

April 9, 1968

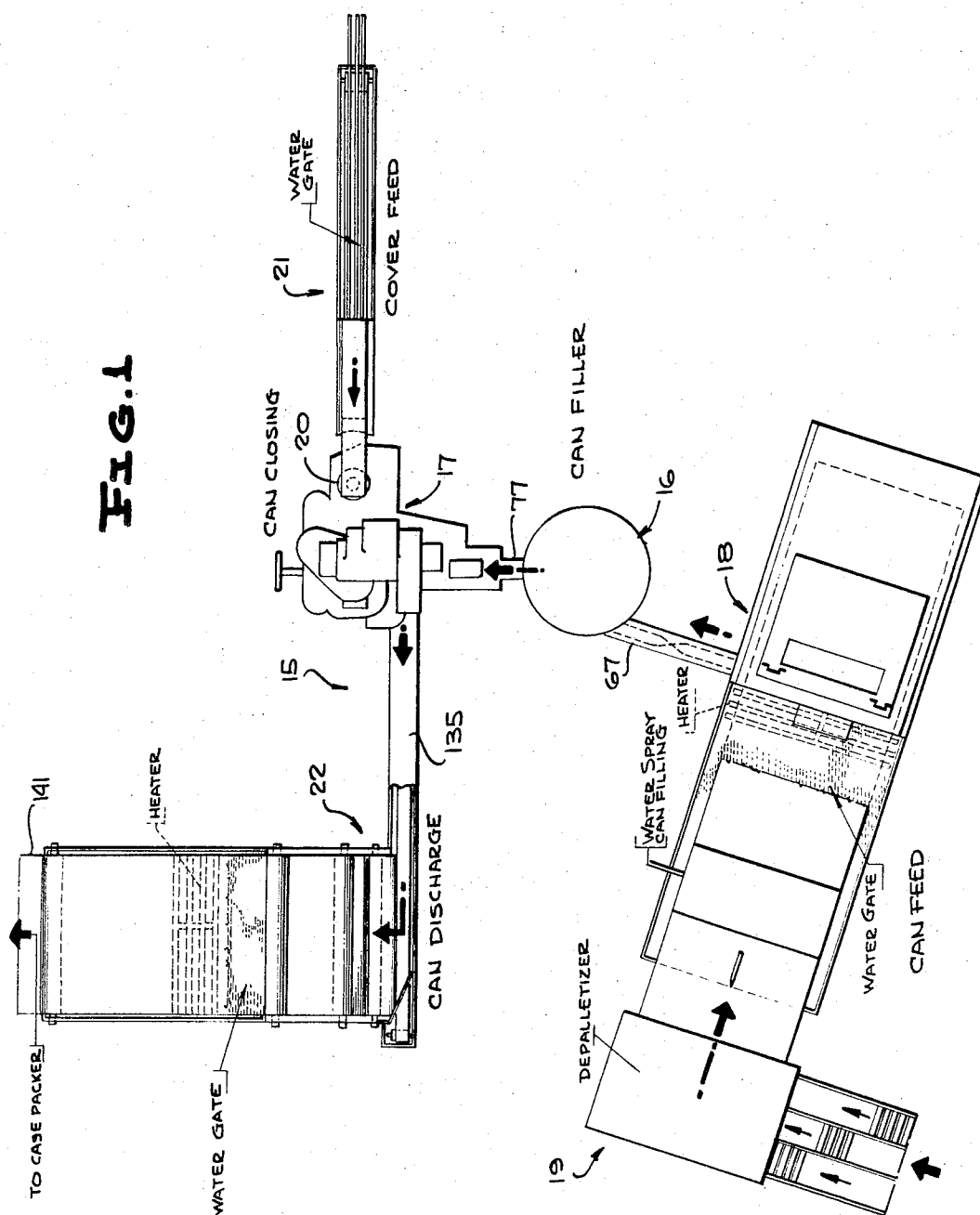
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3,376,689

PACKAGING APPARATUS AND METHOD OF UTILIZING THE SAME

Filed April 4, 1962

7 Sheets-Sheet 1



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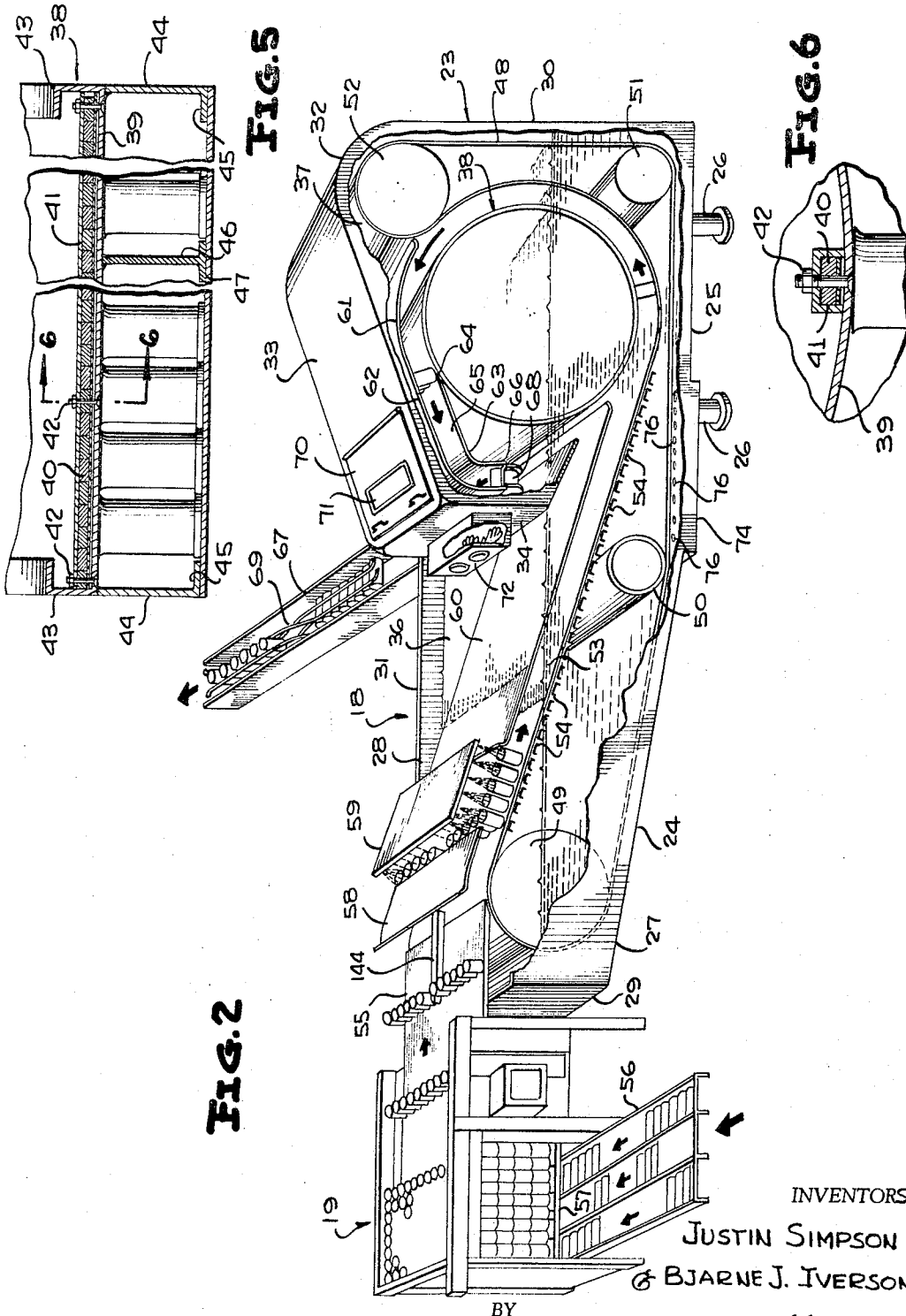
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PACKAGING APPARATUS AND METHOD OF UTILIZING THE SAME

