United States Patent [19]

Roberts

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[45] **Dec. 31, 1974**

[54] **PISTON PRODUCT FILLER**

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[73] Assignee: **The Kartridge Pak Co.,** Davenport, Iowa

[22] Filed: **Aug. 27, 1973**

[21] Appl. No.: **391,822**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 209,813, Dec. 20, 1971, abandoned.

[52] **U.S. Cl.** **141/275,** 141/286, 141/351, 222/384

[51] **Int. Cl.** **B65b 3/32,** B67c 3/26

[58] **Field of Search** 141/18, 20, 140, 148, 172, 141/234, 238, 242, 263, 275–278, 281, 286, 291, 294, 346, 347, 351–354, 387, 392; 222/309, 384; 417/511, 513

[56] **References Cited**

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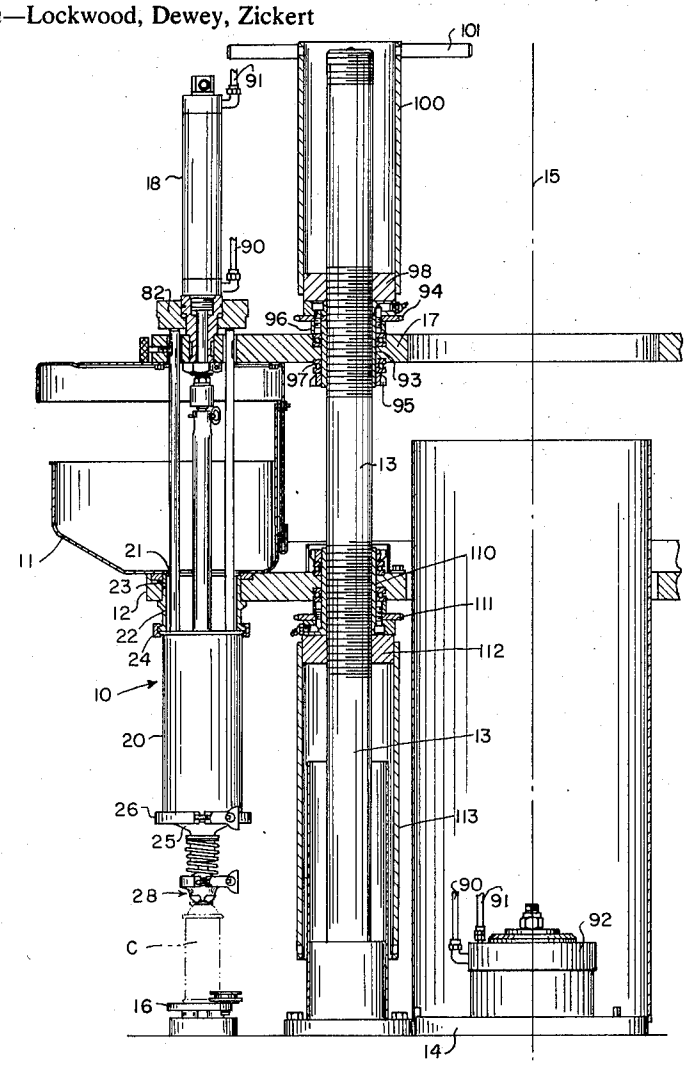
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Primary Examiner—Houston S. Bell, Jr.
Assistant Examiner—Frederick R. Schmidt
Attorney, Agent, or Firm—Lockwood, Dewey, Zickert & Alex

[57] **ABSTRACT**

An apparatus for filling containers with a volumetrically metered amount of liquid which apparatus comprises a series of filling heads each supported on a turret and each filling head including a depending metering cylinder in which there is a hollow piston member movable between an adjustable stop and the bottom of the cylinder with an associated top valve member operated by a superposed air cylinder to close on the piston member and isolate a filling charge. Each filling head is supplied with liquid either directly from an elevated supply tank mounted on the turret or from a stationary supply through a rotary connection. Each metering cylinder has a hollow nozzle in the bottom thereof with an associated poppet valve which opens when the nozzle is actuated by upward pressure of a container to permit discharge of a metered amount of liquid. The metering valve member is lowered initially a sufficient distance to close on the top end of the piston and subsequently to drive the piston down and force liquid isolated below the piston through the nozzle and into the container.

23 Claims, 10 Drawing Figures



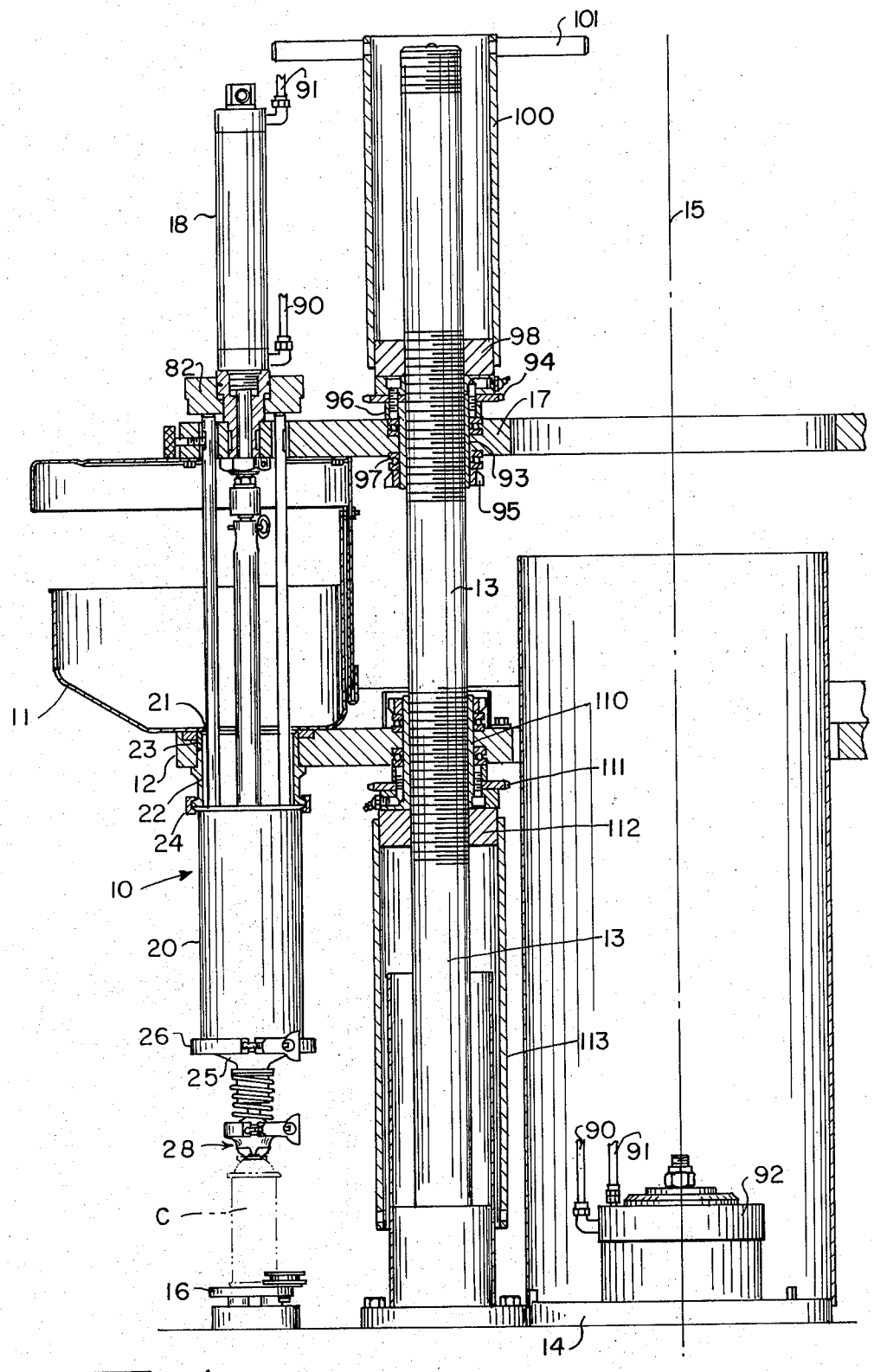

101
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113
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C
16
14

