element. The valve element is provided with O ring seals **108**, **110**, **112** and **114**, disposed in annular grooves in the valve element.

When a carton containing a flexible liner is disposed on the scale platform, and the fill hose is supported between the arms **40** and **44**, and the end seal cut from the hose, the valve body **70** with the valve element is lowered as a unit by manipulation of the levers **78** and **79**, so as to project the tapered end **103** of the nozzle into the hose end. Slight further downward movement of the parts causes the tapered end of the nozzle to resiliently expand the rubber tube end against the tapered flare **58** and to form a seal. The pressure that can be exerted for this purpose is dependent upon the preloading of the spring **98**. The under face **109** of the nozzle may engage the surface **60** of the tube support arm, and limit the pressure that can be exerted on the tube end wall. (See FIG. 6.) Further lowering of the valve body **70** results in relative movement between it and the valve element **93**, bringing the vacuum nipple into alignment with the annular channel or groove **106**. At once the liner and its inlet tube are subjected to a high degree of vacuum, removing and rarifying any gas or air in the tube **34**, and practically eliminating substantially all air or gases from the tube and liner, and collapsing the liner completely. Further lowering of the valve body **70** results in further relative movement between the valve body and valve element **93**, shifting the annular groove from alignment with the vacuum nipple, to a connection with the inlet nipple **88**, which is connected to the supply of milk or other liquid product, and which supply is under pressure. Rapid filling of the liner commences filling out or expanding the liner against the side walls of the carton.

In order to accurately measure the quantity of liquid dispensed, and to cut off the flow, when such measured quantity has been delivered to the carton liner, a hold down lock bar pivoted on a pin **122** extending between the levers **78** and **79** is provided. The bar extends upwardly on a slant to one side of the pivot and has a knee bend **123**. The vertical upper end portion of such bar extends through a guide slot **124** in the arm **62**. The upper end of the bar abuts against the underside of a detent **126** of a link **128** pivoted as at **130** upon the arm **62**. The upper end of the link is connected to the plunger **132** of a solenoid **134**, which is connected in circuit with the microswitch **42**. The plunger is spring biased as is shown at **135**.

As diagrammatically indicated in FIGURE 7, when the predetermined fill weight is attained, the scale spring **140** or scale beam allows platform **22** to be moved down, switch **24** closed and the solenoid **134** is energized. The plunger **132** is thus drawn into the solenoid, rocking the link **128** against spring **135**, so as to disengage the detent **126** from the end **137** of the hold down lock bar **120**. When this occurs the valve body is released and moves upwardly instantly and quickly, under the combined urge of the counter weight **84**, and the spring **98**. During the major part of the upward movement, the valve element **93** is held with the nozzle sealed in the end of the hose, by the reaction of the spring **98**. The relative movement between the valve body and valve element instantly cuts off the flow of milk from port **88**, the annular groove **106** immediately shifting from alignment with such port. The groove swiftly passes vacuum port **90** thereafter. When the split ring **111** on the valve element shank **94** engages the collar **96**, valve body and element commence to move upwardly together by reason of the counterweight **84** alone, disconnecting the nozzle from the hose end. This leaves the hose

end ready to be plugged, and after insertion of a plug the fill procedure has been completed. Thereafter the hose end is released from the clamp, by loosening thumbscrew **54**. The hose end is then tucked away in the open end of the carton above the breast **18**, and the flaps closed. While use of a cork to seal the tube end is described, it will be understood that any means of sealing the tube may be employed, as by pinching the same, or, if plastic, by pinching under heat to form a transverse seam or seal. While not shown, such apparatus for sealing may be associated with the arm **32**, and rendered effective to seal the tube end, before releasing the tube from the arm. While use of a breast has been referred to in the carton, the purpose thereof is to facilitate tube withdrawal for dispensing, and a support, when the package is inverted for dispensing. It will readily appear that where such advantages are not desired, the breast may be dispensed with.

In practice, lined cartons filled by the apparatus may have a ten quart capacity, so that the filled carton weighs about 20 pounds, a weight not out of line with food store items. The fact that filling commences with a collapsed bag, free of air, and sanitary in every respect, and that subsequent dispensing results in collapsing the bag, without allowing air to enter, and the fact that the carton may be placed in a refrigerator and not removed therefrom during the entire dispensing process, results in maintaining the contents under conditions which have a marked effect in prolonging the period during which the contents remain fresh.

The filling apparatus, by evacuating the tube, and assuring complete collapse of the liner, as a result of subjecting the tube and liner to vacuum, immediately before filling, eliminates practically the last trace of air, and the one cause of foaming during filling, with the elimination of foaming, the pressure used for filling is without limit, and the fill time, even through a small hose, is remarkably short. The entire process is conducted without spillage or mess, and the apparatus retains its sanitary condition over long periods.

