(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 201 914**
A2

(12) EUROPEAN PATENT APPLICATION

(21) Application number: 86106508.4

(22) Date of filing: 13.05.86

(51) Int. Cl.⁴: B 65 D 83/14

(30) Priority: 17.05.85 US 735160
20.05.85 US 736097

(43) Date of publication of application:
20.11.86 Bulletin 86/47

(84) Designated Contracting States:
AT BE CH DE FR GB IT LI NL SE

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(54) Disposable package for use in marketing fluids.

(57) A disposable package (8) comprising a plastic container (10) secured to plastic protective and support member (32, 34) so that the container (10) may be supported in a vertical position during shipment and commercial storage and in a horizontal position, such as refrigerator shelf, for consumer use. In the preferred embodiment, the container (10) contains a desired quantity of beer. The container (10) is provided with dispensing means (22) having means (26) movable between at least two positions so that in the first position there is no passageway between the fluid inside the container (10) and the outside of the container and in a second position wherein the beer in the container may be readily dispensed in separate portions over a period of time without degradation of the quality of the remaining portions of beer in the container (10). Means (30) are also provided to control the rate at which beer is dispensed from the container.

EP 0 201 914 A2

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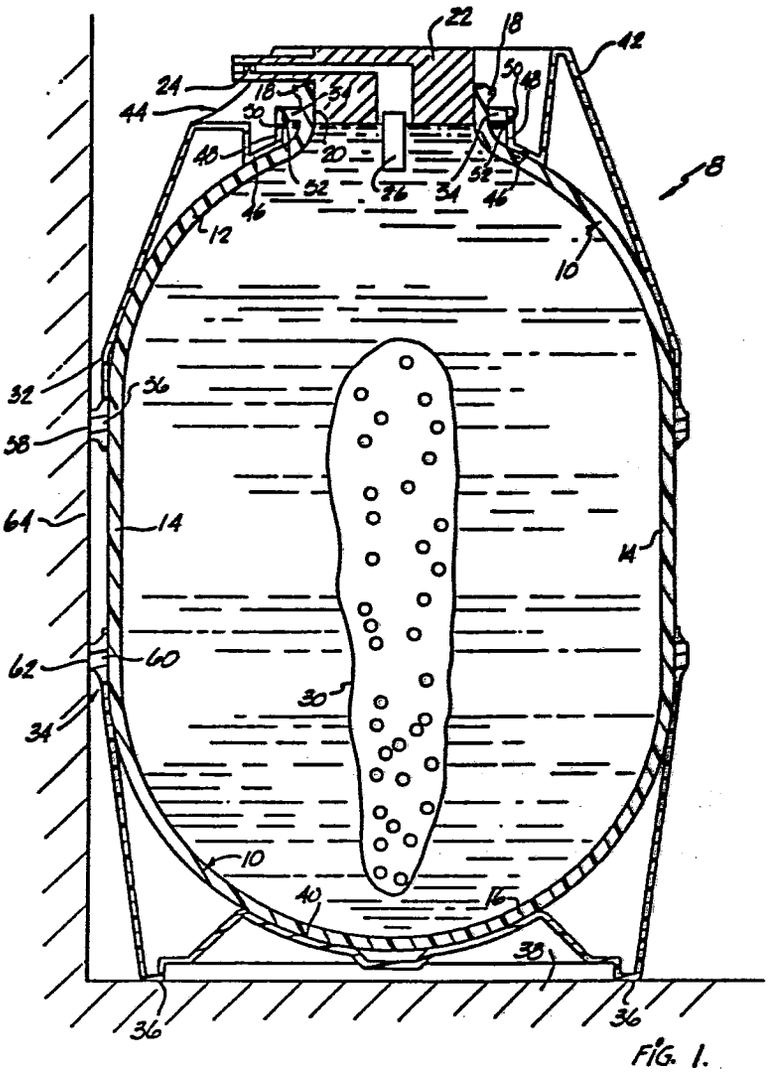
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FIG. 1.

A DISPOSABLE PACKAGE FOR USE IN MARKETING FLUIDS

This invention relates generally to a package for use in the marketing of various types of fluids wherein the fluid is contained in a container forming part of the package and the fluid is dispensed from the container without exposing the fluid in the container to the atmosphere and is more particularly directed to containers of this nature wherein the fluid contained in the container is a carbonated beverage, such as beer, soft drinks and sparkling wines and the package is disposable.

