

Sept. 18, 1962

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3,054,239

FILLING AND SEALING MACHINE

Filed April 25, 1960

4 Sheets-Sheet 1

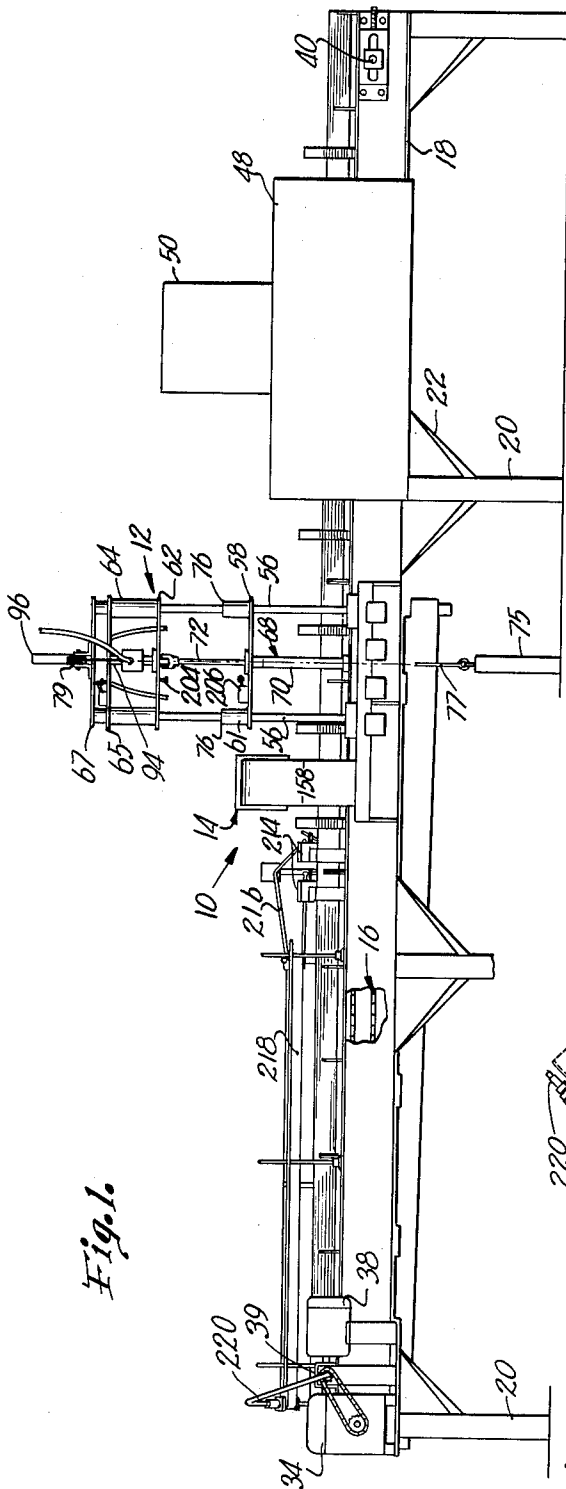


Fig. 1.

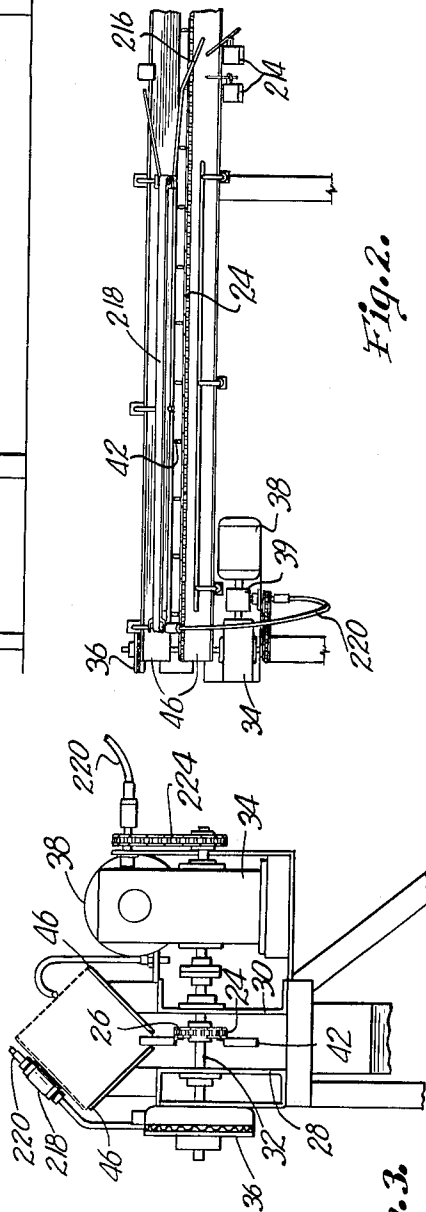


Fig. 2.