While a single station has been shown, it will be understood that a number of filling stations may be set up alongside one another, and all served from the same pressurized source of milk or other liquid, and all served by the same vacuum pump. A single operator may attend a number of such stations since during the filling of some of the stations no attention is required. The operator may thus be setting the hose end for filling at one station, or effecting the final operations in connection with sealing up a filled carton at another station.

It will be further understood that the shape of the flare **58**, and the taper of the nozzle **103** may vary to suit the nature and resiliency of the hose to which connection is to be made, and further that various sized nozzle and sleeve elements **50** and **52** may be employed to accommodate different diameter hoses. If the hose be of plastic, with little resiliency, the flare, and the taper of the nozzle will be correspondingly reduced.

It is contemplated that the filling stations may be arranged around a conveyor travelling in a circle, each station travelling with the conveyor having a loading platform and valve, so that an operator located at one position can effect the necessary placement and removal of the hose ends of a sequence of packages, empty and filled as each starts and completes its filling travel around the apparatus. The filling being done under entirely sealed conditions, is especially adapted to filling while in motion, since spillage, as in open container filling, cannot occur.

It will be seen that a valve apparatus has been disclosed which initially, after nozzle connection with the fill tube, subjects the container and tube to vacuum, and thereafter, after disconnecting the vacuum but while retaining the nozzle connection, subjects the tube and container to a source of liquid under pressure, to effect filling of the vacuum collapsed container.

While a single modification of the invention has been illustrated and described, it is to be understood that the invention is not limited thereto. For example, various forms of valves may be employed such as rotary and the like in place of the valve illustrated. As various changes in the construction and arrangement may be made without departing from the spirit of the invention, as will be apparent to those skilled in the art, reference will be had to the appended claims for a definition of the limits of the invention.

What is claimed is:

1. In a liquid filling apparatus for a flexible thin walled collapsible container liner disposed within a semi-rigid supporting container of a girth and length at least as great as the container, valvular means for vacuumizing and collapsing said liner and subsequently delivering liquid into said liner, and means responsive to the weight of liquid delivered to said liner for terminating filling thereof prior to the delivery of a quantity approaching the volume of said container whereby the pressure within the liner does not exceed atmospheric pressure as increased by the static head of the liquid within the liner.

2. In a liquid filling apparatus for a flexible thin walled collapsible container liner disposed within a semi-rigid supporting container of a girth and length at least as great as the container, means for effecting a sealed connection to said liner for vacuumizing said liner, valvular means associated with and acting through said sealed connection for vacuumizing and collapsing said liner and valvular means for subsequently filling said liner with liquid from a pressure source while maintaining said sealed connection, and means responsive to the quantity of liquid delivered to said liner for terminating filling thereof whereby the pressure within the liner does not exceed atmospheric pressure as increased by the static head of the liquid within the liner.

3. In a liquid filling apparatus for a flexible thin walled collapsible container liner disposed within a semi-rigid supporting container of a girth and length at least as great as the container, means for effecting a sealed connection to said liner for vacuumizing said liner, valvular means associated with and acting through said sealed connection for vacuumizing and collapsing said liner and valvular means for subsequently filling said liner with liquid from a pressure source while maintaining said sealed connection, and means responsive to the quantity of liquid delivered to said liner for terminating filling thereof whereby the pressure within the liner does not exceed atmospheric pressure as increased by the static head of the liquid within the liner, said last named means including means to disconnect said sealed connection.

4. In a liquid filling apparatus for a flexible thin walled collapsible container liner disposed within a semi-rigid supporting container of a girth and length at least as great as the container having a small fill hose, comprising means to support the end of said hose, means for effecting a sealed connection to said hose, valvular means associated with said connection means, including means for vacuumizing said liner, and means for subsequently filling said liner with liquid from a pressure source, all while maintaining said sealed connection and means responsive to the weight of the container for terminating the filling of the liner thereof.

5. In a liquid filling apparatus for a flexible thin walled collapsible container liner disposed within a semi-rigid supporting container of a girth and length at least as great as the container having a small fill hose, comprising means to support the end of said hose, means for effecting a sealed connection to said hose, valvular means associated with said connection means, including means for vacuumizing said liner, and means for subsequently filling said liner with liquid from a pressure source, all while maintaining said sealed connection, and means responsive to the weight of the container for terminating the filling of the liner thereof, said last named means including means to disconnect said sealed connection to said hose.

6. A liquid filling apparatus for filling collapsible impervious containers having a small circular semi-rigid plastic fill tube, comprising a support arm for an end of said fill tube, said support arm having a cylindrical split sleeve adapted to closely embrace the end of said tube, said sleeve being flared at its upper end to permit elastic expansion of a tube end held in said sleeve, and a filling valve located above said support arm, having a nozzle adapted to enter the tube end, said nozzle having a tapered outer wall adapted when inserted into said fill tube, to elastically expand the tube end into the flare of said sleeve and form a sealed connection.