FIG. 1

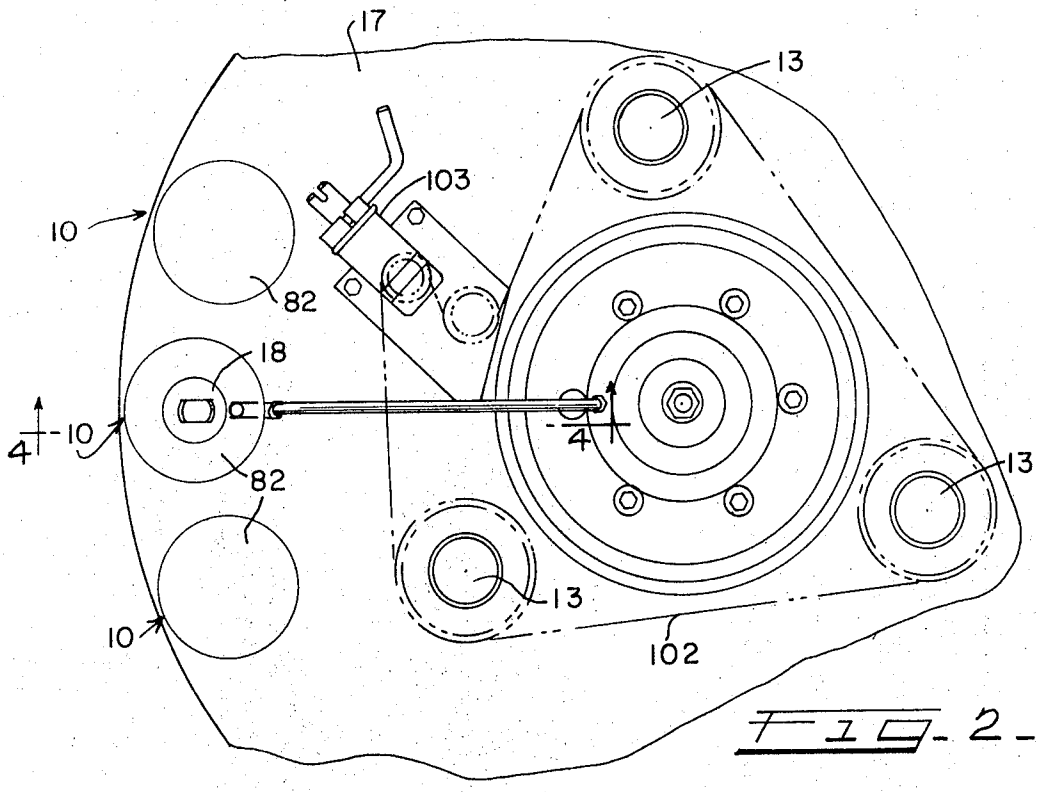


FIG. 2

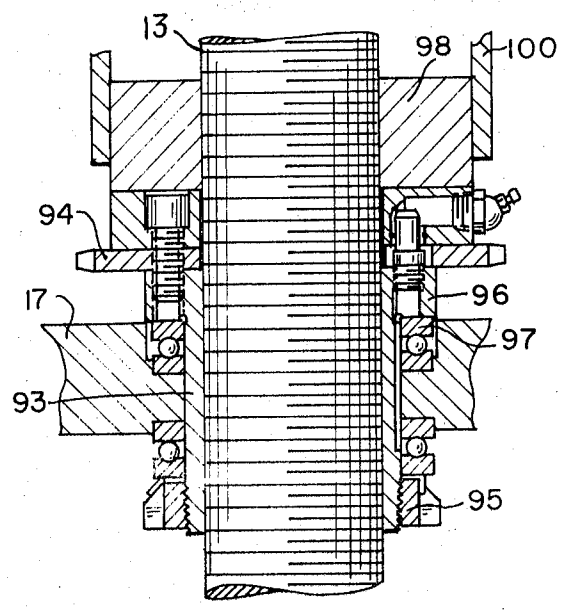


FIG. 3

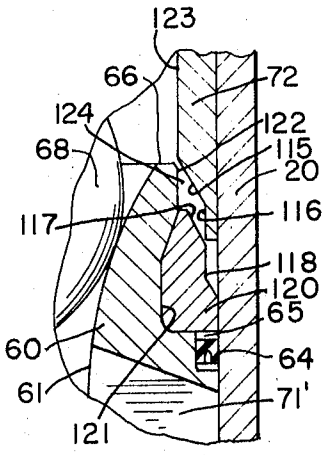
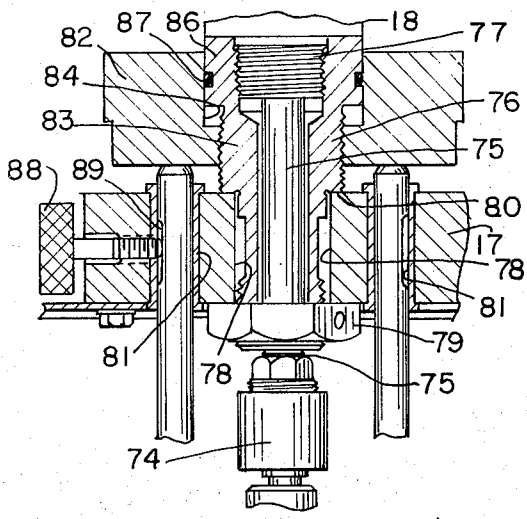