In the marketing of fluids, particularly in the marketing of consumable beverages, it has always been desirable to package the beverages so that they may be readily distributed to the market place and at the same time preserve their natural qualities, such as flavor and carbonation levels, until opened to be consumed. While this type of marketing has been successful in the marketing of beverages in the conventional twelve fluid ounce containers, difficulties have been encountered in maintaining the product qualities of beverages packaged in larger containers once they have been initially opened. Recently, soft drink manufacturers have been marketing beverages in containers having fluid capacities of two or three

liters. However, in some cases in order to preserve carbonation after the container has been opened, it is necessary to provide excess carbonation at the time the product is packaged. The equivalent internal pressures generated in the container with these carbonation levels can reach 55 psig at room temperature and 110 psig at 110°F. While some success has been obtained, even the use of excess carbonation levels does not prevent product quality degradation if the product is not consumed within a relatively short time after initial opening. In addition, the decay in product quality becomes more apparent as the container approaches empty. The characteristics associated with beer would not permit beer to be marketed under such packaging techniques.

Some attempts have been made in the past years to market beverages, and in particular beer, in containers having capacities of about two and one-quarter gallons which capacity is equivalent to one case of twenty-four twelve ounce cans. These attempts generally involved the use of strong, expensive metallic containers and means for pressurizing the container to dispense the fluid therefrom. In view of the expenses involved, these containers had to be returned to the place of purchase and/or manufacture. Also, these containers were bulky and required excessive space for storage in a conventional home refrigerator. For the foregoing and other reasons, this type of marketing of beer was not successful. Therefore, it has long been desired to be able to market that quantity of beverage, two and one-quarter gallons, in a safe, non-toxic, low pressure container which requires the use of no external additional equipment, maintains the quality of the beverage over the entire dispensing life and is readily disposable.

For many years, one of the more acceptable ways to market beverages, such as draught beer, has been

in kegs. Since the shape of a keg of beer is so well recognized, it would be desirable to market a disposable package for holding a case of beer in a container having the form of a keg. However, this presents problems since it is desirable that the disposable package of beer be capable of storage in a unit, such as a household refrigerator, so that it will be desirable to have the keg in a horizontal rather than the conventional upright position. This presents a problem since a keg in a horizontal position has a tendency to roll. Also, since a dispensing means is necessary to get the beer out of the container, special packaging is required to maintain the disposable package in a relatively fixed position so that the dispensing means is readily available and in a position to be used. In addition to the foregoing, the entire package must be as light as possible and provided with suitable means to facilitate transportation and placement at desired locations.

This invention provides a disposable package for marketing fluids in containers, preferably a bottle designed to be capable of withstanding the internal pressures necessary to ensure the dispensation of the fluid from the container and having dispensing means so that the fluid may be fully or partially dispensed from the container without exposing the fluid in the container to any deleterious conditions as those discussed above in association with conventional packaging techniques. The disposable package includes means for supporting the disposable package at a relatively fixed location and in a position so that the dispensing means associated therewith is readily accessible so that fluid may be dispensed therefrom. While the fluid may be dispensed from the container with the package in any position, the preferred embodiment of the invention is provided with means so that the package may be positioned on a horizontal surface, such as a table top or refri-

gerator shelf, while the fluid is being dispensed therefrom. In the preferred embodiment, the fluid is a carbonated beverage and in particular the fluid is beer.

In the preferred embodiment of the invention, the disposable package comprises a hollow integrally molded plastic container having the desired capacity and having a hemispherical bottom portion, an annular central portion and a hemispherical top portion with an opening of a desired size in the top portion. Preferably, the dispensing means for the container is secured in the opening in the top portion. The disposable package includes support, protective and decorative means which are secured to the container and are comprised of two separate integrally molded plastic members each of which is secured to the container by suitable means. One of the members surrounds the top portion of the container and means are provided on the top portion of the container and the one member so as to prevent relative linear movement between the top portion of the container and the one member. The other member surrounds the bottom portion and may be secured thereto by suitable means such as an adhesive. The one and the other members are each provided with means forming aligned planar surfaces so that the dispensable package may be supported in a relative fixed position at any desired location lying generally in one plane, such as a table top or refrigerator shelf. The other member is also provided with a generally planar surface for supporting the disposable package on a plane perpendicular to the one plane. A handle is secured to the top portion of the one member to facilitate the carrying of the disposable package. The one and the other members are shaped so that when the disposable package is being supported solely by the support means on the other member, one disposable package may be stacked on another disposable package with a portion of the one member nested in a portion of the

other member for shipping and storage.