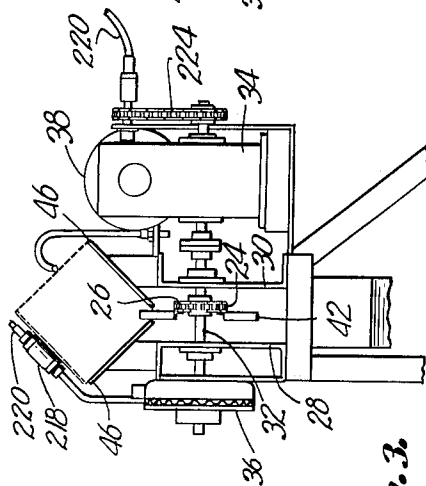


Fig. 3.

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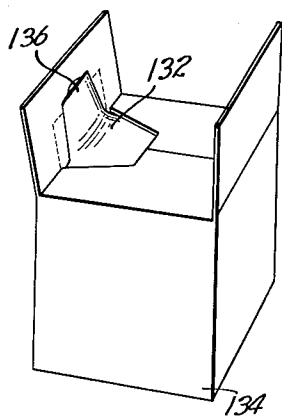


Fig. 13.

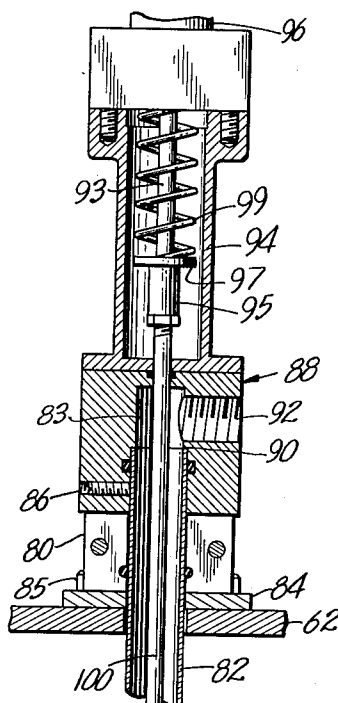
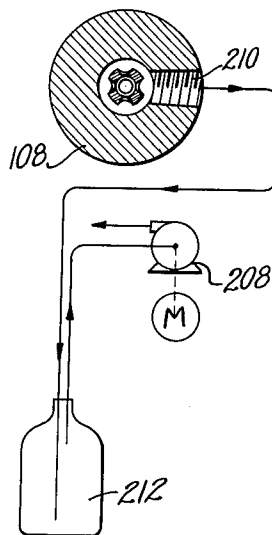


Fig. 8.

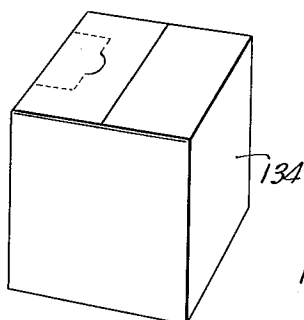


Fig. 14.

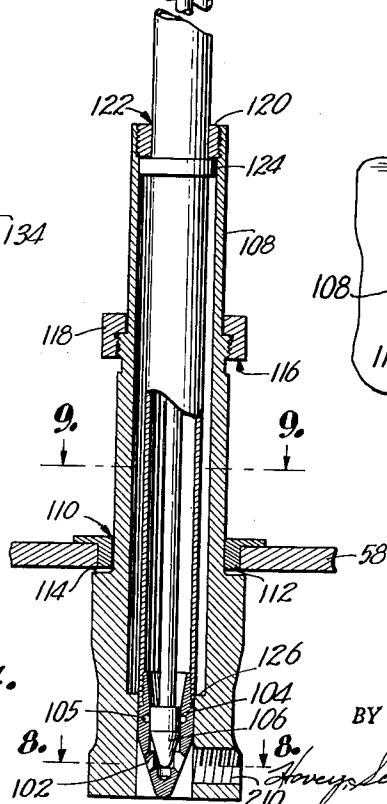


Fig. 4.

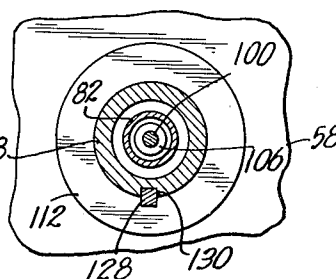


Fig. 9.