FIG. 5



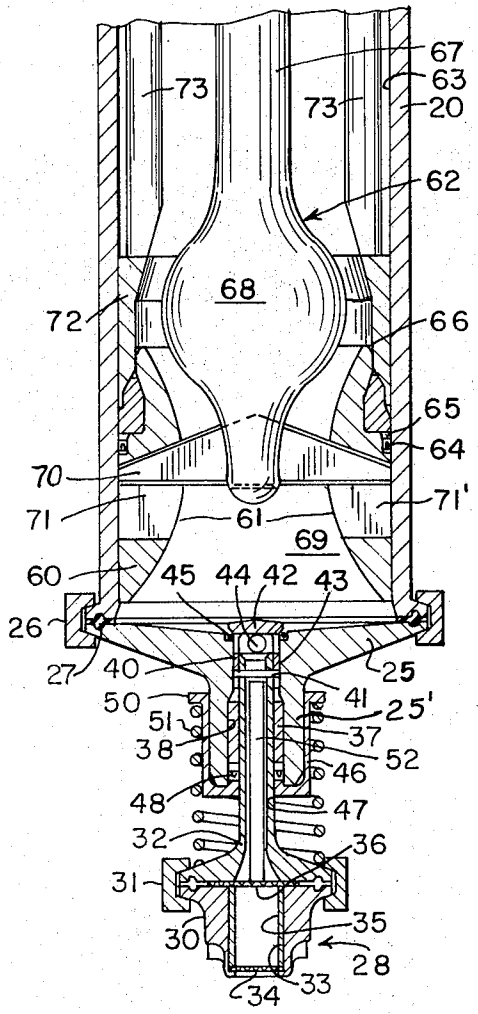


FIG. 4

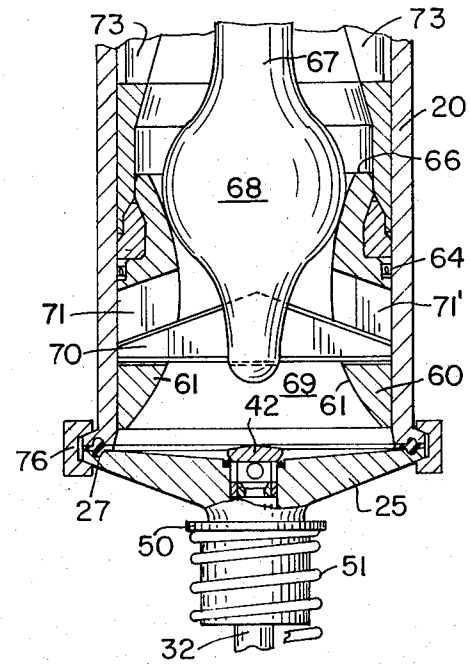


FIG. 6

FIG. 7

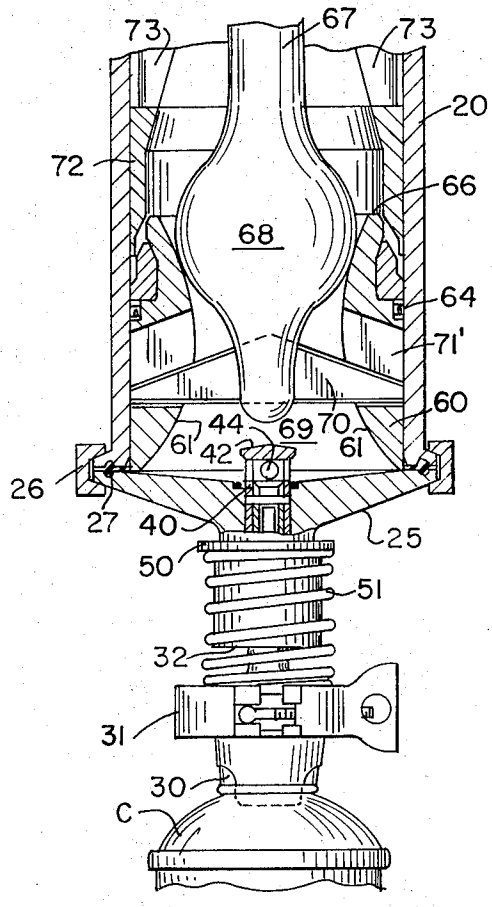


FIG. 8

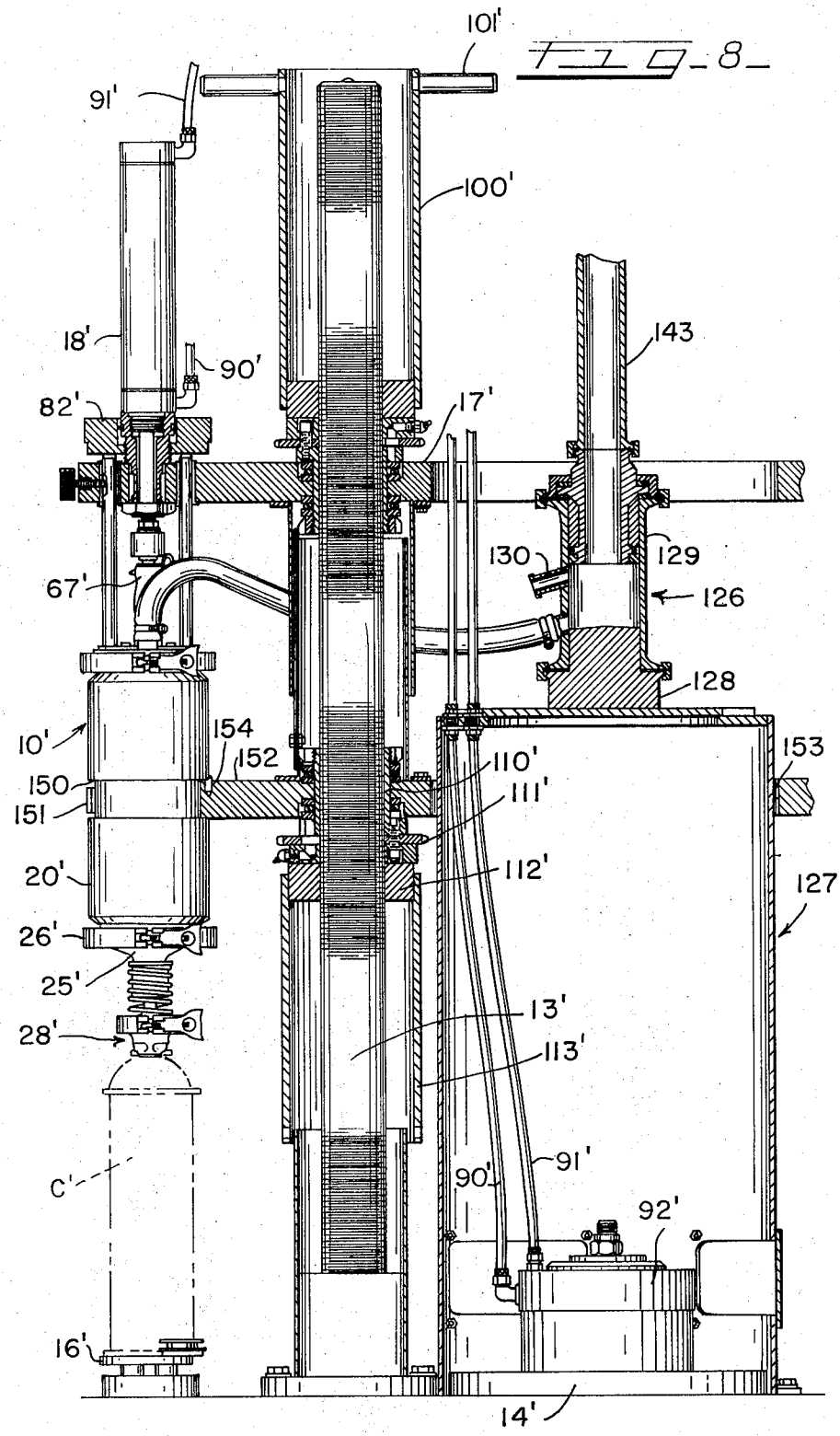

101'
91'
100'
18'
90'
143
82'
17'
130
129
67'
126
128
10'
154
152
153
110'
150
111'
151
112'
20'
127
26'
25'
13'
28'
113'
C'
91'
90'
92'
16'
14'