In the preferred embodiment of the invention, the dispensing means includes a nozzle through which the fluid is dispensed; a passageway leading to the nozzle; means for opening and closing the passageway leading to the nozzle; a flow modulator for locking the dispensing means in an inoperative position during shipment, for placing the dispensing means in condition so that fluid may be dispensed from the container and for limiting the movement of the means for opening the passageway leading to the nozzle; a flow restrictor for reducing the pressure on the fluid as it flows therethrough; and means for ensuring that there is no passageway between the fluid in the container and the means for opening and closing the passageway leading to the nozzle until it is desired to use the dispensing means for the first time to dispense fluid from the container. Since the means for opening and closing the passageway leading to the nozzle is maintained and locked in a closed position during shipment and commercial storage, there is in effect a double seal until it is desired to use the dispensing means for the first time to dispense fluid from the container. Means are provided to maintain the pressures within the container within a desired range of pressures throughout the shelf life and dispensing cycle until the fluid is completely dispensed from the container and to ensure that substantially all of the fluid is dispensed from the container.

It is an object of this invention to provide a package for the marketing of fluids in containers having dispensing means so that portions of the fluid may be periodically dispensed from the container without degrading the quality of the remaining fluid in the container.

It is a further object of this invention to provide a package for the marketing of fluids in con-

tainers having means for maintaining the pressure on the fluid within the container between a desired range of pressures and means for permitting dispensing of fluid from the container at a desired different range of pressures.

It is an additional object of this invention to provide dispensing means for dispensing fluid from a container including means for opening and closing a passageway leading to a nozzle through which the fluid is dispensed from the container which means are maintained and locked in a closed position during shipment and commercial storage and means for ensuring that there is no passageway between the fluid in the container and the means for opening and closing the passageway leading to the nozzle during shipment and commercial storage so that there is in effect a double seal until it is desired to use the dispensing means for the first time to dispense fluid from the container.

It is another object of this invention to provide a package for marketing a quantity of fluid equivalent to a conventional case of twenty-four twelve fluid ounce containers in one container that is a safe, non-toxic, light-weight useable container that is readily stored; the fluid therein may be readily dispensed through self contained means; and under economic conditions that the marketed package is disposable.

It is a further object of this invention to provide a disposable package for marketing a quantity of fluid equivalent to a conventional case of twenty-four twelve fluid ounce containers in one container provided with support and protective means so that disposable packages may be supported in a nested relationship for shipping and commercial storage purposes and in a relatively fixed position at any desired location so that the fluid may be readily dispensed therefrom.

Additional objects, advantages, and novel features of the invention are set forth in part in the

description which follows which will be understood by those skilled in the art upon examination of the following or may be learned by practice of the invention. The objects and advantages of the invention may be realized and obtained by means of the instrumentalities and combinations particularly pointed out in the appended claims.

Fig. 1 is a view partially in section schematically illustrating a disposable package of this invention;

Fig. 2 is a view in section of one of the protective and support members;

Fig. 3 is a view in section illustrating a locking means between the support member of Fig. 2 and a container;

Fig. 4 is an enlarged view showing the relationship of Fig. 3 immediately prior to completion;

Fig. 5 is an end view of a portion of Fig. 2;

Fig. 6 is a view in section of the other of the protective and support members;

Fig. 7 is an end view of a portion of Fig. 6;

Fig. 8 is a partial view in section illustrating the nested condition;

Fig. 9 is a view with parts in section of one type of dispensing means;

Fig. 10 is a partial view of Fig. 9 with parts located for shipping and storage;

Fig. 11 is a view with parts in section of another type of dispensing means;

Fig. 12 is a front end view of Fig. 11;

Fig. 13 is a partial view of Fig. 11 with parts located for shipping and storage.