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7 Sheets-Sheet 2



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PACKAGING APPARATUS AND METHOD OF UTILIZING THE SAME

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7 Sheets-Sheet 3

FIG. 3

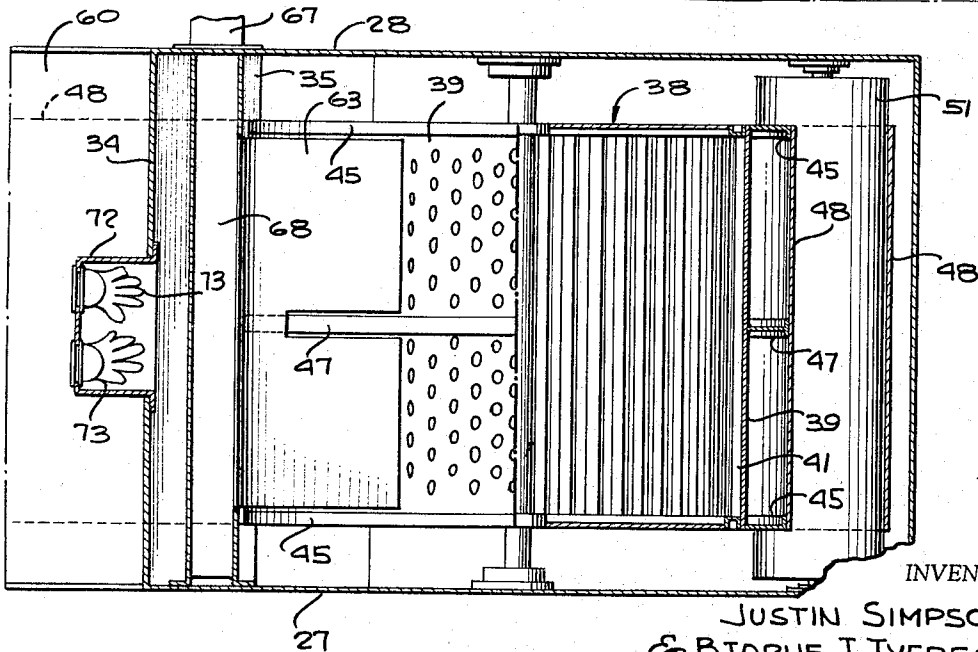
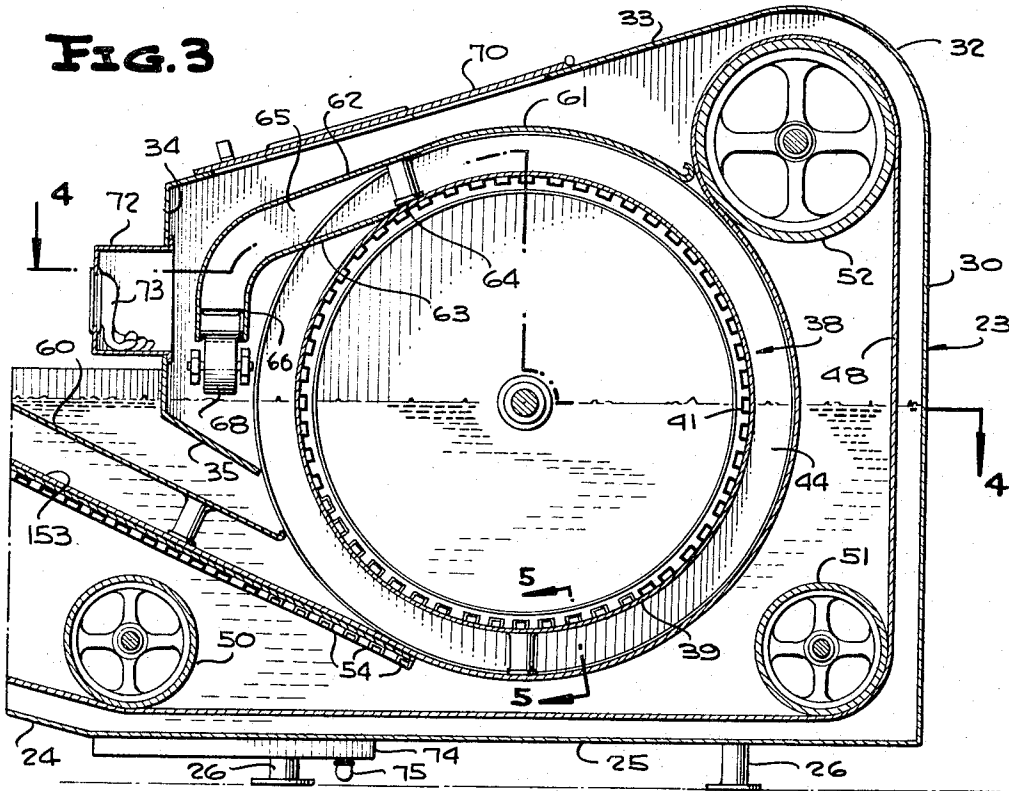


FIG. 4

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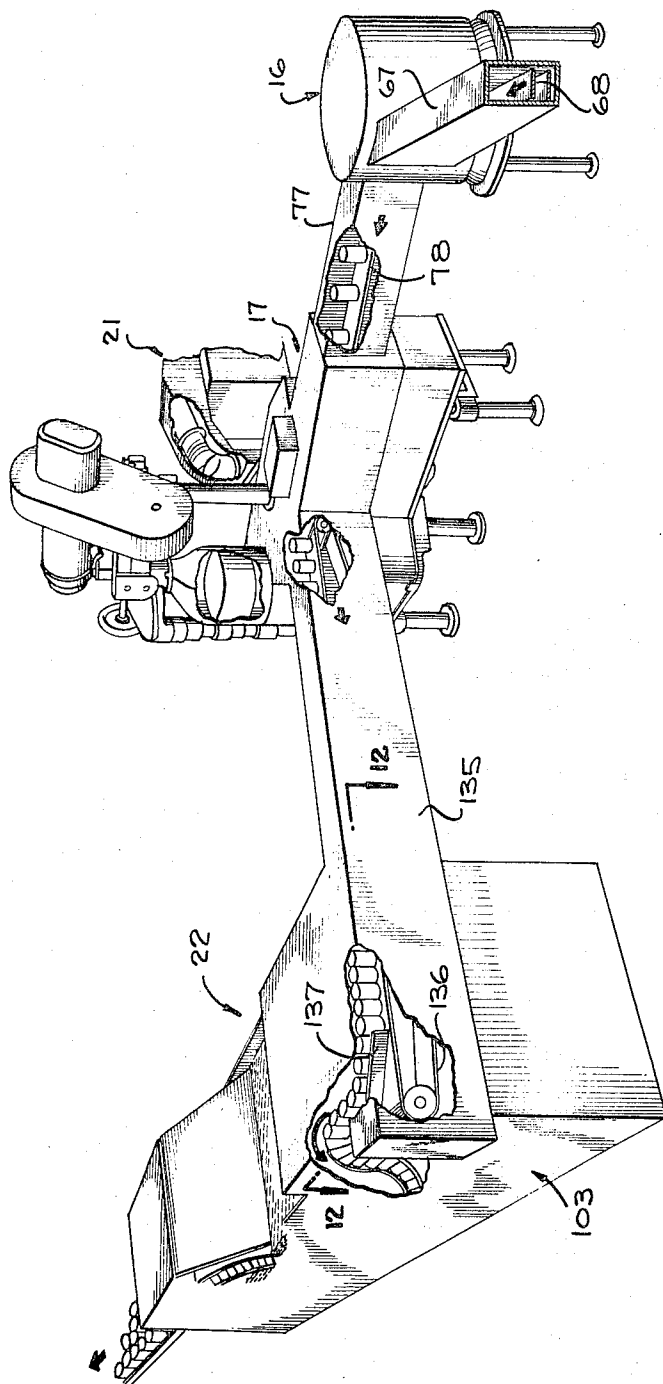
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7 Sheets-Sheet 4