FIG. 9

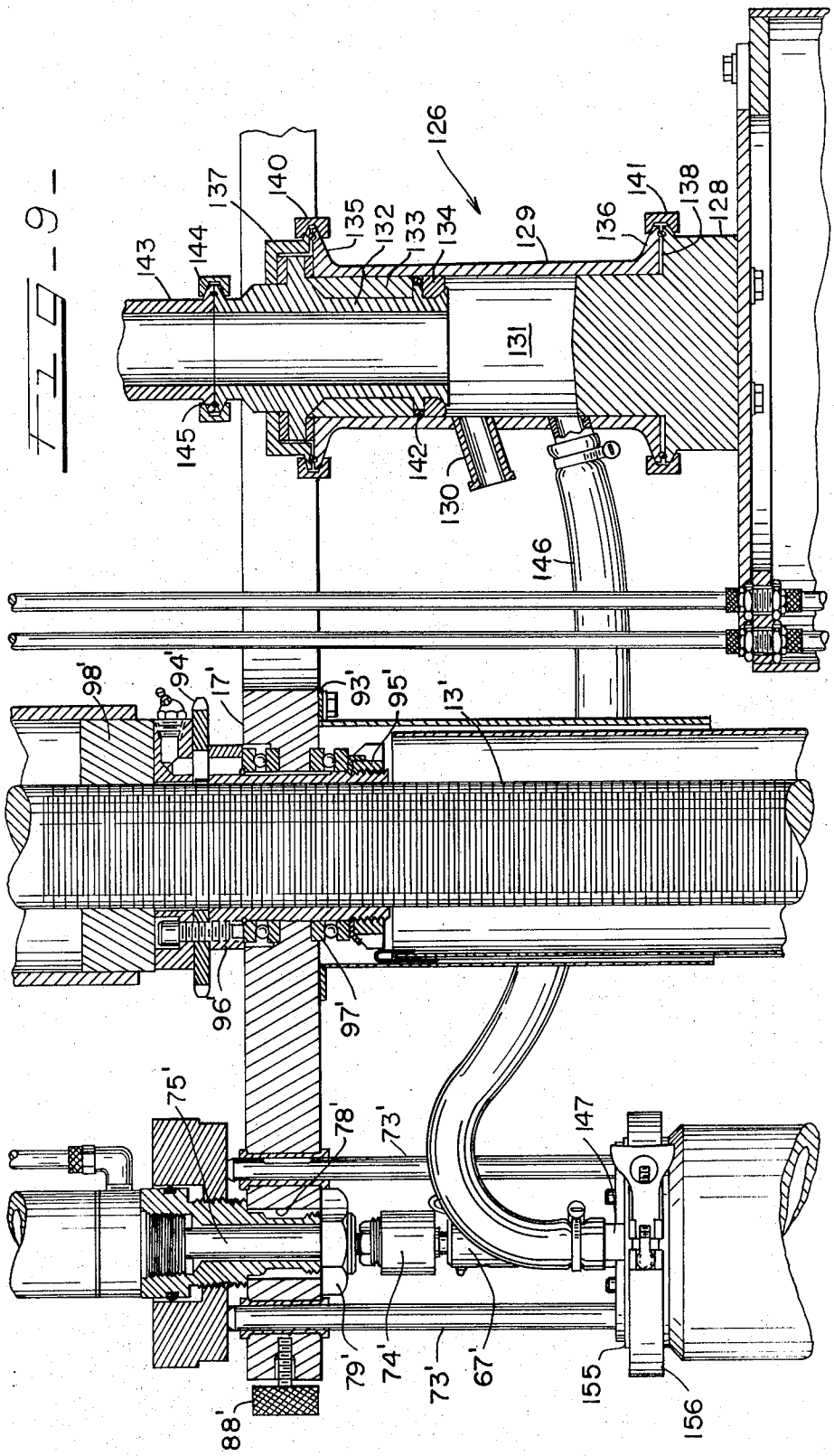
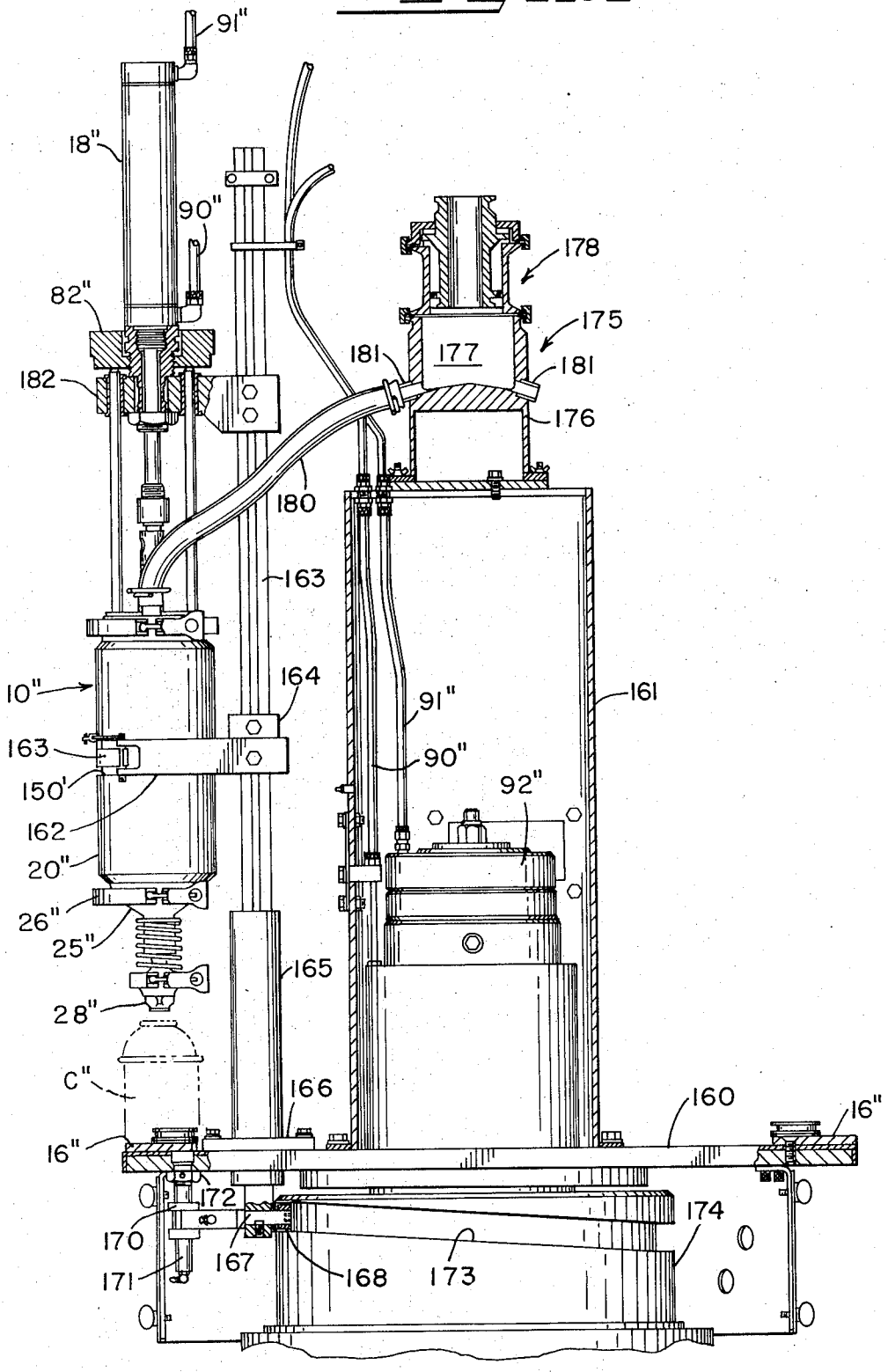

126
137
140
135
132
133
134
129
136
141
138
128
143
144
131
145
142
130
146
98'
94'
17'
93'
95'
13'
96'
97'
75'
78'
73'
147
79'
74'
73'
67'
155
156
88'

FIG. 10


91"
18"
90"
82"
182
178
175
177
181
181
176
180
163
164
10"
163
150'
162
20"
26"
25"
28"
C"
16"
91"
90"
92"
161
165
166
160
16"
172
170
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167
168
173
174

PISTON PRODUCT FILLER

This application is a continuation-in-part of my prior application Ser. No. 209,813 filed Dec. 20, 1971, now abandoned.

This invention relates to container filling apparatus and is more particularly concerned with improvements in apparatus for filling metered amounts of a liquid into the tops of containers.

Various types of filling apparatus have been designed for delivering predetermined amounts of liquid products from a supply tank into a series of jars, cans or other receptacles. The use of such apparatus is essential for successful commercial filling operations in order to obtain high volume production. Typical of prior designs are the machines disclosed in Brinkley et al. U.S. Pat. No. 3,316,945 and Rosseau U.S. Pat. No. 3,176,727, the former employing a turret mounted, rotatable supply tank with reciprocating metering cylinders operating in the bottom apertures in the tank and the latter employing a pressure filler head with a metering cylinder having a piston and nozzle arrangement with an associated valve operated in response to container movement. These prior machines have been successfully employed for filling aerosol-type cans with liquid products. However, experience with these and other filling machines and apparatus has indicated that improvements can be made to increase the efficiency and reliability of the apparatus. It is the purpose of the present invention to provide a filling apparatus of this general type which has improved features and which has increased reliability and greater efficiency in operation.

It is a more particular object of the invention to provide a filling apparatus for containers which employs a filling head in which a charge of liquid is isolated and subsequently discharged into a container with a high degree of volumetric accuracy.

A further object of the invention is to provide an apparatus for filling containers with fluid material which includes a volmetric metering head with a container operated nozzle wherein there is employed a hollow piston operating in a metering cylinder which is connected to a source of supply such as a supply tank or distributor manifold and wherein a filling valve associated with the piston is operated to first isolate a quantity of the fluid below the piston and thereafter advance the piston to discharge a predetermined amount of the fluid through the nozzle and into a container.