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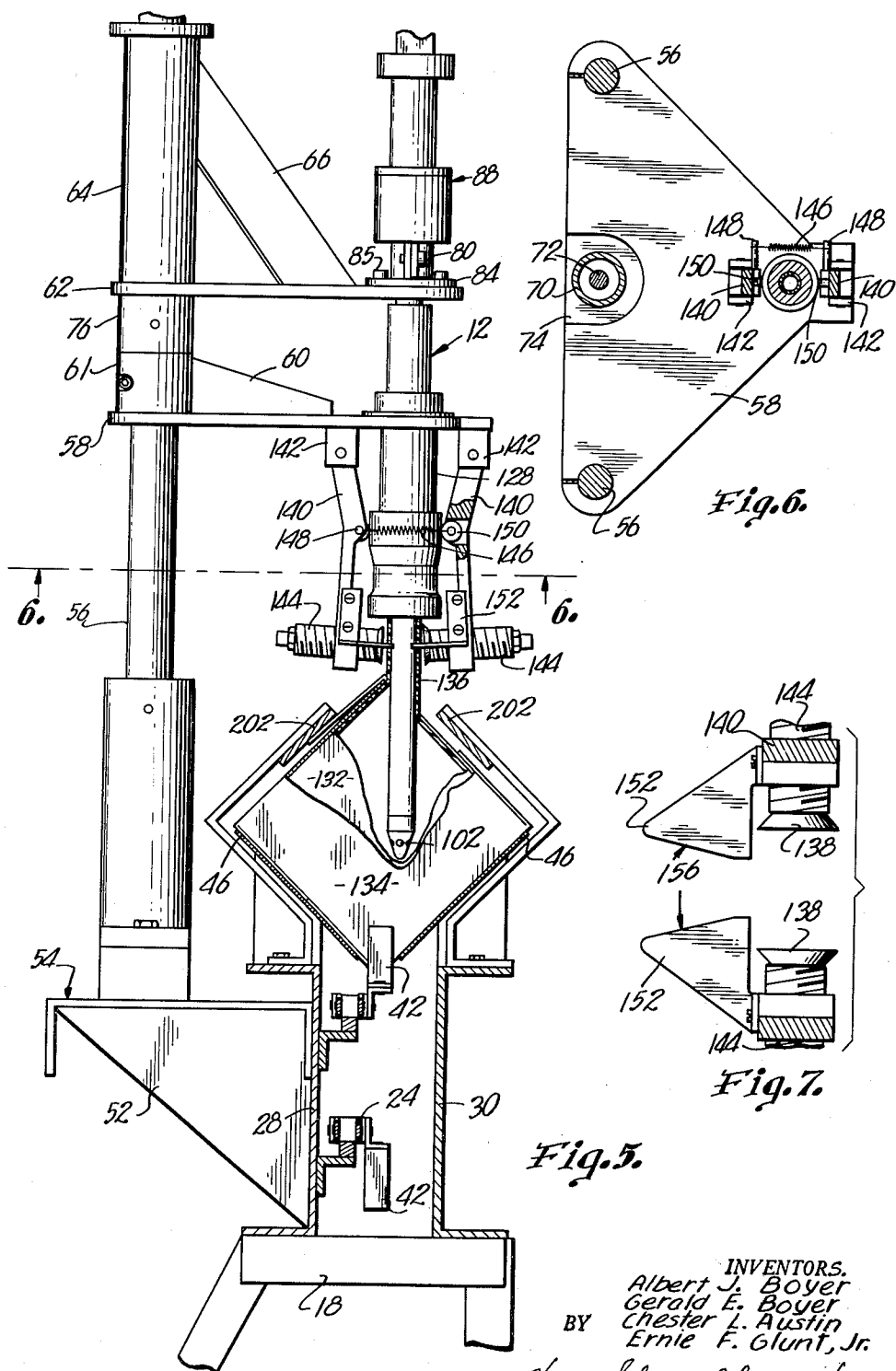
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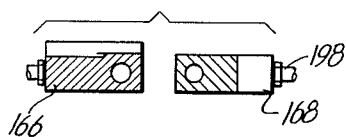
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**3,054,239**

## FILLING AND SEALING MACHINE

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3,054,239

## FILLING AND SEALING MACHINE

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Filed Apr. 25, 1960, Ser. No. 24,292  
12 Claims. (Cl. 53—266)

This invention relates to automatic packaging machines and more particularly to a filling and sealing machine which performs the automatic process of initially filling a container with a fluid and subsequently sealing the same as the container is conveyed relative to the filling and sealing machine.

It is the most important object of this invention to provide a machine which automatically fills a plurality of containers with a fluid as the containers are advanced by means of a conveyor system, and which will seal the containers after the filling operation has been completed.

Another important object of this invention is to provide in a filling and sealing machine, a filler element which may be lowered into successive containers passing therebelow to fill the containers with a fluid such as an acid or the like and which may be withdrawn from the container after the latter has been filled, the foregoing process being entirely automatic, whereby to avoid any human contact with the fluid.

Another important object of the present invention is to provide suction means associated with the filler element which engage and separate portions of a spout provided on the container to be filled so that the filler element may be easily and quickly inserted within and withdrawn from the container.