FIG. 7



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7 Sheets-Sheet 5

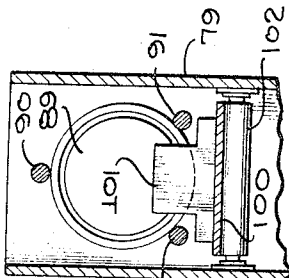


FIG. 10

FIG. 8

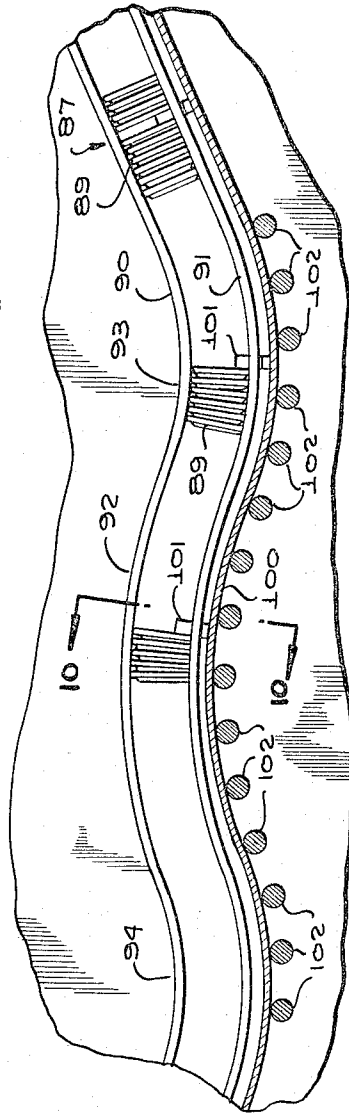
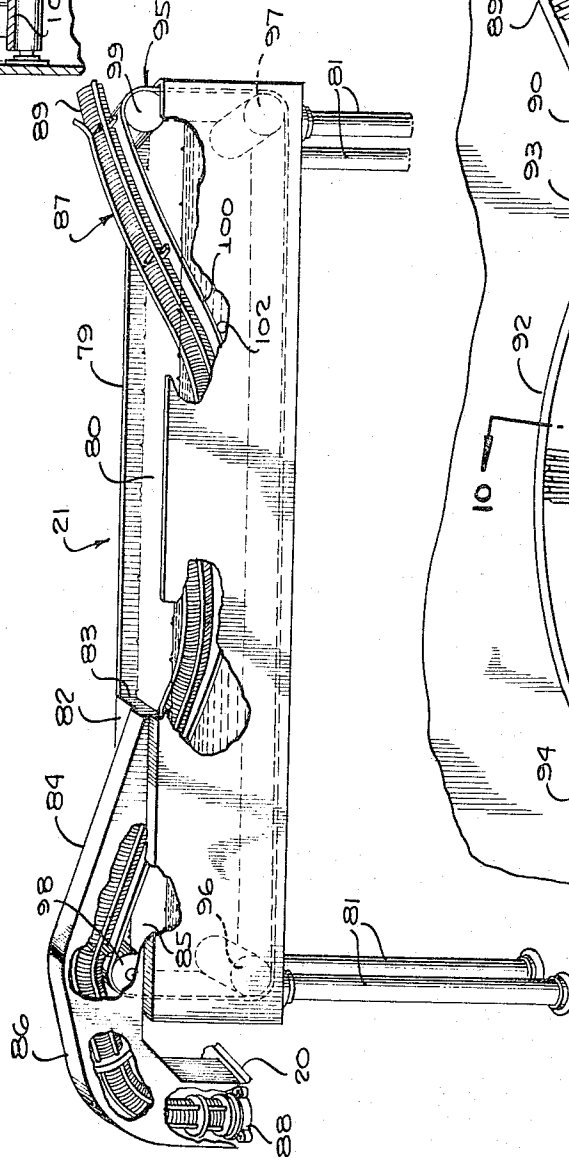


FIG. 9

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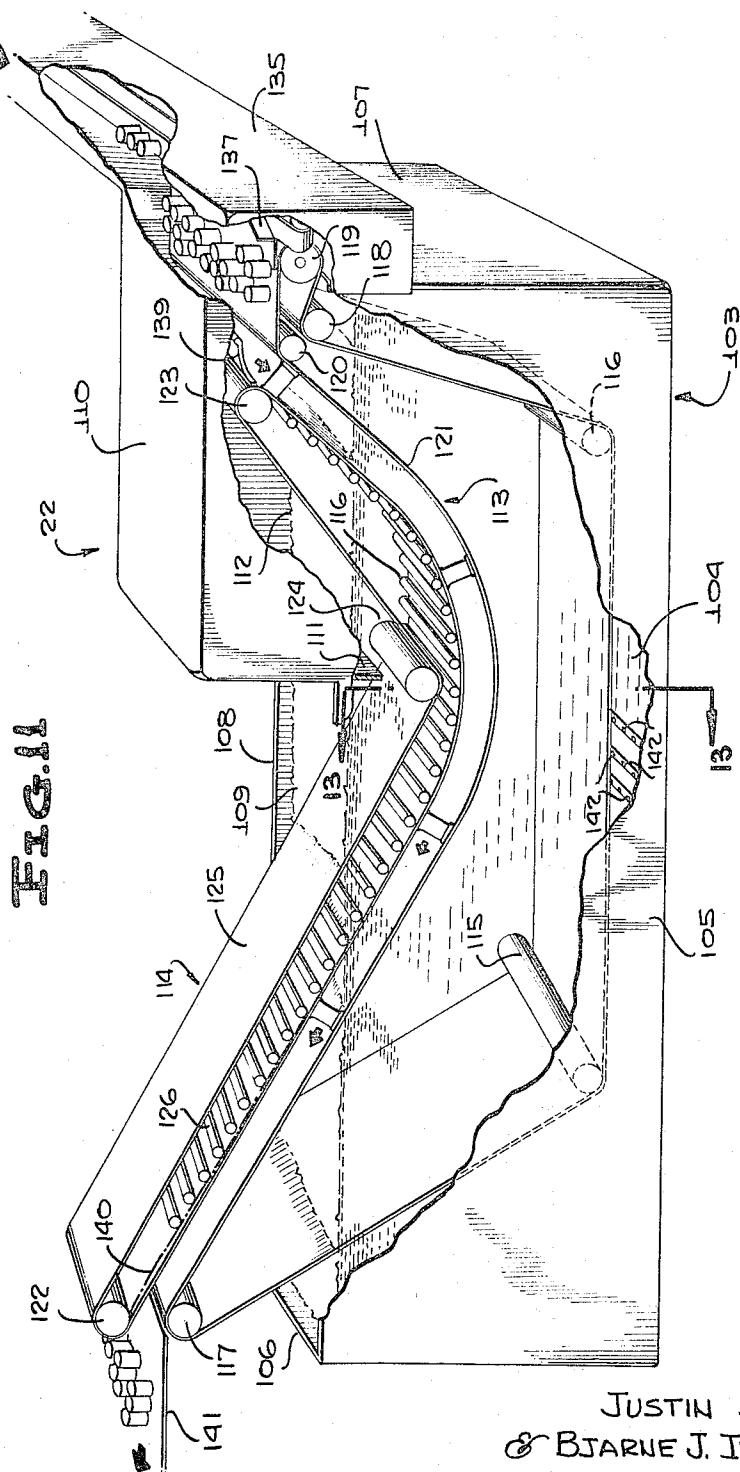
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7 Sheets-Sheet 6



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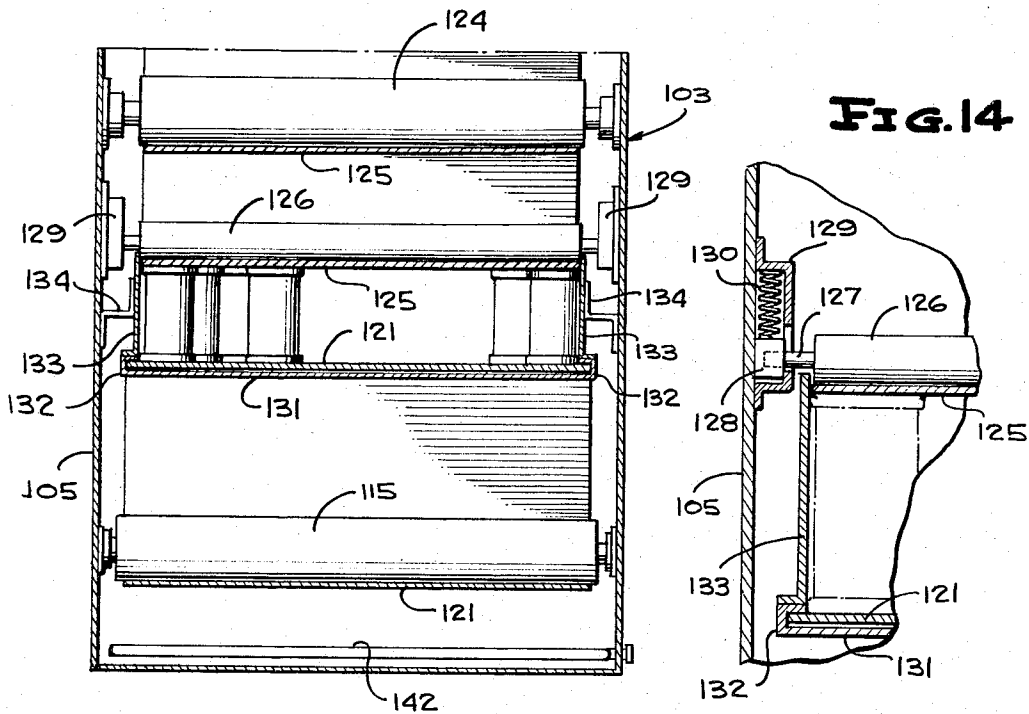
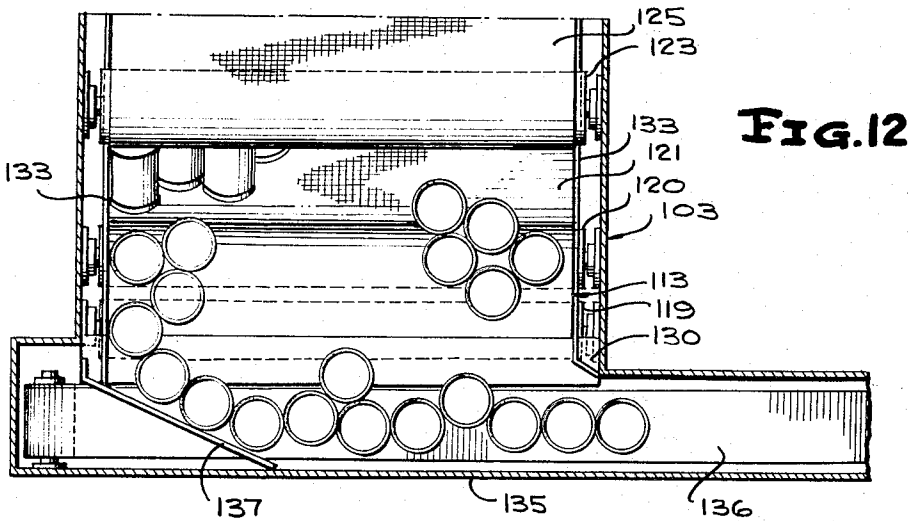
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PACKAGING APPARATUS AND METHOD OF UTILIZING THE SAME