Another object of the invention is to provide an apparatus for filling container with liquid material wherein an open top volumetric metering head is mounted in the bottom of a supply tank which includes a piston mounted in a metering cylinder with valve means for isolating a quantity of the fluid below the piston and means for adjusting the stroke of the piston and associated elements so as to vary the quantity of the fluid and having a container operated nozzle and valve arrangement in the bottom of the cylinder through which a predetermined volume of the liquid is discharged into a container.

Still another object of the invention is to provide an apparatus for filling a container with a fluid material which comprises a volumetric metering cylinder mounted in the bottom of a supply tank or connected to a source of supply, with a piston therein and associated means for isolating a quantity of the fluid below the piston so as to effect the filling of the container and

with a nozzle which includes an anti-drip feature and which also includes means to prevent any air from being drawn into the area below the piston, due to suction, when the container is separated from the nozzle after the filling operation is completed.

A further object of the invention is to provide a filling apparatus of the type described which includes a metering cylinder having a container-engaging hollow nozzle at the bottom end, with the latter having a pair of vertically spaced screens which are adapted to block the passage of air into the bottom of the metering cylinder when the filling is completed and the filled container is withdrawn from the nozzle.

A still further object of the invention is to provide an apparatus for filling containers with a liquid product wherein a volumetric metering cylinder with a hollow piston and associated means for isolating a quantity of liquid below the piston and subsequently forcing a predetermined amount of the isolated liquid through a nozzle and into a container and wherein the cylinder is provided with an adjustably mounted stop ring for varying the position of the piston when it is retracted after a filling operation and said stop ring and piston being constructed so that a small amount of liquid is trapped between the stop ring and the piston when the piston is retracted thereby creating a dash pot effect.

These and other objects and advantages of the invention will be apparent from a consideration of the container filling apparatus which is shown by way of illustration in the accompanying drawings wherein:

FIG. **1** is an elevational view with portions broken away or omitted which shows one embodiment of the invention having a turret mounted filling head embodying the principal features of the invention;

FIG. **2** is a partial plan view of the apparatus shown in FIG. **1**;

FIG. **3** is a fragmentary view showing the arrangement for adjusting the filling heads of FIGS. **1** and **2** on the supporting turret;

FIG. **4** is a sectional view taken on line **4**—**4** of FIG. **2** with portions broken away and with the filling valve apparatus shown in the open position;

FIG. **5** is a fragmentary view, to an enlarged scale, showing a portion of the apparatus in FIG. **4**;

FIG. **6** is a view illustrating the intermediate filling valve position;

FIG. **7** is a view illustrating the position of the filling valve at the completion of fill;

FIG. **8** is an elevational view with portions broken away or omitted of another embodiment of the invention;

FIG. **9** is a fragmentary view on enlarged scale of a portion of FIG. **8**; and

FIG. **10** is an elevational view with parts broken away or omitted of still another embodiment of the invention.

Referring to FIGS. **1** and **2** of the drawings, there is illustrated a portion of a rotary or turret-type filling machine which has a plurality of filling head assemblies **10** and associated mechanisms and which incorporates the principal features of the invention. The head assemblies **10** are mounted in circumferentially spaced relation in a liquid product supply tank **11** which, in the illustrated machine, is in the form of a doughnut with an upwardly opening side. The annular or doughnut-shaped supply tank **11** is mounted on a support plate **12** which is in turn carried on a plurality of upstanding

jackscrews 13. The jackscrews 13, which are three in number, in the form of the machine shown, are upstanding from a base plate 14 which is mounted for rotation about the vertical axis of the machine, the latter being indicated at 15. The base plate 14 carries a series of elevatable platforms 16, each aligned beneath a filling head assembly 10 and adapted to support a container C during the filling operation. In addition to the support plate 12 for the supply tank 11, the jackscrews 13 support a circular plate 17 in adjustable relation above the plate 12 on which are mounted air cylinders 18, each in vertical alignment above a metering cylinder 20. Each metering cylinder 20 and its associated air cylinder 18 constitutes part of a filling head assembly 10.

Each of the metering cylinders 20 depends from an aperture 21 in the bottom of the fluid supply tank 11 (FIG. 1) and is attached thereto by a cylindrical coupling 22, of relatively short length, which extends through an aperture 23 in the tank support plate 12. Each coupling 22 has a bottom rim, and a top rim of the metering cylinder 20 is detachably connected thereto by a suitable clamp ring 24 with a suitable sealing gasket (not shown). The coupling 22 provides a connection between the open top of the metering cylinder 20 and the product supply tank 11 for downward flow of liquid into the metering cylinder 20. The bottom end of the metering cylinder 20 is closed by a bell cap 25 (FIGS. 1 and 4) which is detachably connected to the flanged bottom edge of the cylinder 20 by a clamp ring 26 with a suitable sealing gasket 27. An identical sealing gasket may be employed to seal the top of the metering cylinder and coupling 22. The bell cap 25 has a depending stem portion 25' which supports a nozzle assembly 28 in depending relation therefrom.

The nozzle assembly 28 comprises a lower discharge member on container engaging mouthpiece 30 (FIGS. 1 and 4) which has an external flange at the top for mounting, by means of a clamp ring 31, on the lower end of a stem formation 32. The lower nozzle member 30 has a bore 33 with an internal flange at the lower end on which there is seated a lower screen member 34. A screen cylinder 35 fits in the bore 33 and an upper screen 36 is clamped between the flanged connecting portions of the lower and upper nozzle members 30 and 32. The upper hollow nozzle stem portion 32 has its upper end slidably mounted in a bearing sleeve 37 which is seated in the bore 38 in the bell cap 25. At its upper end there is attached to the nozzle stem portion 32, a poppet valve 40 by means of a cross pin 41. The valve 40 has a top cap 42, or larger diameter than the diameter of the upper portion of the bore 38, and a depending cylindrical body 43 which has peripheral ports 44 opening into the lower end of the metering cylinder 20 when the stem member 32 is raised a sufficient distance to bring the ports 44 above the top surface of the bell cap 25. An O-ring 45 seals the valve when the cap 42 is in the closed position, as shown in FIG. 4.

a cylindrical cap 46 is mounted on the bottom of the bell member 25 with a center opening 47 for receiving the nozzle stem member 32 and a suitable seal 48 is provided at the bottom end of the bore 38. An external flange 50 at the upper end of the cap 46 provides a seat for a compression spring 51 which has its lower end seated on the bottom of the nozzle stem portion 32 which is enlarged in diameter. The spring 51 normally holds the nozzle mouth portion 30 in the downward position with the poppet valve 40 closed. Upward pressure on the nozzle mouth portion 30 when a container C is raised against the same, will, of course, contract the spring 51 and open the poppet valve 40 so as to provide a passageway for discharge of fluid from the metering cylinder 20 through the poppet valve 40 and the nozzle screens 34 and 36 for discharge into the container. A flow restrictor, indicated at 52, may be placed in the bore of the nozzle stem portion 32 with its lower end resting on the upper screen 36. The flow restrictor 52 would be desirable with some types of liquid material and when a slow fill is desired.

A piston member (FIG. 4) in the form of a hollow cylindrical section 60 is mounted for sliding movement within the metering cylinder 20. The piston 60 has an inwardly bowed, inner wall 61 providing a center opening with an hourglass-like inner wall shape or surface configuration for co-operation with a bulbous valve member 62. The outer cylindrical surface of piston member 60 engages the inner wall 63 of the metering cylinder 20 and is sealed thereto by a seal member 64 in the bottom of a peripheral recess 65 which is spaced below the top edge 66. The associated fill valve member 62 has an upstanding stem portion or section 67 and a bulbous bottom portion or section 68 with the latter having a miximum cross sectional diameter greater than the minimum cross sectional diameter of the inwardly bowed inner wall 61 of the piston 60 near the top thereof, so that, when the bulbous portion 68 of the valve member 62 is lowered into engagement with the piston 60 it closes the center opening in the piston and isolates the liquid which is trapped in the area 69 below the lower end of the valve head 68. A cross pin 70 is fixed in the bottom end of the valve head 68 and extends normal to the vertical axis with its ends extending in slidable relation in oppositely disposed vertical slots 71, 71' in the wall of the piston 60. A stop ring 72 is slidably mounted in the cylinder 20 above the piston 60 and carried on depending vertical rods 73. The stem 67 of the valve member 62 is connected by a lineal alignment coupler 74 to the lower end of a piston 75 extending from the air cylinder 18.