A yet further aim of the present invention is to provide a fully automatic filling and sealing machine for use in conjunction with a specially designed container whereby the machine may be utilized to fill the container with a fluid such as an acid or similar material which would be harmful to humans if contacted and which machine includes means for successively and continuously conveying the containers, in a given position, to a location on the machine where a filler element is automatically inserted within the container through a spout formed on the container which spout has been automatically opened by suction means associated with the filler element, and which machine, subsequent to the filling of a container and withdrawal of the filler element therefrom will automatically seal the container and convey the same to a point of delivery.

Other objects of this invention include the construction of the filler head, the sealing means, and the conveying system and other details of construction which will become apparent from the following specification and accompanying drawing wherein:

FIGURE 1 is a rear elevational view of the filling and sealing machine;

FIG. 2 is a fragmentary plan view of one end portion of the machine;

FIG. 3 is a fragmentary elevational view of one end of the machine, illustrating the drive mechanism;

FIG. 4 is an enlarged, sectional view of the filler element and structure associated therewith;

FIG. 5 is an enlarged, side elevational view of the filler element and associated structure showing the same in a lowered position with the filler element inserted within a container supported by the conveyor system, parts being broken away and in section to illustrate details of construction;

FIG. 6 is a sectional view taken along line 6—6 of FIG. 5;

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FIG. 7 is an enlarged, fragmentary plan view of the suction means associated with the filler element;

FIG. 8 is a sectional, diagrammatical view taken along line 8—8 of FIG. 4;

FIG. 9 is an enlarged, sectional view taken along line 9—9 of FIG. 4;

FIG. 10 is an enlarged, side elevational view of the sealing means of the filling and sealing machine, parts being broken away to illustrate details of construction;

FIG. 11 is a fragmentary, plan view of the cooling device forming a part of the sealing means, parts being broken away to illustrate details of construction;

FIG. 12 is a sectional view taken along line 12—12 of FIG. 11;

FIG. 13 is a perspective view of the container intended for use with the filling and sealing machine and illustrating the spout of the inner container and the open top of the outer container; and

FIG. 14 is a perspective view of the container shown in FIG. 13 with the top of the outer container folded into a closed position.

The filling and sealing machine is broadly denoted by the numeral 10. Machine 10 is comprised of a filler portion 12, a sealer portion 14 and a conveyor portion 16 as best seen in FIG. 1, portions 12, 14 and 16 being supported by table 18 having spaced legs 20 made rigid by braces 22.

Conveyor portion 16 includes an endless chain 24 in mesh with a sprocket at each end of table 18 and spanning the length thereof. Sprocket 26 as seen in FIG. 3 is horizontally mounted between a pair of opposed upright members 28 and 30 by means of shaft 32 which is coupled at one end thereof to a speed reducer 34 and at its other end to an electric brake 36. Speed reducer 34 is coupled to a driving motor 38 through a magnetic clutch 39, the motor 38 being connected to a suitable source of electric power whereby chain 24 may be driven. At the other end of table 18, chain 24 is in mesh with a sprocket (not shown), which sprocket is coupled to a tensioning device 40 to adjust the tension in chain 24 to the desired degree. A plurality of dogs 42 are suitably secured to the chain 24 and move therewith as motor 38 drives shaft 32 and chain 24. Dogs 42 extend outwardly from chain 24 and are adapted to engage an article overlying chain 24 to move the article in the direction of motion of chain 24.

Inclined channel members 46, attached to upright members 28 and 30, support articles disposed between members 46 in a position whereby such articles may be engaged by dogs 42 and moved along members 46 all as best seen in FIG. 3. Thus a container placed between members 46 is advanced in a horizontal path in the direction of motion of chain 24 by dogs 42 engaging the container. The container is carried by members 46 in the position illustrated in FIG. 5 for reasons which will hereinafter become apparent.

Motor 38 runs continuously and is intermittently coupled with shaft 32 through operation of clutch 39 according to a predetermined time sequence established in conjunction with the operation of filler portion 12 and sealer portion 14. It is to be noted at the outset that portions 12 and 14 and 16 are operated automatically by means of a timing system and mechanical actuating devices for the purpose of eliminating the need for manual manipulation to accomplish the filling, sealing and conveying process. In this respect, the timing and mechanical actuating devices to accomplish automatic operation of machine 10 are housed within an enclosure 48 mounted uprightly on table 18. Mounted atop enclosure 48 is control panel 50 on which are mounted switches and controls for actuating machine 10. It is to be understood that enclosure 48 and panel 50 carry such timing devices and the like as

are used in imparting controlled automatic action to machine 10 and the components thereof.