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7 Sheets-Sheet 7



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1

3,376,689

PACKAGING APPARATUS AND METHOD OF UTILIZING THE SAME

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14 Claims. (Cl. 53—38)

ABSTRACT OF THE DISCLOSURE

This disclosure has to do with a packaging apparatus and method wherein cans are passed through an entrance seal formed of a sterilizing liquid into a filling machine sealed relative to the atmosphere. The sterilized cans are filled and then transferred to a closing machine while remaining sealed relative to the atmosphere whereat sterilized ends are applied to the filled cans. The sterilized ends are supplied through a shield including a sterilizing liquid and are thus sterilized. The filled and closed cans exit from the closing machine through a further liquid seal.

This invention relates in general to new and useful improvements in the packaging art, and more particularly to a novel apparatus for and method of packaging products under aseptic conditions.

In the normal packaging of products, particularly those subject to contamination and spoilage, it is desired to maintain the packaging conditions as aseptic as possible. However, in the normal packaging process, the containers are exposed to the atmosphere before the product to be packaged is disposed therein, and the closures for the containers are also so exposed. Further, in many instances, the product during the packaging and subsequent to the positioning of the closure on the container, is exposed to the atmosphere. This is undesirable in many instances.

Accordingly, it is a primary object of this invention to provide a novel apparatus for carrying out a packaging process wherein aseptic conditions are maintained at all times, the actual packaging of products in containers and the closing of the containers taking place in an inert atmosphere, and the containers and closures being supplied to the inert atmosphere under sanitary conditions, and the filled and closed containers being removed from the inert atmosphere under the same conditions.

Another object of this invention is to provide a novel apparatus for packaging products under aseptic conditions, the apparatus including a filling machine and a closing machine which are interconnected and are housed to operate under aseptic conditions, there further being provided means for supplying containers to the filling machine under aseptic conditions, with the containers being sterilized as they pass to the filling machine and not being exposed to the atmosphere after they have been sterilized.

Another object of this invention is to provide a novel apparatus for packaging products under aseptic conditions, the apparatus utilizing a filling machine and a closing machine which are designed to operate under sealed aseptic conditions, and there being attached to the filling machine a container supply conveyor unit which will provide the filling machine with sterilized containers not exposed to the atmosphere subsequent to the sterilization thereof, and there being attached to the closing machine a container closure supply conveyor unit for supplying to the closing machine container closures which have been sterilized and not exposed to the atmosphere subsequent to the sterilization thereof.

A further object of this invention is to provide a novel apparatus for packaging products under aseptic conditions,

2

the apparatus including basically a filling machine and a closing machine which are connected together in sealed relation, the closing machine being provided with a container delivery conveyor which is sealed relative to the filling machine, the closing machine being provided with a container closure supply conveyor which is sealed relative to the closure machine, and there being connected to the closing machine in sealed relation a container discharge conveyor, the filling machine, the closing machine and all of the conveyors being sealed in an inert atmosphere and the ends of the conveyors remote from the filling machine and closing machine being provided with a liquid seal to prevent the entrance of atmospheric air and the escape of the inert gas.

Still another object of this invention is to provide a novel method of packaging products under aseptic conditions comprising the steps of passing containers through a liquid seal wherein the containers are sterilized and delivering the sterilized containers under aseptic conditions to a filling machine, placing the product to be packaged within the containers in the filling machine under aseptic conditions, and while retaining the filled containers under aseptic conditions, passing the filled containers to a closing machine to which there are supplied container closures which pass through a sterilizing liquid into an inert atmosphere and are so delivered to the closing machine, and the filled and closed containers being delivered from the closing machine through a further liquid seal so as to prevent the dilution of the inert gas by the atmosphere.

Still another object of this invention is to provide a novel container supply conveyor unit which includes a tank having a closed over exit area sealed by liquid within the tank, a conveyor leading from the atmosphere down through the liquid and up out of the liquid into the closed off area for delivering containers from the atmosphere to the closed off area with the liquid within the tank being a sterilizing liquid so that the containers delivered to the sealed off area are sterilized, and a container delivery conveyor leading from the sealed off area for passing on the sterilized containers under aseptic conditions.

Another object of the invention is to provide a novel container supply conveyor unit which includes a tank having a closed over area which is sealed by liquid within the tank, and there being mounted within the tank a conveyor which serves to move containers down through the liquid from outside of the tank and up out of the liquid into the closed off area, the conveyor unit including spray means for filling the containers prior to the submergence of the containers within the liquid to eliminate the flotation characteristics of the containers, and the container conveyor within the tank including means for inverting the containers within the closed off area so as to drain the liquid therefrom.

Still another object of this invention is to provide a container closure conveyor unit for supplying container closures to a closing machine under aseptic conditions, the conveyor unit including an elongated guide there-through, and the tank having a closed over end portion sealed by liquid within the tank, with the guide exiting through the sealed over area, and the guide having humped central portion whereby as the container closures pass along the guide within the tank, the container closures are first fanned in one direction and then in the opposite direction so that all air trapped between adjacent container closures is released while the container closures are within the tank so as to prevent the delivering of the container closures with air bubbles attached thereto.

Another object of the invention is to provide a novel container closure supply conveyor unit which includes an elongated tank having liquid disposed therein, one end of

3

the tank being closed over and sealed by the liquid within the tank, and an elongated guide extending through the tank for the purpose of delivering container closures down through the liquid in the tank and up out of the liquid within the closed off area, the liquid being a sterilizing liquid, and the tank being provided with a conveyor underlying the guide and serving to support and move the container closures while within the tank.

A still further object of this invention is to provide a novel container discharge conveyor unit for discharging containers filled under aseptic conditions, the conveyor unit including a tank having a closed over entrance end with the tank having liquid therein sealing the closed over entrance end, and a pair of conveyor belts having opposed runs moving in like direction disposed within the tank and being spaced apart a distance substantially equal to the height of the containers being discharged, the opposed runs of the conveyor belts extending down into the liquid within the tank from the sealed off entrance area and then up out of the liquid into the atmosphere whereby containers may be removed from a sealed area to the atmosphere without the escape of the inert gas or other matter within the sealed area providing the aseptic conditions and at the same time without the entrance of atmospheric air into the sealed off area so as to destroy the aseptic conditions.

With the above and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by reference to the following detailed description, the appended claims and the several views illustrated in the accompanying drawings:

In the drawings:

FIGURE 1 is a plan view of the packaging apparatus which is the subject of this invention and shows the general arrangement of the components thereof.

FIGURE 2 is an end perspective view showing only the container supply conveyor unit of the packaging apparatus, with parts thereof broken away and shown in section in order to clearly illustrate the working components thereof.

FIGURE 3 is an enlarged elevational view of the delivery end of the container supply conveyor unit with one side wall thereof removed, and shows the specific details of the container conveying means therein.

FIGURE 4 is an enlarged fragmentary horizontal sectional view taken along the line 4—4 of FIGURE 3, and shows further the specific details of the container conveying means.

FIGURE 5 is an enlarged fragmentary generally vertical sectional view taken through a drum of the conveying means and shows the specific details of construction of the drum and the relationship of a conveyor belt with respect thereto, intermediate portions of the drum and conveyor belt being broken away and omitted.

FIGURE 6 is an enlarged fragmentary vertical sectional view taken along the line 6—6 of FIGURE 5, and shows the specific details of the mounting of a magnet within the drum for attracting and retaining containers on the exterior surface of the drum.

FIGURE 7 is a fragmentary perspective view of the packaging apparatus with the exception of the container supply conveyor unit, portions of the apparatus being broken away in order to show the movement of containers therethrough.

FIGURE 8 is enlarged perspective view of the container closure supply conveyor means with portions broken away in order to illustrate the internal details of the conveyor unit.

FIGURE 9 is an enlarged fragmentary elevational view within the tank of the container closure supply conveyor unit, and shows the specific details of the guide for the container closures and the manner in which the container closures are automatically fanned during the movement thereof along the guide to assure the escape of air from therebetween.

4

FIGURE 10 is an enlarged fragmentary vertical sectional view taken along the line 10—10 of FIGURE 9, and shows further the specific details of the container closure guide and means for conveying the container closures along the guide.