7. A liquid filling apparatus for filling collapsible impervious containers having a small circular semi-rigid plastic fill tube, comprising a support arm for an end of said fill tube, said support arm having a cylindrical split sleeve adapted to closely embrace the end of said tube, said sleeve being flared at its upper end to permit elastic expansion of a tube end held in said sleeve, and a filling valve located above said support arm, having a nozzle adapted to enter the tube end, said nozzle having a tapered outer wall adapted when inserted into said fill tube, to elastically expand the tube end into the flare of said sleeve and form a sealed connection and means associated with said valve for connecting said nozzle, while sealingly engaging the said arm supported tube end, sequentially to vacuum, and immediately thereafter to a source of liquid under pressure, whereby to evacuate said tube to a substantial degree and collapse the container prior to liquid filling thereof and whereby to provide foam free filling thereof.

8. A liquid filling apparatus for filling collapsible impervious containers having a small circular semi-rigid plastic fill tube, comprising a support arm for an end of said fill tube, said support arm having a cylindrical split sleeve adapted to closely embrace the end of said tube, said sleeve being flared at its upper end to permit elastic expansion of a tube end held in said sleeve, and a filling valve located above said support arm, having a nozzle adapted to enter the tube end, said nozzle having a tapered outer wall adapted when inserted into said fill tube, to elastically expand the tube end into the flare of said sleeve and form a sealed connection, means associated with said valve for connecting said nozzle, while sealingly engaging the said arm supported tube end, sequentially to vacuum, and immediately thereafter to a source of liquid under pressure, whereby to evacuate said tube to a substantial degree and collapse the container prior to liquid filling thereof and whereby to provide foam free filling thereof, and means responsive to the weight of said container and liquid for disconnecting said nozzle from said liquid source, including means to disconnect said nozzle from said tube.

9. A liquid filling apparatus comprising a base, a support extending upward from the base having a container filling tube support arm extending over said base, and a valve mechanism support disposed above said tube support arm, said valve support comprising a guideway, valve mechanism slidable in said guideway for movement toward and away from said tube support arm, said valve mechanism comprising a hollow valve body and a valve element slidable therein, said valve element having a tube engaging nozzle projecting from the lower end thereof, and a side port connecting with said nozzle, and said body having a lower lateral side port connected to a source of vacuum, and an upper lateral side port connected to a source of liquid under pressure, and means for lowering said valve mechanism to engage said nozzle with a fill tube and for thereafter moving said body downwardly relative to said element to sequentially connect said element side ports with said lower and upper body side ports.

10. A liquid filling apparatus comprising a base, a scale platform mounted on said base, a support extending up-

ward from the base having a container filling tube support arm extending over said platform, and a valve mechanism support disposed above said tube support arm, said valve support comprising a guideway, valve mechanism slidable in said guideway for movement toward and away from said tube support arm, said valve mechanism comprising a hollow valve body and a valve element slidable therein, said valve element having a tube engaging nozzle projecting from the lower end thereof, and a side port connecting with said nozzle, and said body having a lower lateral side port connected to a source of vacuum, and an upper lateral side port connected to a source of liquid under pressure, and means for lowering said valve mechanism to engage said nozzle with a fill tube end and for thereafter moving said body downwardly relative to said element to sequentially connect said element side port with said lower and upper body side ports, means to lock said valve body in lowered position with its upper side port aligned with said element port, means to bias said valve mechanism to move upwardly in said guideway, and said valve body to move upwardly with respect to said element, and means responsive to movement of said scale platform for releasing said lock means.

11. A liquid filling apparatus for flexible thin wall impervious collapsible containers having a small diameter discharge and fill tube, comprising a support for the tube end, a valve mechanism disposed in alignment above the support, comprising a guide, a hollow valve body slidable in the guide and having a liquid inlet port, and a vacuum port disposed in spaced relation to said inlet port along the length thereof, a valve element slidably disposed within said body having a nozzle at one end adapted to sealingly engage a tube end held in said support, and a port extending through said element from said nozzle to a side port in said element adapted to alternately be aligned with said valve body vacuum port and inlet port, means for biasing said valve element for movement of its side port beyond said body vacuum port.

12. A liquid filling apparatus for flexible thin wall impervious collapsible containers having a small diameter fill tube, comprising means to support the container, means to support the tube end, valve mechanism comprising a valve element having an end nozzle adapted to be coupled with the hose end, said element having a side port connecting with said nozzle, a valve body associated with said element and movable relative thereto, said valve body having a vacuum port, and a liquid inlet port and a pressure source of liquid connected thereto, and means for moving said body member relative to said element to sequentially connect said vacuum and inlet ports with said side port.