Filler portion 12 is mounted on upright 28 by means of angle member 52 as best seen in FIG. 5, it being noted that portion 12 is portable and may be mounted on any suitable framework if desired. Member 52 has an upper surface 54 on which is mounted a pair of vertical shafts 56. Rigidly secured to shafts 56 intermediate the ends thereof is a normally lower platform 58, said platform 58 being supported by a web 60 extending laterally from collars 61 secured to shafts 56 and platform 58 to add rigidity to platform 58. Disposed above platform 58 and movable relative thereto is upper platform 62 which is rigidly connected to a pair of sleeves 64 surrounding shafts 56, and movable with respect thereto, there being webs 66 secured to the upper surface of platform 62 and interconnecting the same with sleeves 64. Shafts 56 are interconnected adjacent their uppermost ends by frame members such as 65 and 67 rigidly secured thereto.

Disposed between shafts 56 and spanning the distance between the upper face 54 of member 52 and platform 62 is power means 68 as best seen in FIG. 1. Power means 68 is comprised of an air cylinder 70 and a piston rod 72 reciprocable with cylinder 70 which rod 72 has its outer free end secured to upper platform 62. Lower platform 58 is provided with an opening 74 therein to permit piston rod 72 to reciprocate therethrough and thereby lower upper platform 62 as air is introduced within cylinder 70 above the piston therein. It is to be noted at this point that cylinder 70 is operably coupled to a source of air and suitable actuating mechanism housed in enclosure 48 and is operated automatically according to a predetermined time sequence.

By introducing air into cylinder 70 above the piston therewithin, rod 72 is moved downwardly within said cylinder 70 and will lower upper platform 62 and any parts carried thereby. FIG. 5 illustrates platform 62 in its lowermost position. To raise platform 62 air is removed from above the piston within cylinder 70 and a weight 75 which is carried by a cable 77 trained over a pulley 79 mounted on frame member 65 will serve to raise said platform 62 to its uppermost position as shown in FIG. 1. Stops 76 are carried by shafts 56 above collars 61 to limit the downward movement of platform 62, and to also serve as a spacer between platforms 58 and 62 when the latter is in its lowered position.

Platform 62 carries filler portion 12 by means of a clamp 80 which tightly surrounds a portion of the filler element 82, the lowermost edge of clamp 80 being welded or otherwise suitably secured to a plate 84 which is bolted to platform 62 by means of bolts 85. Mounted atop clamp 80 and secured to the uppermost portion of element 82 by means of setscrew 86 is a head 88 which is provided with a lower hollow section conforming to the cylindrical shape of element 82 and a reduced hollow portion 83 thereabove which provides a shoulder 90 for engaging the uppermost edge of element 82 whereby said element 82 may be seated within and secured to head 88. Head 88 is also provided with a threaded fluid inlet 92 which communicates with the interior of filler element 82 through the reduced hollow portion 83 of the head 88 and through which fluid may pass when a suitable fluid supply is coupled to inlet 92.

Mounted atop head 88 is a tubular spring housing 94 and above the latter is an air cylinder 96. An elongated valve rod 100 extends throughout the length of filler element 82, through head 88 and into housing 94 where it is connected to the lowermost end of a piston rod 93 by coupling 95, there being a spring plate 97 surrounding rod 93 immediately above said coupling 95 and supporting a coil spring 99. Thus it will be seen that when air is introduced into cylinder 96, the same, in acting upon a piston (not shown) secured to the uppermost end of rod 93 will urge rods 93 and 100 upwardly against the action of spring 99 and that valve rod 100 will be maintained in its

raised position so long as air pressure is maintained in cylinder 96.

Filler element 82 is provided at the normally lowermost tapered end thereof with a plurality of apertures 102 through which fluid may issue into a container into which element 82 has been inserted. Element 82 is also provided with a restriction 104 proximal to apertures 102 thereabove to provide a seat for a valve plug 106 which is carried by rod 100, there being an O-ring 105 at said restriction 104 to insure a tight seat for plug 106. As plug 106 engages seat 104, as best seen in FIG. 4, fluid passing into element 82 is prevented from flowing therefrom through apertures 102. However, as rod 100 is raised as abovedescribed so as to remove plug 106 from seat 104, fluid is permitted to flow from element 82 through apertures 102.