Fig. 14 is an elevational view in cross-section of a flow modulator of this invention;

Fig. 15 is a view with parts in section of a portion of another type of dispensing means with parts located for shipping and storage;

Fig. 16 is a view similar to Fig. 15 with parts located so that fluid may be dispensed from the container;

Fig. 17 is a view with parts in section of another type of dispensing means with parts located for shipping and storage; and

Fig. 18 is a front end view of Fig. 17.

A preferred embodiment of the present invention is schematically illustrated generally in Fig. 1 and comprises a disposable package 8 comprising a blown hollow integral plastic container 10 having hemispherical top portion 12, an annular cylindrical central portion 14 and a hemispherical bottom portion 16. A neck portion 18 defining an opening 20 is provided in the top portion. A dispensing means 22 having a pour nozzle 24 and a flow restrictor 26 is mounted in the opening 20 after the container has been filled with a suitable fluid, such as a beverage which preferably is beer. A pressure pouch 30, which is designed to expand according to a set program as the fluid is dispensed such as those described in U.S. Patent No. 3,096,000 to Staley and U.S. Patent No. 3,718,236 to Reyner et al., is inserted into the container and as the pouch 30 expands, it provides the necessary forces to facilitate removal of the beer from the container in any orientation of the container and to fill the headspace to maintain proper carbonation levels and/or pressure in the container. If necessary, a flexible hollow flow tube (not shown) may be positioned in the container to ensure that all of the fluid is dispensed.

Protective and support members 32, 34, made of a relatively flexible molded plastic material, are attached to the container top portion 12 and bottom portion 16. Member 34 has an annular rim portion 36, which enables the keg to be supported in a vertical attitude on a support surface 38, and a spherical portion 40 is engaged with the container bottom portion 16.

Member 32 has an annular rim portion 42 which protects dispensing means 22 and pour nozzle 24. A recess 44 in rim portion 42 provides clearance for dispensing the beer from the nozzle 24. A spherical band portion 46 of the member 32 supportively engages the container end portion 12 adjacent to, but spaced from the neck portion 18. An annular portion 48 of member 32 has an annular projection 50 having a tapering surface 52 and cooperates with an annular projection 54 on container neck portion 18 for a purpose to be described below.

The member 32 is provided with an annular reinforcing rib 56 and is provided with a generally planar surface 58 at a desired location. The member 34 is provided with an annular rib 60 and is provided with a generally planar surface 62 at a desired location. The planar surfaces 58 and 62 are aligned relative to each other so that they may be placed in contact with a surface 64, such as a shelf of a refrigerator, and remain in a relatively fixed position so that beer may be readily dispensed from the spout 24.

The protective and support member 32 is is illustrated in Fig. 2 and comprises a first section 72 having an annular configuration adapted to contact the container 10, a second section 74 integral with the first section 72 and having an outer surface having a configuration generally of a frustum of a cone; a third section 76 integral with the second section 74 at a location of the second section having the smallest outside diameter and having an annular generally planar surface; a fourth section 78 integral with said third section 76 and having an outer surface having a configuration of a frustum of a cone with its largest diameter adjacent to the third section 76 and projecting inwardly in a direction generally toward the first section 72; a fifth section 46 integral with the fourth section 78 and having an inner surface 82 having a con-

figuration of a frustum of a hemisphere and adapted to contact the container 10; a sixth section 48 integral with the fifth section 46 having an annular configuration and projecting outwardly in a direction generally toward the third section; and an annular projection 50 projecting inwardly and provided with a tapered surface 52 with largest inner diameter of the tapered surface 52 being the closest to the fifth section 46. As described above in relation to Fig. 1, a recess 44, comprising portions of sections 74, 76 and 78, has a surface 86 and provides an opening in which a receptacle for fluid may be positioned.