13. A liquid filling apparatus for flexible thin wall impervious collapsible containers having a small diameter fill tube, comprising means to support the container, means to support the tube end, valve mechanism comprising a valve element having an end nozzle adapted to be coupled with a hose end, said element having a side port connecting with said nozzle, a valve body associated with said element movable relative thereto, said valve body having a vacuum port, and a liquid inlet port adapted upon relative movement between said body and element to sequentially couple said nozzle with the hose end, and thereafter align said element side port with said body vacuum port and subsequently said liquid inlet port.

14. A liquid filling apparatus for flexible thin wall impervious collapsible containers having a small diameter fill tube, comprising means to support the container, means to support the tube end, valve mechanism comprising a valve element having an end nozzle adapted to be coupled with a hose end, said element having a side port connecting with said nozzle, a valve body associated with said element movable relative thereto, said valve body having a vacuum port, and a liquid inlet port adapted upon relative movement between said body and element to sequentially couple said nozzle with the hose end, and thereafter align said element side port with said body vacuum port and subsequently said liquid inlet port, and means responsive to the weight of a container being filled for sequentially disaligning said liquid inlet port and side port, and uncoupling said nozzle.

15. A liquid filling valve mechanism comprising a guideway support, a hollow cylindrical valve body having an upwardly extending tubular shank slidable in said support, said body having a liquid inlet port and a vacuum inlet port, axially spaced along the valve body, a valve element slidably disposed within said valve body, and having a stem extending through said body shank and beyond the end thereof, a guide collar in the end of said hollow shank, through which said stem extends, a compression spring disposed around said stem and within said shank adapted to urge said element downwardly with respect to said body, and shoulder means on the end of said shank beyond said collar for limiting the relative movement between said element and body, said element having a nozzle on its lower end, and a side port connecting therewith and adapted to sequentially be aligned with said vacuum inlet port and said liquid inlet port, upon relative movement between said body and element against the compression of said spring.

16. A liquid filling valve mechanism comprising a guideway support, a hollow cylindrical valve body having a shoulder and a tubular shank extending upwardly therefrom and slidable in said support, means to bias said body to a position with said shoulder engaging said support, said body having an upper liquid inlet port and a lower vacuum side inlet port, axially spaced along the valve body, a valve element slidably disposed within said valve body, and having a stem extending through said body shank and beyond the end thereof, a guide collar in the end of said hollow shank, through which said stem extends, a compression spring disposed around said stem and within said shank adapted to urge said element downwardly with respect to said body, and shoulder means on the end of said shank beyond said collar for limiting the relative movement between said element and body, said element having a nozzle on its lower end, and a side port connecting therewith and adapted to sequentially be aligned with said vacuum inlet port and said liquid inlet port, upon relative movement between said body and element against the compression of said spring.

17. A liquid filling valve mechanism comprising a guideway support, a hollow cylindrical valve body having a shoulder and a tubular shank extending upwardly therefrom and slidable in said support, means to bias said body to a position with said shoulder engaging said support, said body having an upper liquid inlet port and a lower vacuum side inlet port, axially spaced along the valve body, a valve element slidably disposed within said valve body, and having a stem extending through said body shank and beyond the end thereof, a guide collar in the end of said hollow shank, through which said stem extends, a compression spring disposed around said stem and within said shank adapted to urge said element downwardly with respect to said body, and shoulder means on the end of said shank beyond said collar for limiting the relative movement between said element and body, said element having a nozzle on its lower end, and a side port connecting therewith and adapted to sequentially be aligned with said vacuum inlet port and said liquid inlet port, upon relative movement between said body and element against the compression of said spring, means for supporting the open end of a fill tube of a collapsible container immediately below and in alignment with said nozzle for reception thereof upon lowering said valve body and element in its guideway.

18. The method of filling a semi-rigid container having bottom and side walls and having disposed therein a collapsible thin wall flexible impervious liner having a girth and length at least as great as the container and

having a fill tube, which comprises evacuating said liner to collapse the same and remove air from said fill tube, and thereafter, while retaining the vacuum in said fill tube, disconnecting the source of vacuum therefrom, and subsequently destroying the vacuum in said fill tube by injecting liquid under pressure into said liner through said fill tube to expand said liner into supporting contact with the bottom and a portion of the side walls of said container under a pressure not exceeding atmospheric pressure, as increased by the static head of the liquid within the liner.

References Cited in the file of this patent

UNITED STATES PATENTS

1,059,553	Meyer	Apr. 22, 1913
1,518,446	Phelps	Dec. 9, 1924
2,349,594	McMahan	May 23, 1944
2,425,844	Spaulding	Aug. 19, 1947
2,531,743	Ray	Nov. 28, 1950
2,654,557	Henderson	Oct. 6, 1953
2,905,560	Bender	Sept. 22, 1959
2,954,203	Carter	Sept. 27, 1960