FIGURE 11 is an enlarged fragmentary perspective view of the container discharge conveyor unit, with portions thereof broken away in order to clearly illustrate the details of the various container conveying means disposed therein.

FIGURE 12 is an enlarged fragmentary horizontal sectional view taken through the upper portion of the entrance end of the container discharge conveyor unit of FIGURE 11, and shows the manner in which containers are transferred from a single line conveyor to a wide random conveyor.

FIGURE 13 is an enlarged fragmentary vertical sectional view taken along the line 13—13 of FIGURE 11, and shows the specific arrangement of the two related endless belt conveyors for gripping containers therebetween and transporting such containers.

FIGURE 14 is an enlarged fragmentary vertical sectional view showing the specific resilient mounting of conveyor belt hold-down rollers within the container discharge conveyor unit.

Referring now to the drawings in detail, it will be seen that the over-all layout of the packaging apparatus, which is generally referred to by the numeral 15, is illustrated in FIGURE 1. The packaging apparatus 15 includes basically a filling machine 16 which is directly coupled to a closing machine 17. The filling machine 16 and the closing machine 17 are of conventional construction and adapted by slight modification for filling and closing containers under aseptic conditions, preferably within a sterile inert atmosphere, such as sterile carbon dioxide; by the addition thereto of suitable air tight covers, steam jets for sterilizing the machine parts within the covers, inert gas supply fittings and air venting valves.

In order that containers may be supplied to the filling machine 16 under aseptic conditions, there is provided a container supply conveyor unit, generally referred to by the numeral 18. The container supply conveyor unit 18 preferably has associated therewith a conventional type of container depalletizer, generally referred to by the numeral 19. It is to be understood that the container depalletizer 19 will receive containers stacked in layers on a pallet, and the depalletizer 19 is capable of handling large quantities of containers almost continuously supplied to the container supply conveyor unit 18 in rows and columns.

The closing machine 17 is provided with a conventional type of container closure inlet fitting 20 to which there is connected a container closure supply conveyor unit, generally referred to by the numeral 21. As will be more apparent hereinafter, the container closure supply conveyor unit 21 serves to supply container closures to the closing machine 17 under aseptic conditions.

In view of the fact that the containers are closed under aseptic conditions preferably within an inert atmosphere, it is also desirable to provide the packaging apparatus 15 with a special type of container discharge to maintain the desired sealed aseptic conditions. Accordingly, the packaging apparatus 15 also includes a container discharge conveyor unit, generally referred to by the numeral 22, which is coupled to the closing machine 17 in the normal manner.

Referring now to FIGURES 2 through 6 of the drawings, it will be seen that there are illustrated the specific details of the container supply conveyor unit 18. The conveyor unit 18 includes an elongated tank, generally referred to by the numeral 23. The tank 23 includes a downwardly sloping bottom wall portion 24 which terminates in a lower, generally horizontal, bottom wall portion 25. The bottom wall portion 25 is provided with suitable supports 26. The tank 23 also includes a pair of side

walls 27, 28 which are connected together at one end by a relatively shallow end wall 29 and at the opposite end by a relatively tall end wall 30.

It is to be noted that the major portion of the tank 23 has a top edge 31. However, the end wall 30 projects a substantial distance above the top edge 31 and terminates at its upper end in a reversely curved portion 32 which, in turn, terminates in a downwardly sloping top wall 33. The top wall 33 is provided at its left end, as viewed in FIGURE 2, with a vertical wall 34 which extends down into the tank 23 and terminates in a downwardly sloping wall 35 which is disposed below the liquid 36 within the tank 23. The side walls 27 and 28 extend up above the edges 31 of the tank 23 in the vicinity of the top wall 33 and are secured to the end wall 30, the top wall 33, the vertical wall 34 and the sloping wall 35 in sealed relation. In this manner, the right hand end of the tank 23, as viewed in FIGURE 2, is provided with a closed over exit area sealed to the atmosphere 36 within the tank 23. This closed over exit area is referred to by the numeral 37.

A large drum, generally referred to by the numeral 38, is mounted in the right end of the tank 23, as viewed in FIGURES 2 and 3, and projects up above the level of the liquid 36 into the exit area 37. The drum 38 may be of any suitable construction as far as the mounting and driving details thereof are concerned. However, it is necessary that the drum 38 be provided with a perforated shell or skin 39 through which a liquid, such as water, may drain. It is desirable that the skin 39 be formed of a noncorrosive, nonmagnetic material. As is best shown in FIGURE 6, a plurality of circumferentially spaced, longitudinally extending magnets 40 are clamped to the inner surface of the skin 39. The magnets 40 are secured in place by means of channel-shaped clamps 41 which are held in place by bolts 42 passing through the skin 39. The magnets 40 may be of any desired type, although ceramic magnets are preferred.

Reference is now made to FIGURE 5 wherein it is shown that the skin 39 is reinforced at the ends thereof by means of suitable circular ribs 43. The drum 38 carries circular outer ribs 44 which terminate in outer flanges 45 which function as belt supports, as will be described hereinafter. When the drum 38 is very wide, it will be provided with at least one intermediate belt support 46 having a belt supporting flange 47.

The containers are moved through the tank 23 primarily by means of an endless belt 48. The endless belt 48 is preferably formed of a noncorrosive, nonmagnetic metal which is very flexible and which has been perforated to permit the free passage of liquid therethrough.

In order to facilitate the supporting of the endless belt 48 in its travel throughout the tank 23, there are mounted within the tank 23 a number of rollers for the endless belt 48. These rollers include a relatively large roller 49 which is mounted within the tank 23 adjacent the end wall 29. A smaller roller 50 is mounted adjacent the bottom of the tank 23 where the bottom wall portion 24 intersects with the bottom wall portion 25. Another smaller roller 51 is mounted in the bottom of the tank 23 adjacent the end wall 30. A further roller 52, which is slightly larger than the rollers 50 and 51, is mounted in the upper right hand corner of the tank 23, as is shown in FIGURE 2, in partially overlying relation to the drum 38.

It is to be noted that the endless conveyor belt 48 passes downwardly from the top of the roller 49 beneath and around the drum 38 with the endless belt 48 passing partially up over the drum 38 before it is removed out of engagement with the drum 38 by the roller 52. The endless belt 48 then passes down from the roller 52 generally parallel to the end wall 30 and around the roller 51. The endless conveyor belt 48 then passes under the roller 51 generally parallel to the bottom wall portion 25 to the roller 50 and then from the roller 50 up to the roller 49 generally parallel to the bottom wall portion 24. It is to be understood that any of the rollers supporting the endless con-

veyor belt 48 or the drum 38 may serve as the driving force for the endless conveyor belt 48. If the drum 38 is not relied upon as the driving force, then, the drum 38 must be driven at the same peripheral speed as is the driving roller for the endless conveyor belt 48 so that there will be no slippage between the endless conveyor belt 48 and the belt supports carried by the drum 38.

The run of the endless conveyor belt 48 between the upper portion of the roller 49 and the lower portion of the drum 38 is referred to by the numeral 53. This run 53 supports containers being delivered into the tank 23. Accordingly, the run 53 is supported by a plurality of transverse supports 54. It is preferred that the transverse supports 54 be of the same construction as the magnets 40 and the clamp 41 so that not only is the run 53 supported by the supports 54, but also the magnets thereof will serve to prevent sliding and tipping of the containers relative to the conveyor belt 48.

Containers are delivered to the conveyor belt 48 from a deadplate 55 which bridges between the depalletizer 19 and the container supply conveyor unit 18. The depalletizer 19 is of a conventional type of construction and includes an inlet conveyor 56 for palletized stacks of containers. A pallet, such as the pallet 57, loaded with containers arranged in layers thereon, is mounted within the depalletizer 19 and in accordance with the usual operation of the depalletizer 19, the pallet 57 is progressively raised, and each layer of containers is pushed off of the top of the stack of containers by suitable pusher means and the containers are delivered to the deadplate 55. Advancing containers continuously push off the leading rows of containers from the deadplate 55 onto the run 53 of the endless conveyor belt 48.

In order to aid in the guiding of the containers and to prevent the tipping thereof as they pass off of the deadplate 55 onto the endless conveyor belt 48, an upper guide 58 is provided in overlying relation to the conveyor belt run 53 for engagement with the upper ends of the containers in the event they attempt to tip. The guide 58 is interrupted by a spray assembly 59 for the purpose of filling the containers with liquid. The purpose of filling the containers with liquid is to prevent the flotation of the containers as they pass down into the liquid 36. It is to be understood that the liquid sprayed into the containers is pumped from the liquid 36 within the tank 23.

After the containers pass under the spray unit 59, they pass under another upper guide 60 which overlies the remainder of the run 53.