Filler element 82 has its lower portion disposed within a collar 108, which collar 108 is tubular in cross section and is slidably carried by an opening 110 in lower platform 58. Collar 108 slidably engages bearing means 112 disposed within opening 110 and is reciprocable with respect to platform 58 between an upper limit determined by a lip 114 of collar 108 engaging the lower face of platform 58 and a lower limit defined by the lower face 116 of intermediate coupling 118 engaging the upper face of platform 58. At the upper end of collar 108 the inner surface thereof is threaded to receive a bearing nut 120 which is mounted within collar 108 at the upper end thereof. Nut 120 is provided with an opening 122 for receiving element 82 in slidably engaging relationship therewith. Element 82 is provided with an annular ring 124 integral therewith and slidable within collar 108 from an upper limit determined by the lower face of nut 120 to a lower limit determined by a shoulder 126 formed within the lower end of collar 108. As upper platform 62 is vertically reciprocated, element 82 is permitted to reciprocate from an upper limit determined by the lower face of nut 120 to a lower limit determined by shoulder 126 of collar 108, and collar 108 is reciprocable relative to lower platform 58 between the limits of lip 114 and face 116 of the coupling 118. To guide collar 108 and insure that the same does not rotate with respect to lower platform 58, a key 128 is provided within opening 110 of platform 58 and integral with the latter, which key 128 seats in a slot 130 formed in collar 108 as best seen in FIG. 9. Slot 130 extends longitudinally of collar 108 between face 116 of coupling 118 and lip 114 of collar 108.

A representative container to be filled and sealed by machine 10 is shown in FIGS. 13 and 14 takes the form of an inner container 132 and an outer container 134, the latter being, for purposes of illustration, a cardboard box and the inner container being a plastic bag having a spout 136 adapted to be utilized as a fluid inlet to container 132. Spout 136 is comprised of a pair of plastic sheets secured together at the side edges thereof and separable at the upper edges thereof whereby to allow access to the interior of inner container 132.

The sides of spout 136 are separated by means of a pair of opposed suction cups 138 disposed below the lower face of collar 108 and carried by a pair of legs 140 pivotal relative to ears 142 which are secured to and depend from lower platform 58. Suction cups 138 are formed by the concave end face of tubular sections 144 which are adapted to be coupled to a source of continuous reduced pressure so that, when spout 136 is inserted between cups 138, the sides of spout 136 are pulled apart and separated to thereby present an inlet through which element 82 may be inserted to within container 132. Legs 140 are biased toward collar 108 by means of spring 146 connected at each of the ends thereof to arms 148 respectively which extend laterally from legs 140. Rollers 150 are rotatably secured to legs 140 intermediate the ends of the latter, and engage the outer camming surface of collar 108. Thus as collar 108 reciprocates vertically with

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respect to platform 58 in predetermined time sequence, legs 140 are swung as rollers 150 mounted thereon engage the outer surface of the lower part of collar 108. In this respect it is to be noted that as collar 108 is moved from its uppermost to its lowermost position, shown in FIG. 5, cups 138 are first moved closer together and then further apart by the camming action of the outer surface of that portion of collar 108 beneath plate 58, whereby to grasp, pull apart and hold apart the sides of spout 136.

To assure that spout 136 is properly positioned as container 134 is conveyed to a point below element 82, a pair of guides 152 are secured to legs 140. Guides 152 have mutually converging marginal edges 156 as best seen in FIG. 7. As spout 136 passes between edges 156, the spout 136 is guided to a point between cups 138 and the sides of spout 136 are separated, due to the reduced pressure at the faces of cups 138, prior to the insertion of element 82 within container 132.

The sealing portion 14 of machine 10 is best seen in FIGS. 10-12 and is provided with an upright supporting stem 158 and a horizontal extension 160, stem 158 being secured to table 18. Horizontal extension 160 houses a pair of electrical heating devices 162 and 164 and a pair of cooling devices 166 and 168, which cooling devices are situated below heating devices 162 and 164. Heating device 164 is movable toward and away from heating device 162, the latter being fixed relative to horizontal extension 160. Heating device 164 is operably coupled to an arm 170 which is swingable about a point 172 and is biased by spring 174 so that heating device 164 is normally biased away from device 162. Operably coupled to arm 170 is push rod 176 which is secured at the other end thereof to a coupling 178 attached to one end of a rod 180, the latter being operable according to the aforementioned predetermined time sequence. When rod 176 is actuated so that arm 170 forces heating device 164 towards heating device 162, heat is applied to the upper edges of spout 136 disposed therebetween to thereby fuse the sides of spout 136 and close the opening therein.

To insure that the material of spout 136 is not overheated so as to cause the spout to lose its shape, cooling devices 166 and 168 are provided and are actuated simultaneously with heating devices 162 and 164. As heating device 164 is actuated so as to move it toward heating device 162, cooling device 168 moves toward cooling device 166 through the movement of link 182 operably coupled to cooling device 168 intermediate the ends thereof. Link 182 is pivotally secured to a crank 184 pivotal about a point 190 being spaced from an ear 192 secured to a wall 194 of extension 160. Cooling device 168 is normally biased away from cooling device 166 by means of a pair of springs 196 connected to device 168 on opposite sides of link 182 and to wall 194. Cooling devices 166 and 168 are provided with a fluid conduit means 198 therein through which cool water is forced from a supply to which pipe 200 leading to the inlets of devices 166 and 168 is connected. The flow of cool water through conduits 198 and the actuation of rod 188 are both controlled according to the aforementioned predetermined time sequence.