The air cylinder 18 is mounted on the plate 17 by means of an adapter stud 76 (FIG. 4). The adapter stud 76 is threadably connected to the nose 77 of the air cylinder 18 and clamped in an opening 78 in the plate 17 by means of the nut 79 and the shoulder 80 on the stud 76. The cylinder rod 75 extends through the adaptor stud 76 and is connected by the coupler 74 to the valve stem or pin 67. The rods 73 extend in slidable relation through sleeves 81 mounted in apertures in the frame plate 17 and their upper ends engage the bottom face of a fine adjustment nut 82 which is threaded on an enlarged portion 83 of the adaptor stud 76 and recessed at 84 to accommodate the top portion 86 of the stud 76, with a suitable friction drag O-ring 87, so as to permit a limited movement of the cylinder rod 75 in the axial direction. A thumb screw 88 is threaded in a suitable aperture in the outer face of the frame plate 17 with its end engaging in an axial groove 89 in the ring support rod 73 to prevent the rod 73 from following the piston 60 down when it is lowered. The downward travel of the piston 60 is limited by the bottom edge of the piston seating on the top surface of the cap 25.

The air cylinder **18** is connected by conduits **90, 91** with an air supply through a manifold **92** mounted on the bottom support **14.**

The support plate **17** for the cylinders **18** is carried on the jackscrews **13** by an internally threaded sleeve member **93** which has mounted on its upper end a sprocket **94.** A nut **95** on the lower externally threaded end of the sleeve **93** co-operates with a shoulder forming collar **96** in clamping the sleeve to a thrust bearing assembly **97** mounted in the frame plate **17.** A jamb nut **98** carried on the lower end of a cylindrical member **100** is turned manually by handles **101** to take up any play in the assembly. The sprockets **94** on the jackscrews **13** are interconnected by a chain **102** with a manually operated device **103** for adjusting the height of the support sleeves **93** simultaneously so as to raise or lower the frame plate **17** relative to the tank support plate **12,** in adjusting the position of the stop rings **72** for varying the amount of fill in accordance with the size of the container being filled. Fine adjustment of the individual stop rings in the head assemblies **10** is accomplished through the operation of the fine adjustment nut **82.**

The support plate **12** for the fluid supply tank **11** is mounted on the jackscrews **13** in the same manner as the cylinder support plate **17** with the same type of mounting sleeves or adaptors indicated at **110** and carrying sprockets **111** which are interconnected with an adjusting chain (not shown). The assembly includes a jamb nut **112** and depending operating sleeve **113** for turning the same for the same purpose as the jamb nut **98** in the upper assembly.

Each stop ring **72** is cut away on the inside at the bottom margin to provide an upwardly and inwardly tapered inner wall section **115** (FIG. **5**) and a marginal vertical wall section **116** which are adapted to cooperate with a vertical, upwardly and inwardly tapering outer wall section **117** and associated vertical wall section **118** on a ring member **120** which is seated in an external recess **121** adjacent the top outer wall margin on the piston **60.** An external or outer marginal wall section **122** at the top of the piston **60** is adapted to engage in sliding relation with the inner wall **123** of the stop ring **72.** These wall surfaces are located in the axial direction of the members so that when the piston **60** is retracted and approaches the end of its upward movement a small amount of liquid is trapped in the pocket **124** (FIG. **5**) formed between the ring member **120** and the stop ring surfaces **115, 116** where it is squeezed as the pocket area is reduced in size and forced through a narrowing opening so as to provide a dashpot-effect, thereby slowing down the travel of the piston **60** before its movement is positively stopped by contact of surfaces **115** and **117.**

In the operation of the apparatus the supply of liquid product is maintained at a suitable level in the tank **11** and the height of the stop ring **72** in each head assembly **20** is adjusted for the proper volume of fill following adjustment of the plate **12** so as to position the head assembly **20** at the proper height for the height of the containers C which are to be filled. The stop ring **72** is adjusted, of course, by raising or lowering the plate **17** relative to the plate **12** with any necessary further adjustment made by operation of the fine adjustment nut **82.** The valve assembly **62** and piston **60** are normally in the open position shown in FIG. **4** with the area **69** below the piston filled with liquid from the tank **11.** The cylinder **18** is first actuated to close the valve head **68** on the bowed inner wall **61** of the piston (FIG. **6**) which closes the valve and isolates a measured amount of liquid in the area or space below the piston. The container C is raised which opens the poppet valve **40.** The valve head **68** is lowered further by operation of cylinder **18** which drives the piston **60** down until it seats on the top of cap **25** and forces a measured charge of the liquid into the container C. At the end of the discharge stroke the container C is lowered and disengaged while the valve head **68** is raised, carrying the piston **60** with it through the lost motion connection provided by cross pin **70** and slots **71, 71'** which permits liquid to flow into the hollow piston **60** to replace the discharged liquid. The cycle is repeated for filling subsequent containers.

The container actuated poppet valve **40** allows passage of the metered fill only when a container is present. The upper nozzle screen **36** encourages laminar flow and keeps suck back air near the outlet of the nozzle. The lower nozzle screen reinforces the surface tension of the product allowing atmospheric pressure to retain excess product in the nozzle and virtually eliminates dripping while negative poppet valve displacement as the container leaves the nozzle sucks back clinging droplets.

In FIGS. **8** and **9** a modification is shown wherein the filling heads **10'** receive their supply of liquid product from a distributor **126** mounted on the top of a center pedestal **127** of the filling machine instead of being mounted underneath and supplied from a supply tank **11** (FIG. **1**). Except for having a different source of supply the embodiment of FIGS. **8** and **9** corresponds to that of FIGS. **1–7.**

The distributor or manifold **126** comprises a hub **128** bolted to the center pedestal **127** with a sleeve fitting **129** mounted thereon. The rotatable fitting **129** has a plurality of nipple outlet connections **130—130** extending laterally therefrom. Disposed within the upper portion of the rotary sleeve **129** so as to leave a chamber **131** above the hub **128** is a stationary assembly comprising an inner sleeve fitting **132,** an outer sleeve fitting **133** and a bottom ring **134.**

The rotary sleeve fitting **129** has upper and lower flanges **135** and **136,** respectively, with suitable gaskets being interposed between the top and bottom surfaces of the flanges **135** and **136,** respectively, and a cap fitting **137** and a shoulder surface **138,** respectively. Upper and lower ring clamps **140** and **141,** respectively, secure the components of the distributor assembly **126** together in fluid tight relationship with assistance of an O-ring seal **142** between ring **134** and the sleeve **133.**

Liquid product is delivered to the distributor **126** through a pipe **143** from a suitable source of supply (not shown) to the upper end of the stationary inner sleeve **132** to which the end of pipe **143** is secured by means of a clamp **144** with a gasket **145** between the mating ends. It will be seen that the incoming liquid flows downwardly through the stationary fitting **132** into the space or chamber **131** from which it is distributed through the nipples **130** which serve as outlet connections. There is a length of flexible tubing **146** interconnecting each nipple **130** with one of the filling heads **10'.** Each hose or conduit **146** is clamped at one end over one of the nipples **130** while the opposite end

is clamped to an inlet nipple **147** on each filling head.