The spacing between the endless conveyor belt 48 and the skin 39 of the drum 38 is substantially equal to the height of the containers. In this manner, the containers are clamped against the outer surface of the skin 39 of the drum 38 by the conveyor belt 48 as the containers pass around the lower portion of the drum 38. Due to the fact that the containers are formed of ferrous metal, the containers are attracted to the skin 39 by the magnets 40 so that when the conveyor belt 48 is led away from the drum 38 by the roller 52, the containers remain attached to the drum 38.

An upper guide 61 is mounted in overlying concentric relation to the upper portion of the drum 38 immediately adjacent the point where the endless conveyor belt 48 is removed from the drum 38. This upper guide terminates in a straight portion 62 which slopes downwardly and to the left, as is best shown in FIGURES 2 and 3. The upper guide 61 cooperates with a lower guide 63 to define a chute. The lower guide 63 is provided with a tapered edge 64 which rides on the skin 39 of the drum 38 and serves to strip the containers from the surface of the drum 38 and urge the containers down into the chute 65 defined by the guide portions 62 and 63. It is to be noted that the chute 65 terminates in a vertical lower portion 66.

At this time, it is pointed out that although the container supply conveyor unit 18 is primarily intended to be utilized in conjunction with ferrous metal containers,

it is possible to utilize it in conjunction with plastic and glass containers, for example. In such event, it will be necessary to provide the skin 39 of the drum 38 and the endless conveyor belt 48 with suitable cleats to effect the necessary movement of the containers.

A housing 67 leads off from the tank 23. The housing 67 is sealed to the tank 23 and opens through the side wall 28 thereof above the level of the liquid 36 within the tank 23. It is to be noted that the housing 67 opens into the sealed exit area 37 of the tank 23. A container delivery conveyor 68 is mounted within the housing 67 and extends into the tank 23 in underlying relation to the lower portion 66 of the chute 65.

As the containers pass down through the chute 65, they are turned to a horizontal position and so come to rest on the endless conveyor 68. The endless conveyor 68 moves the containers out through the tank 23 into the housing 67. This endless conveyor 68, which is considered the container delivery conveyor, is provided with a container turning mechanism 69 within the housing 67 which turns the containers 69 so that they are again disposed in upright position with the open upper ends thereof disposed uppermost.

The top wall 33 of the tank 23 is provided with an inspection hatch 70 through which access to the interior of the closed off area 37 may be obtained. In addition, the inspection hatch 70 is provided with an inspection port 71 through which the movement of the containers within the sealed off area 37 may be watched. In the event there should be a minor jam up within the sealed off area 37 in the vicinity of the chute 65, provision has been made for the straightening of this jam up without destroying the sealed aseptic condition within the exit area 37. To this end, there has been provided a housing 72 on the vertical wall 34. This housing 72 has a pair of gloves 73 mounted therein in sealed relation to facilitate this straightening of the containers.

Operation of container supply conveyor unit

In the operation of the container supply conveyor unit 18, including the depalletizer 19, palletizer containers mounted on a pallet 57 are delivered to the conveyor 56 and are moved into the depalletizer. The depalletizer 19 operates to continuously remove the containers from the pallet 57 and push the containers across the deadplate 55 linking the depalletizer 19 with the container supply conveyor unit 18 and forcing the containers onto the run 53 of the endless conveyor belt 48. At this time, the containers are disposed in upright positions with the open ends thereof uppermost. As the containers pass down the run 53, they are filled with liquid by the spray unit 59 with the result that most of the air from within the containers is removed. The containers move slowly enough down through the liquid 36 to permit all air carried by the containers to be removed. As the containers pass around the drum 38, the containers are inverted and the liquid runs out of the containers. Thus, the containers are substantially free of liquid at the time they pass down the chute 65 onto the container delivery conveyor 68.

It is to be understood that the liquid 36 within the tank 23 may be of any desired type. The liquid could be provided with suitable sterilizing chemicals, if desired. However, when it is desired to sterilize the containers passing through the tank 23, which is the usual case, the liquid 36 in the tank 23 will be heated. To this end, the bottom wall portion 25 of the tank 23 is provided with a steam chamber 74 which extends transversely beneath the tank 23. The steam chamber 74, as is shown in FIGURE 3, is provided with a steam inlet pipe 75. That portion of the bottom wall portion 25 overlying the steam chamber 75 is provided with a plurality of steam nozzles 76 (FIGURE 2) for directing jets of steam upwardly into the tank 23. It is to be understood that the steam jets

will heat the liquid to effect the sterilization of the containers passing through the tank 23.

Referring now to FIGURES 1 and 7 in particular, it will be seen that the housing 67 leads from the tank 23 into the filling machine 16 and is sealed relative to the filling machine 16. Thus, the container delivery conveyor 68 delivers a sterilized container from the tank 23 to the filling machine 16 under aseptic conditions.

The filling machine 16 is of a conventional type, and therefore, will not be described in detail here. However, it is to be understood that the containers will be filled with the desired products under the desired aseptic conditions, obtained by the prior operation of suitably placed steam jets (not shown) within the filling machine cover, the housing 67 and the exit area 37 of the tank 23. The aseptic conditions obtained by steaming may be maintained through the use of a sterile inert gas, such as carbon dioxide, in which event, the filling machine 16, the housing 67 and the exit area 37 of the tank 23 will be filled with the inert gas.

As has been stated hereinabove, the closing machine 17, which is disposed adjacent the filling machine 16, also is of a conventional construction and therefore is not described in detail here. However, it is to be understood that the closing machine 17 is also designed to function under aseptic conditions and may be filled with sterilizing steam followed by a sterile inert gas, such as carbon dioxide. A housing 77 extends between the filling machine 16 and the closing machine 17 and is connected to the two machines in sealed relation. A conveyor of any desired type extends through the housing 77 to deliver filled containers from the filling machine 16 to the closing machine 17. This conveyor is referred to by the numeral 78.

Reference is now made to FIGURES 8, 9 and 10, wherein the details of the container closure supply conveyor unit 21 are shown. The conveyor unit 21 includes an elongated tank 79 in which a suitable liquid 80 is contained. The liquid 80 may be a sterilizing liquid, if desired, and for sterilizing purposes, the liquid 80 could be water which has been heated to a sterilizing temperature.

The tank 79 is of a generally rectangular construction and is supported in an elevated position by legs 81. One end of the tank 79 is partially closed by means of a closure plate 82 which extends between and is secured to the upper edges of the side walls of the tank 79. The closure plate 82 has a depending plate 83 which extends down below the level of the liquid 80 to form a seal therewith. The closure plate 82 also carries an upstanding housing 84. It is to be understood that the housing 84, together with the closure plate 82, defines a sealed exit area 85. The housing 84 terminates in a generally rectangular housing 86 which is coupled to the fitting 20 of the closing machine 17.

A suitable container closure guide, generally referred to by the numeral 87, extends down into the tank 79 below the level of the liquid 80 from the end of the tank 79 remote from the housing 84. The guide 87 passes up out of the tank 79 under the housing 84 and down through the housing 86. The end of the guide 87 terminates in a coupling flange 88 which is secured to a like coupling flange (not shown) on the closing machine 17. It is to be understood that container closures 89 are supplied to the guide 87 in any conventional manner.

Reference is now made to FIGURE 10 in particular, wherein it is to be noted that the guide 87 is formed of an uppermost rod 90 and a pair of lower rods 91. The rods 90 and 91 are disposed in generally triangular relationship and are so spaced so as to provide proper support for the container closures 89.

Reference is now made to FIGURE 9 in particular, wherein it will be seen that the lower portion of the guide 87 is provided with a central hump 92. It will be apparent that as the container closures 89 pass down the guide 87

into the tank 79, the container closures are closely disposed relative to one another. As the container closures 89 reach the lower portion of the guide 87, the guide 87 is upwardly curved, as at 93. This results in the outward fanning of the lower edges of the container closures so as to permit the liquid 80 to flow therebetween and displace any air which may be disposed between the lower portions of the container closures. Then, as the container closures 89 pass up into the hump 92 of the guide 87, the container closures 89 are reversely fanned so as to space the upper portions of adjacent container closures and permit the final escape of all air from therebetween. It is also to be noted that the guide 87 is reversely curved to the left of the hump 92, as at 94, which results in an additional fanning of the container closures 89 beneath the surface of the liquid 80 to assure that all air initially disposed between the container closures is released therefrom.

In order to effect the feeding of the container closures 89 through the guide 87 in the area of the tank 79, there is provided a conveyor, generally referred to by the numeral 95. The conveyor 95 includes two lower rollers 96, 97 and two upper rollers 98, 99. One of these rollers, preferably the roller 99, is driven. An endless conveyor belt 100 is entrained over the rollers 96, 97, 98 and 99 and carries a plurality of spaced cleats 101 which project up between the rails 91 of the guide 87 and engage behind container closures 89 to force the same through the guide 87. A typical cleat 101 is illustrated in FIGURE 10.