The operation of machine 10 is as follows: Containers such as 134 are placed on conveyor system 16 at a point thereon proximal to enclosure 48 and in inclined position with respect thereto as shown in FIG. 5, the top flap thereof normally overlying spout 136 being held in a folded back position by one of a pair of guide plates 202. The conveyor system 16 is then actuated so that the containers 134 are advanced towards the filler portion 12. The chain 24 alternately starts and stops due to intermittent actuation of clutch 39 so that the containers 134 are advanced according to a predetermined time sequence.

When a container 134 advances so that it is situated below filler portion 12, the conveyor system 16 is automatically halted, and to insure that the container 134 does not overshoot the desired point below element 82

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electric brake 36 is employed which immediately stops rotation of shaft 32 upon disengagement of clutch 39 through operation of a switch actuated when the conveyor reaches a predetermined position. Simultaneously with stopping the conveyor, a switch is actuated by the conveyor to allow air to be supplied to cylinder 70 above the piston therein so that piston rod 72 is lowered therewithin to lower upper platform 62 and thereby filler element 82. Concurrently with this operation, cups 138 which have a continuous suction at the faces thereof engage the sides of spout 136 and as platform 62 is lowered the camming action of the outer surface of collar 108, as it moves downwardly as a result of the movement of platform 62, pulls the sides of spout 136 apart to allow filler element to pass therethrough and into the interior of container 132 as platform 62 continues its downward movement.

As platform 62 reaches its lowermost position, a pin 204 carried thereby actuates a switch 206 mounted on platform 58 (see FIG. 1) which actuation allows air to enter cylinder 96 and thus raise valve rod 100 from its closed, seated position. As rod 100 is raised, fluid which is continuously supplied to the interior of element 82 is allowed to pass therefrom through aperture 102 and into inner container 136. After a predetermined filling time has elapsed means are actuated to remove the air from cylinder 96 and allow spring 99 to urge valve rod 100 to its closed position, this being accomplished while element 82 is lowered to substantially its fullest extent into container 136. Once the valve is closed, a switch is actuated to allow the air above the piston within cylinder 70 to be removed and weight 75 acts upon platform 62 to raise the same. As platform 62 is raised, element 82 is likewise raised and withdrawn from container 132. Element 82 will be raised until annular ring 124 thereon contacts the lower face of nut 120. Thereupon both element 82 and collar 108 will be further raised until lip 114 contacts the underside of lower platform 58. The filler element 82 then is in its uppermost position, which position is shown in FIG. 4.

To assure that element 82, after having been inserted within container 132, is not exposed to corrosion as a result of being in contact with the liquid within the container, a suction means is employed to withdraw the excess fluid remaining on the outer surface of element 82 after it has been retracted from container 132. This is accomplished by means of a suction pump 208 operably coupled to collar 108 at drain 210 as best seen in FIG. 8. As element 82 moves within collar 108 and past drain 210, suction pump 208 which is continuously operating removes all excess fluid from element 82 and deposits the same in a suitable receptacle 212. In this manner element 82 is kept clean and free from the harmful effects of corrosion due to the type of fluid such as acid or the like being put into container 132.

When the filler element 82 is in its uppermost position of fully retracted and as platform 62 arrives at its uppermost position, conveyor system 16 is again actuated to advance the filled container 132 towards the sealer portion 14 until the container 132 is directly aligned beneath sealing portion 14 so that spout 136 is disposed between heating devices 162 and 164. As the filled container is advanced to a point beneath sealing portion 14, an empty container is simultaneously advanced to a point directly beneath filler element 82 so that, as the filled container is being sealed, an empty container is being filled.

As soon as the conveyor system has halted so that filled container 132 is situated beneath sealing portion 14 and the spout 136 is between heating elements 162 and 164, rod 176 is automatically actuated so that arm 170 forces heating device 164 towards heating device 162 to contact the sides of spout 136 and to press the same together to thereby close the opening therebetween. Heat is then applied to devices 162 and 164 and the ends of spout 136 are fused together to seal the opening. Concurrently with this operation, rod 188 has been actuated to swing crank

184 so that cooling device 168 is moved toward cooling device 166. These cooling devices contact the sides of spout 136 and provide cooling surfaces in engagement therewith by virtue of the cold water flowing through cooling devices 166 and 168. After a predetermined time interval, rods 176 and 188 are actuated so that heating device 164 and cooling device 168 move away from their respective counterparts so that spout 136, now sealed, is free to move from between the heating and cooling devices.