In Figs. 3 and 4, there is illustrated a locking means for preventing relative linear movement between the container 10 and the protective and support member 32. The assembled relationship is illustrated in Fig. 3 wherein the surface 82 of the fifth section 46 is in contact with the adjacent outer surface 88 of the container 10, which surface 88 has an outer configuration of a frustum of a hemisphere and the surface 90 of the projection 50 is in contact with the surface 92 of the projection 54. The relationship of the various parts prior to the completed assembled relationship is illustrated in Fig. 4. An annular flange 94 on the neck 18 of the container 10 has an outer diameter less than the inner diameter of the projection 50 so that as the container 10 moves in the direction of the arrow 96, the flange 94 moves readily by the projection 50. However, the projection 54 on the neck 18 has an outer diameter greater than the inner diameter of the projection 50 so that, as the container 10 moves in the direction of the arrow 96, the projection 54 moves into contact with the tapered surface 52. Continued movement of container 10 in the direction of the arrow 96 results in movement of the projection 54 over the tapered surface 52. The container 10 and therefore the projection 54 is formed

from a relatively rigid plastic material and is not readily deformable. However, since the protective and support member 32 and therefore the projection 50 is formed from a plastic material with some degree of flexibility, the projection 50 will be compressed permitting the projection 54 to move in the direction of the arrow 96 until the assembled relationship illustrated in Fig. 3 has been reached. In some instances, it may be desirable to provide serrations or nicks (not shown) in the projection 50 in the areas 51 to facilitate the flexing of member 50 as the projection 54 passes over it. This will have no adverse effect in the regular operational characteristics between the projections 50 and 54. Relative linear movement between the protective and support member 32 and the container 10 in a direction indicated by the arrow 98 is prevented by the contact between the surfaces 90 and 92. This contacting relationship between the surfaces 90 and 92 is very important since this contacting relationship provides the support for the filled container when it is being carried by the handle, as described below. Relative linear movement between the protective and support member 32 and the container 10 in a direction indicated by the arrow 100 is prevented by the contact between the surfaces 82 and 88. Also, this contacting relationship functions to support an upper disposable package when disposable packages are in nested relationship for shipping and commercial storage, as described below. Relative rotational movement between the container 10 and support member 32 is prevented by the interference fit of the contacting surfaces 90 and 92. In some instances, it may be desirable to provide a positive mechanical stop, such as a detect and a projection or an adhesive, to prevent relative rotational movement between the container 10 and the support member 32.

The means for providing the planar supporting

surface 58 on the member 32 is illustrated in Fig. 5 and comprises a member 101 which in the preferred embodiment is integral with the reinforcing rib 56. If desired, the member 101 could be formed by itself and secured to the reinforcing rib 56 by suitable means, such as a solvent adhesive. The member 101 has two end portions 102 having the supporting surfaces 58 thereon joined by a central strip 103.

The protective and support member 34 is illustrated in Fig. 6 and comprises a first section 104 having an annular configuration adapted to contact the container 10; a second section 106 integral with the first section 104 and having an outer surface having a configuration generally of a frustum of a cone; a third section 108 integral with the second section 106 at a location of the second section 106 having the smallest outside diameter and having an annular generally planar surface extending inwardly; a fourth section 110 integral with the third section 108 and having a cylindrical inner surface which is perpendicular to the third section; a fifth section 112 integral with the fourth section 110 and having an annular generally planar surface extending inwardly and parallel to said third section 108; a sixth section 114 integral with the fifth section 112 and having an outer surface having a configuration of a frustum of a cone with its largest diameter adjacent to the fifth section 112; and a seventh section 116 integral with the sixth section and having a spherical inner surface 118 adapted to contact the container 10. The seventh section 116 also is provided with a recess 120 adapted to receive any projections from the container 10 resulting from the process by which the container is formed. The seventh section 116 has a bleed hole 119 to allow air to escape during the assembly of member 34 onto the container 10. In some instances, it may be desirable to provide a plurality of bleed holes

119. Additionally, holes similar to the bleed holes 119 can be provided in the third section 108 to drain any moisture which may collect therein. The third section 108 provides the surface 36 for supporting the container 10 on the surface 38. The fifth section 112 provides a surface 121 for supporting a container on the third section 76 of a protective and support member 32 as will be described below.

The means for providing the supporting surface 62 on the member 34 is illustrated in Fig. 7 and comprises a member 122 which in the preferred embodiment is integral with the reinforcing rib 60. If desired, the member 122 could be formed by itself and secured to the reinforcing rib 60 by suitable means, such as a solvent adhesive. The member 122 has two end portions 124 having the supporting surfaces 62 thereon joined by a central strip 126.