The construction and operation of each of the filling heads **10'** and its associated operating parts both external and internal, are the same as for the product filling heads **10** shown and described above in connection with FIGS. **1–7.** Accordingly, corresponding parts and components have been given primed reference numerals in FIGS. **8** and **9** and the construction and operation of the filling heads **10'** will not be described.

The metering cylinder **20'** of each filling head **10'** is provided with a circumferential groove **150** in the midportion so as to receive therein clamp **151** securing it to an elevated rotatably mounted support **152** having a central opening **153** so as to fit over the upper end of the pedestal **127.** In order to prevent each clamped metering cylinder **20'** from turning slightly over a period of useage a lock pin **154** is provided for each with its upper end fitting in a recess in the side wall of the metering cylinder **20'** and its lower end fitting in a recess in the support **152.**

Each of the metering cylinders **20'** is provided with a closure cap or cover **155** which supports an off-center nipple **147.** A clamp **156** secures each of the closure caps or covers **155** in fluid tight relationship to the upper end of a metering cylinder **20'.** It will be understood that each of the nipples **147** is located off-center and adjacent the outer margin of each cover **155** so as not to interfere with the vertical reciprocation through an accommodating center opening in each cap or cover **155** of the stem **67'** extending upwardly from each of the valve heads within the metering cylinders **20'** corresponding to the valve heads **68** in the metering cylinders **20.**

It will be appreciated from the foregoing that the product filling heads **10'** operate in the same manner as do the filling heads **10** which were described above in connection with FIGS. **1–7,** the only difference between the two embodiments being that the liquid product to each filling head **10'** is supplied through one of the connections **146** from the distributor **126** rather than directly from the supply tank **11.**

In FIG. **10** a modification is shown wherein filling heads **10''** are supported on vertically reciprocating rods mounted on a rotating table or platform **160.** Depending upon the size of the machine and the needs of the user provision can be made for a single filling head **10''** or a plurality thereof, e.g. 12. For each filling head **10''** there will be a stationary container support **16''** in registry therewith. A center pedestal **161** is mounted on the support plate **160** and houses therein a compressed air manifold **92''** from which connections **90''** and **91''** extend to the air cylinder **18''.** The components and subassemblies of the filling machine shown in FIG. **10** which correspond to those of the embodiment shown in FIGS. **1–7** are designated by corresponding reference numerals with double primes.

Each filling head **10''** is mounted by means of a bracket **162** on a vertically reciprocating support rod **163.** The bracket **162** on its outer end carries a clamp **163** which fits in a circumferential groove **150'** in the sidewall of the cylinder **20''.** In order to prevent the support bracket **162** from working up on the support rod **163** during operation of the machine a stop ring **164** is provided so as to have engagement with the upper side of the portion of the bracket **162** which is clamped to the reciprocating rod **163.**

The reciprocating rod **163** passes through a support sleeve **165** provided adjacent the bottom with a flange **166** which is bolted to the top of the support plate **160.** The sleeve **165** projects downwardly through the plate **160** thereby providing additional support for the reciprocating rod **163.** A pin **167** projects through a lateral hole in the lower end of the rod **163** and extends on opposite sides thereof. On one end of the pin **167** carries a cam roller or follower **168** while on the other end it carries a bushing **170** which fits slidably over a downwardly depending post **171** secured at its upper end by a clamp nut **172** to the underside of the plate **160.** The bushing **170** and the post **171** prevent the associated reciprocating rod **163** from twisting or turning during operation with resulting swinging of the filling head **10''.**

The cam follower roller **168** fits in a cam groove **173** extending around a box cam **174.** When the cam follower **168** is in the position shown in FIG. **10,** it is at its uppermost elevation whereas when it moves around 180° to the opposite side of the box cam **174,** it will be at its lowest elevation.

Liquid product is delivered or distributed to each filling head **10''** in much the same way as in the embodiment shown in FIGS. **8** and **9.** That is, a distributor or manifold **175** is mounted on the top of the pedestal **161** with the upper portion of a fixture **176** being provided with a chamber **177.** A stationary connection **178** is mounted with a liquid-tight swivel connection on the top of the fixture **176** and is adapted to be connected at its upper end with a conduit leading from a suitable source of supply (not shown) of liquid product. The liquid product is discharged from the chamber **177** by means of a flexible hose connection **180** connected at one end to a nipple **181** and at the other end to the upper end of the filling head **10''.**

It will be understood that the internal structure of the filling head **10''** and its mode of operation correspond to the stsructure and operation of the filling heads **10** and **10'** shown and described in connection with the embodiment shown and described in connection with the embodiment shown in FIGS. **1–7** and **8–9,** respectively.

The air cylinder **18''** and adjustment nut **82''** associated with each filling head **10''** is carried by a laterally projecting member **182** clamped to a support rod **163** above the support bracket **162.**

In the operation of the embodiment shown in FIG. **10,** containers to be filled are placed on the supports **16''** when the filling heads **10''** are in their uppermost of elevated position. As the filling head **10''** shown continues to travel with the platform the support rod **163** will be lowered under the control of the cam follower **168** thereby bringing the nozzle assembly **28''** downwardly into engagement with the upper end of a container C'' and thereby actuating the nozzle in the same manner as described in connection with the embodiment shown and described in connection by FIGS. **1–7** to deliver a metered quantity of liquid product into the container.

While the invention is illustrated in turret-type machines, it may be embodied in a straight line multiple head machine or in a single head machine.

I claim:

1. In an apparatus for filling containers with a measured amount of a liquid product from a source of supply which apparatus comprises elevated support means,

at least one filling head mounted on said support means, each said filling head including a metering cylinder fixedly mounted on said support means and in communication with said source of supply through an inlet in the upper portion of said cylinder, a hollow nozzle in the bottom of said metering cylnder with an associated valve which is opened by upward pressure of a container to be filled, a hollow piston member movable in said cylinder, an adjustable stop limiting the upward movement of said hollow piston, a valve member operable to close on the piston member and thereby isolate a quantity of the liquid product in the bottom of each said metering cylinder and means to operate said valve member and thereafter to move said piston member when the valve associated with said nozzle is opened so as to discharge a predetermined amount of the liquid product through the nozzle and into the container.

2. In an apparatus as set forth in claim **1** wherein said metering cylinder has a bottom cap with a vertical bore, said nozzle has a hollow stem portion slidable in said bore and a container engaging mouth portion with resilient means normally urging said nozzle to a downward position and the valve associated with said nozzle is at the top of said stem portion and is opened to allow passage of liquid product when said mouth portion is moved upward by pressure of said container.

3. In an apparatus as set forth in claim **1** wherein said metering cylinder has a readily detachable bottom closure in the form of a bell cap with a hollow depending stem portion and said nozzle has a hollow container engaging portion and a hollow upstanding stem portion slidably mounted in the depending stem portion of said bell cap whereby upon upward movement of said nozzle the associated valve is opened for discharge of fluid from the bottom of the metering cylinder.

4. In an apparatus as set forth in claim **3** wherein said nozzle has a pair of axially spaced screen members with the lowermost one thereof adjacent the bottom end of said nozzle.

5. In an apparatus as set forth in claim **3** wherein said nozzle has axially spaced screen members with the lowermost one thereof adjacent the bottom end of said container engaging nozzle portion and the uppermost one clamped between said nozzle portions.

6. In an apparatus as set forth in claim **1** wherein said nozzle has an anti-drip means in the form of a screen disposed at the lowermost end thereof.

7. In an apparatus as set forth in claim **1** wherein said adjustable stop comprises a ring member adjustably mounted in sliding engagement with the inside wall of said metering cylinder.

8. In an apparatus as set forth in claim **1** wherein said adjustable stop comprises a ring member adjustably mounted in sliding engagement with the inside wall of said metering cylinder and wherein said ring member has a bottom wall configuration which co-operates with the top wall configuration of said piston member so as to form, when the piston member approaches the ring member, a pocket with an upper opening of a size which decreases as the members engage so as to trap a small quantity of liquid therein and produce a dash pot effect.