Following the sealing of spout 136 of a container 132 and the filling operation of a succeeding container, conveyor system 16 is again actuated to advance the sealed container to a point at which the top flaps thereof are released by guide plates 202 which terminate just beyond the sealing portion 114. After their release the top flaps of outer container 134 are sprayed with an adhesive by suitable spraying structure 214 actuated by the movement of the container 134 thereby. One of the top flaps is then moved to a closed position by the action of elongated bar 216 thereupon, which bar 216 engages the one flap and closes it as the container is moved with respect to bar 216 by chain 24. The opposite top flap of the outer container 134 is brought into engagement with a driven belt 218 which is mounted above and spaced from conveying portion 16. Belt 218 is driven by a flexible shaft 220 which is coupled to shaft 32 through chain and sprocket assembly 224. Thus belt 218 moves at the same speed as conveyor portion 16 and is adjusted to exert a continuous closing and sealing pressure upon the one flap of container 134 which it engages. Following the closing and sealing of the top flaps of container 134 as above-described, the filled and closed container is removed from machine 10 while the filling and sealing operations are continued on succeeding containers, all as hereinabove described.

Having thus described the invention what is claimed as new and desired to be secured by Letters Patent is:

1. In combination with a conveyor system for horizontally advancing a plurality of plastic containers provided with spouts, a machine for filling and sealing said containers comprising a support; a pair of spaced, vertical shafts mounted on said support and extending upwardly from said conveyor system; a horizontal platform secured to said shafts and extending laterally therefrom, said platform having an opening therein overlying said conveyor system; a filler element operably coupled to said shafts for vertical reciprocation through said opening, said element being provided with a fluid inlet and outlet; valve means for controlling the flow of fluid from said element; means operably coupled with said element for vertically reciprocating the latter; a collar carried within said opening in the platform in surrounding relationship to the filler element; and means carried by said platform and engageable with said collar for separating the sides of the spouts of a container positioned therebelow as the element is reciprocated, said element adapted to be lowered into the container through the spout thereof whereby to fill the later with fluid and to be raised therefrom after a predetermined filling time has elapsed.

2. In combination with a conveyor system for horizontally advancing a plurality of plastic containers provided with spouts, a machine for filling and sealing said containers comprising a support; a pair of spaced, vertical shafts mounted on said support and extending upwardly from said conveyor system; a pair of vertically spaced, horizontal platforms secured to said shafts and extending laterally therefrom, said platforms each having an opening therein, said openings being vertically aligned and overlying said conveyor system, the uppermost of said platforms being shiftable relative to said shafts; a hollow

filler element secured to said upper platform at the opening thereof and vertically shiftable therewith; a collar carried within the opening in the lower platform, the element being slidably disposed within said collar, said element being provided with a fluid inlet proximal to its normally uppermost end and a fluid outlet at the lowermost end thereof; valve means associated with said element for controlling the flow of fluid therefrom; power means operably coupled with said uppermost platform for vertically shifting the latter; means carried by the lower platform and engageable with said collar for separating the sides of the spout of a container positioned therebelow as the element is reciprocated, said element adapted to be lowered into the container whereby to fill the latter with fluid and to be raised therefrom after a predetermined filling time has elapsed; and sealing means mounted on said support for sealing the spout of a filled container.

3. The invention as set forth in claim 2 wherein said valve means is carried within the filler element.

4. The invention as set forth in claim 3, wherein said valve means includes a rod reciprocably mounted within said element and a plug secured to one end of said rod for closing said fluid outlet as said rod moves downwardly and for opening said fluid outlet as said rod moves upwardly.

5. The invention as set forth in claim 2, wherein said power means includes an air cylinder secured to said support and having a piston rod slidably mounted therein, said piston rod being operably coupled to said upper platform and adapted to reciprocate the latter in response to pressurized air entering or leaving said cylinder.

6. The invention as set forth in claim 5, wherein said cylinder is mounted uprightly on said support between said shafts.

7. The invention as set forth in claim 2 said collar being slidably mounted within the opening of the lower platform and provided with an upper and a lower stop, said element having an annular ring secured thereto and adapted to engage said stops as said element reciprocates.

8. The invention as set forth in claim 2, wherein said means for separating the sides of the spout include a pair of opposed suction cups adapted to be operably coupled to a source of reduced pressure.

9. The invention as set forth in claim 8 wherein each of said suction cups is comprised of a horizontally disposed tubular section having a resilient, concave surface at the end thereof adjacent said element, said surface being adapted to engage the sides of the spout of an underlying container.

10. The invention as set forth in claim 9, wherein each of said sections are coupled to a leg pivotally mounted on said lower platform and depending therefrom, said legs being biased toward said element and provided with rollers intermediate the ends thereof for engaging said collar as the latter slidably moves relative to said lower platform.

11. The invention as set forth in claim 10, wherein each of said legs is provided with a guide for directing the spout of an underlying container between said sections.

12. The invention as set forth in claim 11, wherein said guides are provided with mutually converging marginal edges.

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