It is desired that the endless belt 100 closely follow the contour of the guide 87 and underlie the container closures 89. Due to the provision of the central hump 92 in the guide 87, it is necessary to provide the tank 79 with rollers 102 which extend between the sides of the tank 79 and support the upper run of the endless belt 100 beneath the hump 92. The arrangement and mounting of the rollers 102 is shown in FIGURES 9 and 10.

At this time, it is also pointed out that immediately adjacent the rollers 98 and 99, it is desired that the endless belt 100 directly engage the container closures 89 to urge the same up against the top rail 90. It will be understood that the portions of the guide 87 disposed adjacent the rollers 98 and 99 will be so related with respect to the path of the endless belt 100 that this desired contact will occur. Because of the relationship of the cleats 101 with respect to the lower rails 91, it may be necessary to move the lower rails 91 upwardly and outwardly in these areas.

In order that the endless conveyor belt 100 may be properly tensioned, it is desired that at least one of the rollers be adjustably and spring mounted. It is preferred that the roller 96 be the roller so mounted so that the necessary upward pulling on the upper run of the endless conveyor belt 100 may be accomplished.

It is understood that the housing 89 is sealed from the outside atmosphere by the liquid 80 in the tank 79. Further, it is to be understood that when the liquid 80 is of a sterilizing type, the container closures 89 will be supplied to the housing 86 under sterilized conditions. It is also to be understood that the same aseptic conditions which exist in the closing machine 17 will exist within the housing 86 and the sealed exit area 85.

Operation of the container closure supply conveyor unit

In the operation of the container closure supply conveyor unit 21, suitable container closures 89 are supplied to the right hand end of the guide 87 in any conventional manner. As the container closures 89 pass into the guide 87, the container closures 89 are gripped at spaced intervals by the cleats 101 and are thereby pushed through the guide 87. Since the guide 87 passes down through the liquid 80 in the tank 79 and up out into the sealed area 85, it will be seen that the container closures 89 will pass from the outside atmosphere through a water seal and up into an area having conditions as desired, the conditions

being preferably aseptic in nature. Due to the particular configuration of the guide 87, it will be seen that the container closures 89 will be reversely fanned so as to assure the removal of all air from between adjacent ones of the container closures. Thus, no outside air is brought into the housing 86 with the container closures 89. In addition, when the liquid 80 is of a sterilizing type, including heated water, the container closures supplied to the closing machine are sterilized.

Reference is now made to FIGURES 11 through 14, inclusive, wherein there are shown the details of the container discharge conveyor unit 22. The conveyor unit 22 includes a tank, generally referred to by the numeral 103. The tank 103 has a bottom wall 104, upstanding side walls 105 and spaced end walls 106 and 107. For the most part, the side walls 105 have upper edges 108 below which the tank 103 is substantially filled with a liquid 109.

The side walls 105 project upwardly above the edges 108 for a distance towards the end wall 107. The end wall 107 also projects up beyond the upper edge of the end wall 106. A top wall 110 extends between the upwardly projecting portions of the side walls 105 and is connected to the upper edge of the end wall 107. In addition, a vertical wall 111 extends downwardly at the left end of the top wall 110 between the upwardly projecting portions of the side walls 105. The wall 111 extends down into the tank 103 below the level of the liquid 109 therein. In this manner, a closed off sealed entrance area 112 is formed at the right end of the tank 103 above the level of the liquid 109.

A pair of cooperating conveyors 113 and 114 are carried by the tank 103. The conveyor 113 includes a pair of lower rollers 115, 116, and an upper roller 117 which is disposed above the end 106 of the tank 103. A roller 118 is disposed above and to the right of the roller 116 in the upper portion of the tank 103 in the sealed area 112 thereof. A drive roller 119 is mounted to the right and slightly above the roller 118. Another roller 120 is disposed with the top thereof in the same plane as the roller 119 and disposed to the left of the roller 118. An endless conveyor belt 121 is entrained over the rollers 115, 116, 117, 118, 119 and 120. It is to be noted that the endless conveyor belt 121 loops down between the rollers 117 and 120 and passes out of the sealed entrance area 112 down through the liquid 109 and out of the liquid 109 to the atmosphere.

The conveyor 114 includes an upper left hand roller 122 which is disposed above the roller 117. The conveyor 114 also includes an upper right hand roller 123 which is disposed above and to the left of the roller 120. In addition, the conveyor 114 includes a centrally located lower roller 124.

It is desired that a lower run of an endless conveyor belt 125 of the conveyor 114 extend generally parallel to the upper run of the endless conveyor belt 121. It is desired that the shapes of these two opposed runs of the conveyors 113 and 114 be substantially that illustrated in FIGURE 11. In order that the lower run of the endless conveyor belt 125 will have the desired arcuate shape, a plurality of small diameter rollers 126 are mounted principally between the side walls 105 of the tank 103 and by means of suitable supports (not shown) where the rollers 126 are disposed above the side walls of the tank 103. It is to be understood that the endless conveyor belt 125 is entrained around the rollers 122 and 123, and under the rollers 124 and 126. Either the roller 122 or 123 may be suitably driven at the same peripheral speed as is the roller 119 so that the opposed runs 113 and 114 will move at the same rate. It is to be understood, of course, that the direction of movement of these two opposed runs is to be the same.

Reference is now made to FIGURE 14 in particular, which shows the manner in which the rollers 126 are supported. Each of the rollers 126 has a shaft 127 which

projects through opposite ends thereof. The shaft 127 has each end thereof suitably journaled in a block 128 which, in turn, is mounted in a guide 129 carried by an associated one of the side walls 105 of the tank 103. The block 128 is vertically movable with its associated guide 129, but is normally retained in a lower position by means of a spring 130 bearing thereagainst. It is to be noted, however, that the rollers 126 are resiliently mounted so as to maintain the necessary tension on the endless conveyor belt 125 at all times.

In order to assure the proper spacing of the opposed runs of the endless conveyor belts 121 and 125, it is necessary that the upper run of the endless conveyor belt 121 be suitably guided. To this end, a flat guide 131 having channel-shaped end portion 132 is provided, as is clearly shown in FIGURES 13 and 14. Also, in order to prevent the accidental movement of containers side-wise from between the endless conveyor belts 121 and 125, it is necessary that suitable side plates 133 extend upwardly from the guide 131. These side plates 133 are utilized as supports for the guide 131 by being attached to suitable brackets 134 carrier by the side walls 105 of the tank 103 with the side plates 133 functioning as hangers for the guide 131.

Reference is now made to FIGURES 7 and 11 in particular, wherein it will be seen that a housing 135 extends between the closing machine 17 and the tank 103. The housing 135 is connected primarily to the end wall 107 of the tank and the housing 135 and the end wall 107 have aligned openings so that the interior of the housing 135 is in communication with the interior of the tank 103.

An endless conveyor 136 is mounted within the housing 135 and receives closed containers from the closing machine 17. The endless conveyor 136 delivers the closed containers to a position aligned with the tank 103 and into engagement with a deflector plate 137, as is shown in FIGURE 12. The deflected containers are moved from the endless conveyor 136 onto a deadplate 138 which overlies the upper portion of the conveyor 113. Following containers push the advance containers from the deadplate 138 onto the conveyor 113 in a random order.

Referring now to FIGURE 11, it will be seen that a suitable guide 139 extends generally above the roller 120 so as to urge the containers down between the opposed runs of the endless conveyor belts 121 and 125. Referring to the left end of the conveyors 113 and 114, it will be seen that the lower run of the endless conveyor belt 125 extends straight to the roller 122. However, when containers are disposed between the opposed runs of the conveyor belts 121 and 125, the conveyor belt 125 will be upwardly bowed, as indicated by the phantom line 140. The containers exiting from between the conveyors 113 and 114 are passed onto either a suitable deadplate 141 or some take-away means.

In view of the fact that the conveyor belts 121 and 125 must pass through the liquid 109 within the tank 103, it is desirable that these conveyor belts be formed of a non-corrosive perforated metal. Also, since the closed containers must pass through the liquid, it is desirable to expedite the drying thereof after they have passed from within the tank 103. To this end, the bottom portion of the tank 103 is provided with suitable steam pipes 142 formed to direct jets of steam up into the liquid within the tank 103. In this manner, the containers and the contents thereof may be preheated to facilitate the drying of the containers after being discharged from the container discharge conveyor unit 22. The heating of the liquid also maintains it sterile and lessens the amount of inert gas that it will absorb.

Operation of container discharge conveyor unit

The container discharge conveyor unit 22 receives filled and closed containers from the closing machine 17.

These containers move along the single line conveyor belt 136 until they approach the end of the housing 135, at which time they are engaged by the deflector plate 137 and are moved onto the deadplate 138. As the containers crowd onto the deadplate 138, as is best shown in FIGURE 12, the containers will be forced off the deadplate 138, by the following containers, onto the conveyor 113 in random order. The containers are then deflected down between the conveyors 113 and 114 by the guide plate 139, with the result that the containers pass through the seal formed by the liquid 109 in the tank 103. The containers are then discharged by the conveyors 113 and 114 onto the deadplate 141 from which they are moved either to suitable drying means or suitable packing means.