9. In an apparatus as set forth in claim **1** wherein the means to operate said valve member comprises an air cylinder mounted for vertical adjustment above said metering cylinder and having its piston connected to said valve member so as to raise and lower said valve member.

10. In an apparatus as set forth in claim **9** and said valve member having a lost motion connection with said hollow piston member whereby initial downward movement of said valve member closes the center opening in said piston member and subsequent downward movement of said valve member lowers said piston member and initial upward movement of said valve member opens the center opening in said piston member and subsequent upward movement of said valve member raises the piston member against said stop.

11. In an apparatus for filling containers with a measured amount of a liquid product which apparatus comprises a product supply tank, a filling head assembly mounted in said supply tank, said filling head assembly including a metering cylinder fixedly depending from the supply tank with the open top thereof in communication with said supply tank so as to receive liquid product from the tank, a hollow nozzle in the bottom of said metering cylinder with an associated valve which is normally closed and which is opened in response to upward pressure of a container to be filled, a hollow piston member movable in said cylinder, an adjustable stop limiting the upward movement of said hollow piston, a valve member operable to move downwardly and close on the piston member so as to isolate a quantity of the liquid product in said metering cylinder, means to operate said valve member and means to move said piston member when the valve associated with said nozzle is opened so as to discharge a predetermined amount of the isolated liquid product through the nozzle and into the container.

12. In an apparatus as set forth in claim **11** wherein said metering cylinder has a bottom cap with a central bore, said nozzle has a hollow stem portion slidable in said bore and a container engaging mouth portion with means normally urging said nozzle to a downward position where the valve associated with said nozzle is closed and adapted to be opened to allow passage of liquid product when said mouth portion is raised by upward pressure of said container.

13. In an apparatus as set forth in claim **11** wherein said metering cylinder has a bottom closure in the form of a bell cap with a hollow depending stem portion and said nozzle has a container engaging portion and a hollow stem portion slidably mounted in the depending stem portion of said bell cap and said nozzle associated valve is operable upon upward movement of said nozzle to permit discharge of fluid from the bottom of the metering cylinder through said nozzle.

14. In an apparatus as set forth in claim **13** wherein the container engaging portion of said nozzle is provided with horizontally disposed, axially spaced screen members, the lowermost one of which is disposed adjacent the bottom end of said nozzle.

15. In an apparatus as set forth in claim **13** wherein screen members are mounted in said nozzle in parallel, axially spaced relation with the lowermost one thereof adjacent the bottom end of said container engaging portion and the uppermost one at the bottom of said nozzle stem portion.

16. In an apparatus as set forth in claim **11** wherein a horizontally disposed screen is mounted adjacent the lowermost end of said nozzle which reinforces the surface tension of the product allowing atmospheric pres-

sure to retain excess product in the nozzle when the container is withdrawn after filling.

17. In an apparatus as set forth in claim **11** wherein said valve member has a bulbous lower end of a size to close the center opening in said hollow piston member and said means to operate said valve member comprises a pneumatic cylinder with its piston connected to the upper end of said valve member.

18. In an apparatus as set forth in claim **11** wherein said means to operate said valve member comprises a power cylinder mounted above said product supply tank and having a depending piston connected to said valve member.

19. In an apparatus as set forth in claim **11** wherein said piston member has a peripheral recess at the top thereof and said adjustable stop comprises a ring member having a bottom edge shaped to move into the peripheral recess in said piston member so as to trap in the pocket formed by said recess a relatively small quantity of the liquid product while leaving a top opening of decreasing area as the piston member approaches the end of its upward stroke so as to create a dashpot effect.

20. In an apparatus as set forth in claim **11** wherein said adjustable stop comprises a ring member which is supported on rod members depending from an adjustable support above said metering cylinder.

21. An apparatus for filling containers with a measured amount of a liquid product comprising a product supply tank, a horizontal support member for said supply tank, a plurality of filling heads mounted in said supply tank, each said filling head including a metering cylinder depending from the supply tank and in communication with said supply tank so as to receive liquid product therefrom, a hollow nozzle in the bottom of said metering cylinder with an associated valve which is opened by upward pressure of a container to be filled, a hollow piston member movable in said cylinder, a stop ring limiting the upward movement of said hollow piston, a valve member operable to close the opening in said piston member and isolate a quantity of the liquid product in the bottom of said metering cylinder, a power cylinder disposed above said product supply tank and having its piston connected to said valve member so as to move said valve member and said piston member when the valve associated with said nozzle is opened to discharge a predetermined amount of the liquid product through the nozzle and into the container, a common horizontal support member for the power cylinders and the stop rings associated with said filling heads, vertically extending jackscrews having axially spaced nut forming means connected to said horizontal support members, and means for simultaneously operating the nut forming means for adjusting each of said support members so as to simultaneously adjust the elevation of the valve members and stop rings relative to the metering cylinders.

22. An apparatus for filling containers with a measured amount of a liquid product comprising, product distributor means having a stationary product inlet fitting and a rotatable product outlet fitting with at least one outlet connection thereon, elevated rotatably mounted horizontal support means, at least one filling head mounted on said horizontal support means, each said filling head including a metering cylinder mounted on said horizontal support means with a conduit connecting the top portion of each metering cyliner with one of said outlet connections, a hollow nozzle in the bottom of said metering cylinder with an associated valve which is opened by upward pressure of a container to be filled, a hollow piston member movable in said cylinder, a stop ring limiting the upward movement of said hollow piston, a valve member operable to close the center opening in said piston member and isolate a quantity of the liquid product in the bottom of said metering cylinder, a power cylinder disposed above said metering cylinder and having its piston connected to said valve member so as to move said valve member and said piston member when the valve associated with said nozzle is opened to discharge a predetermined amount of the liquid product through the nozzzle and into the container, a common rotatably mounted horizontal support member for the power cylinders and the stop rings associated with said filling heads, vertically extending jackscrews having axially spaced nut forming means connected to said elevated rotatably mounted horizontal support means and said rotatably mounted horizontal support member, and means for simultaneously operating the nut forming means for adjusting said elevated rotatably mounted horizontal support means and said rotatably mounted horizontal support member so as to simultaneously adjust the elevation of the valve members and stop rings relative to said metering cylinders.

23. An apparatus for filling containers with a measured amount of a liquid product comprising, product distributor means having a stationary product inlet fitting and a rotatable product outlet fitting with at least one outlet connection thereon, at least one elevated support bracket, a filling head mounted on each said support bracket, a rotatably mounted platform, a vertically reciprocating support rod for each said filling head mounted on said platform with each said support bracket mounted on a support rod above said platform, each said filling head including a metering cylinder mounted on a said support bracket and a conduit connecting the top portion of each metering cylinder with one of said outlet connections, a hollow nozzle in the bottom of said metering cylinder with an associated valve which is opened by upward pressure of a container to be filled, a hollow piston member movable in said cylinder, a stop ring limiting the upward movement of said hollow piston, a valve member operable to close the center opening in said piston member and isolate a quantity of the liquid product in the bottom of said metering cylinder, a power cylinder disposed above said metering cylinder and having is piston connected to said valve member so as to move said valve member and said piston member when the valve associated with said nozzle is opened to discharge a predetermined amount of the liquid product through the nozzle and into the container, and a lateral support member mounted on each vertically reciprocating support rod for supporting one of said power cylinders and the stop ring associated therewith, and drive means for simultaneously rotating said platform and reciprocating said support rods so as to lower said nozzles against container on said platform and thereafter raise said nozzles to permit removal of the filled containers and replacement with unfilled containers.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 3,857,424

DATED : December 31, 1974

INVENTOR(S) : Gary Francis Roberts

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In column 3, Line 37, take out "on" and insert -- or --.

In column 3, line 43, after "screen" insert -- spacer --.

In column 8, line 39, take out "stsructure" and insert

-- structure --.

In column 8, line 59, take out "of" and insert -- or --.

Signed and sealed this 17th day of June 1975.

(SEAL)
Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents
and Trademarks