At this time, reference is again made to FIGURE 2, wherein it is shown that a divider member 144 is carried by the deadplate 55 in the center thereof. The divider member 144 serves to spread apart the containers in a row so as to provide suitable space down the center of the endless belt 48 to provide the necessary clearance for a center belt support carried by the drum 38, if such center belt support is provided. It is to be understood that the existence of the divider 144 will depend upon the center belt support and the dividers may vary in number in accordance with the central belt supports.

At this time, it is particularly pointed out that the present invention has to do with the packaging of all types of products where aseptic conditions are desired. Although the packaging apparatus 15 is principally developed for use in conjunction with cans, it is to be understood that other types of containers, including plastic bottles and glass bottles and jars, may be used in the packaging apparatus 15. Further, it is to be understood that the products to be packaged are not limited to foods and beverages in that all types of products requiring aseptic conditions may be packaged in accordance with this invention. However, it is pointed out that the packaging apparatus 15 is particularly well adapted to the packaging of beer in cans.

In the foregoing description wherever the words aseptic or sterile are used, what is meant is commercially aseptic or commercially sterile. In the food industry commercially sterile means free of viable organisms capable of growth in the product under the conditions existing but does not necessarily mean absolute sterility. For instance, in canning acid products such as beer and citrus fruit juices having a pH of below 4.5 commercial sterilization may be achieved at relatively low temperatures and in short periods of time due to the fact that the types of bacteria that adversely affect such products by being capable of growth therein are among the most readily killed by heat.

On the other hand products having a pH of 4.5 and above require either much higher temperatures or a very long time at lower temperatures to be rendered commercially sterile.

In view of this, the apparatus and method of the present invention are most admirably suited for aseptically packaging an acid product, such as beer, which can be accomplished at a very high rate of speed.

The use of a sterile inert gas atmosphere in which the packaging operations are performed also serves the purpose of eliminating oxygen from the containers that would normally be present if sterile air were used. For the packaging of most products it is desirable to achieve as low an oxygen content as possible in the packages.

From the foregoing, it will be seen that novel and advantageous provision has been made for carrying out the desired end. However, attention is again directed to the fact that variations may be made in the example method and apparatus disclosed herein without departing from the spirit and scope of the invention, as defined by the appended claims.

We claim:

1. A method of packaging products under aseptic con-

13

ditions utilizing sealed filling and closing mechanisms comprising the steps of maintaining aseptic conditions within the filling and closing mechanisms, feeding containers to the filling mechanism through a sterilizing liquid first seal wherein containers fed to the filling mechanism are sterilized prior to delivery thereof to the filling mechanism, feeding container closures to the closing mechanism through a sterilizing liquid second seal wherein container closures fed to the filling mechanism are sterilized prior to the delivery thereof to the closing mechanism, and discharging filled and closed containers from the closing mechanism through a third seal, the container closures being continuously provided and being fanned in opposite directions within the sterilizing liquid second seal to remove all air from therebetween.

2. An apparatus for aseptic packaging of products, said apparatus being sealed against the introduction of outside air and comprising a sealed filling machine and a sealed closing machine interconnected in sealed relation, a sealed container supply conveyor unit leading to said filling machine, a seal in said container supply conveyor unit, means for delivering air free containers to said container supply conveyor unit through said seal, a sealed container closure supply conveyor unit leading to said closing machine, a second seal in said container closure supply conveyor unit, means for delivering air free container closures to said container closure supply conveyor unit through said second seal, and a sealed container discharge conveyor unit leading from said closing machine and having a discharge seal, said container supply conveyor unit including a tank having a closed over area sealed by liquid within said tank, a housing connected to said filling mechanism and said closed over area in sealed relation and having a container delivery conveyor extending therethrough, and a container supply conveyor having a portion thereof exposed for the reception of containers, said container supply conveyor passing liquid through said liquid into said closed over area and terminating at said container delivery conveyor for supplying containers thereto, said container supply conveyor unit including a liquid spray for filling containers prior to the passage of the containers through the liquid to exclude air from the containers and prevent the containers from floating.

3. An apparatus for aseptic packaging of products, said apparatus being sealed against the introduction of outside air and comprising a sealed filling machine and a sealed closing machine interconnected in sealed relation, a sealed container supply conveyor unit leading to said filling machine, a seal in said container supply conveyor unit, means for delivering air free containers to said container supply conveyor unit through said seal, a sealed container closure supply conveyor unit leading to said closing machine, a second seal in said container closure supply conveyor unit, means for delivering air free container closures to said container closure supply conveyor unit through said second seal, and a sealed container discharge conveyor unit leading from said closing machine and having a discharge seal, said container supply conveyor unit including a tank having a closed over area sealed by liquid within said tank, a housing connected to said filling mechanism and said closed over area in sealed relation and having a container delivery conveyor extending therethrough, and a container supply conveyor having a portion thereof exposed for the reception of containers, said container supply conveyor passing through said liquid into said closed over area and terminating at said container delivery conveyor for supplying containers thereto, said container supply conveyor unit including a liquid spray for filling containers prior to the passage of the containers through the liquid to exclude air from the containers and prevent the containers from floating, and said container supply conveyor including a container inverting drum for inverting containers to empty liquid from the containers within said closed over area prior to delivery to said container delivery conveyor.

14

4. An apparatus for aseptic packaging of products, said apparatus being sealed against the introduction of outside air and comprising a sealed filling machine and a sealed closing machine interconnected in sealed relation, a sealed container supply conveyor unit leading to said filling machine, a seal in said container supply conveyor unit, means for delivering air free containers to said container supply conveyor unit through said seal, a sealed container closure supply conveyor unit leading to said closing machine, a second seal in said container closure supply conveyor unit, means for delivering air free container closures to said container closure supply conveyor unit through said second seal, and a sealed container discharge conveyor unit leading from said closing machine and having a discharge seal, said container closure supply conveyor unit including a tank having a closed over exit area sealed by liquid within said tank, a container closure guide passing into said tank through the liquid therein and out through said exit area, said container closure guide having a humped lower central portion whereby container closures passing along said guide are reversely fanned to assure the escape of all air from between the container closures.

5. The apparatus of claim 4 wherein feed means are associated with said container closure guide within said tank.

6. In a sealed packaging apparatus, a container supply conveyor unit comprising a tank having a closed over exit area sealed from the atmosphere by liquid within said tank, a housing extending from said tank exit area, a container delivery conveyor extending through said housing and into said tank, a container supply conveyor extending from outside of said tank down through the liquid and up into said exit area for delivering containers to said container delivery conveyor, and a liquid spray overlying said container supply conveyor for filling containers prior to the passage of the containers through the liquid to exclude air from the containers and prevent the containers from floating within the liquid.

7. In a sealed packaging apparatus, a container supply conveyor unit comprising a tank having a closed over exit area sealed from the atmosphere by liquid within said tank, a housing extending from said tank exit area, a container delivery conveyor extending through said housing and into said tank, a container supply conveyor extending from outside of said tank down through the liquid and up into said exit area for delivering containers to said container delivery conveyor, said container supply conveyor including an endless conveyor belt having an upper container engaging run, a drum disposed partially in said exit area and partially in said liquid, a portion of said conveyor run passing partially under up and around said drum for delivering container to said drum, and container retaining means on said drum.

8. The apparatus of claim 7 together with means for removing inverted containers from said drum and delivering the same to said container delivery conveyor.

9. The apparatus of claim 7 wherein said liquid is a sterilizing liquid.

10. The apparatus of claim 7 wherein said container supply conveyor unit includes a liquid spray for filling containers prior to the passage of the containers through the liquid to exclude air from the containers and prevent the containers from floating.

11. In a sealed packaging apparatus, a container closure supply conveyor unit comprising a tank having a closed over exit area sealed by liquid within said tank, a container closure guide passing into said tank through the liquid therein and out through said exit area, said container closure guide having a humped lower central portion whereby container closures passing along said guide are reversely fanned to assure the escape of all air from between the container closures.

15

12. The apparatus of claim 11 wherein said liquid is a sterilizing liquid.

13. The apparatus of claim 11 wherein feed means are associated with said container closure guide within said tank.

14. In a sealed packaging apparatus, a container closure supply conveyor unit comprising a tank having a closed over exit area sealed by liquid within said tank, a container closure guide passing into said tank through the liquid therein and out through said exit area, said container closure guide having a humped lower central portion whereby container closures passing along said guide are reversely fanned to assure the escape of all air from between the container closures, said guide including an upper guide member and two lower guide members, and a conveyor belt underlying said guide and having an upper run adapted to engage container closures and lift said container closures up off of said lower guide members and into engagement with said upper guide member.

5

10

15

16

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