In Fig. 8, there is illustrated the arrangement of the disposable packages when in commercial storage or in shipment (the dispensing means have been omitted for the sake of clarity). The disposable packages are mounted one on top of the other with the protective and support member 34 of one disposable package nested on top of the protective and support member 32 of another disposable package. As illustrated, the third section 76 of the protective and support member 32 is in contacting relationship with the fifth section 112 of the protective and support member 34 so as to support the upper disposable package on the lower disposable package. As illustrated in Fig. 3, the weight of the upper disposable package is transmitted onto the lower container through the contacting relationship between the surfaces 82 and 88. A handle 128 is also illustrated and is pivotally mounted on the fourth section 78 by pivot means 130. As illustrated in Fig. 3, the weight of the filled container when carried by the handle 128 is supported by the contacting relationship of the surfaces 90 and 92.

A necessary part of the container 10 is some type of dispensing means so that the fluid may be removed as desired from the container 10. One preferred dispensing means is illustrated in Fig. 9 and comprises a hollow annular housing 132 having an open end 134 at one end thereof and an end wall 136 at the other end. The end wall 136 has a central passageway 138 having a generally cylindrical inner surface. A rod 140 is positioned in the passageway 138 for reciprocal movement therein. An annular groove 142 is formed in the rod 140 and a sealing gasket 144 is positioned in the groove so as to form a fluid tight seal between the rod 140 and the passageway 138. A partition 146 is located in the housing 132 with the annular outer surface 148 of the partition 146 in engagement with the inner surface 150 of the housing 132 so as to form a fluid tight seal therebetween. The partition 146 has a central opening 152 having a diameter greater than the diameter of the rod 140 for a purpose to be described below. A flow restrictor 154 is mounted in the housing 132 and is provided with a projecting spiral rib 156 in contact with the inner surface 150 of the housing 132 so as to form a spiral passageway 158 for the flow of fluid. A resilient sealing means 160 is connected at one end 162 to the flow restrictor 154 and at its other end 164 to the rod 140. As illustrated in Fig. 9, the resilient sealing means 160 is connected to the flow restrictor 154 by a snap fit wherein a projection 166 on the flow restrictor 154 is seated in a recess 168 in the resilient sealing means 160. A similar snap fit connection is provided between the resilient sealing means 160 and the rod 140 with a projection 170 on the rod 140 being seated in a recess 172 in the resilient sealing means 160. An annular sealing surface 174 is formed on the sealing means 160 and is adapted to be moved into and out of sealing engagement with the annular surface 176 surrounding the central opening 152

of the partition 146 as described below.

The housing 132 is provided with an integral outwardly projecting annular flange 178 and an integral outwardly projecting annular rib 180 having an outer tapering surface 182 having its smallest outer diameter closer to the open end 134. A seal washer 184 and a closure means 186 are positioned on the housing 132 between the flange 178 and the rib 180. The seal washer 184 functions to effect a fluid tight seal between the closure means 186 and the housing 132.

The means for reciprocating the rod 140 so as to move the sealing surface 174 into and out of engagement with the annular surface 176 is illustrated in Fig. 9 wherein the dispensing means is shown in an open position. In the closed position (not shown), the force due to the resilient nature of the sealing means 160 moves the sealing surface 174 into sealing engagement with the annular surface 176. The means for moving the rod 140 in the opposite direction to a position illustrated in Fig. 9 comprises a dispenser handle 190 rotatably mounted on a pivot 192 mounted in a pivot block 194. The rod 140 is provided with an arcuate surface 196 that projects outwardly from the end wall 136. The dispenser handle 190 has an arcuate surface 198 adapted to be in contact with the arcuate surface 196 of the rod 140. When the dispenser handle 190 is in a vertical position A, the arcuate surface 196 is in contact with the end 200 of the arcuate surface 198 so that the dispensing means is in a closed position (not shown) with the sealing surface 174 in sealing engagement with the annular surface 176 surrounding the central opening 152. When the dispenser handle 190 has been moved to position B, the arcuate surface 198 has gradually moved over the arcuate surface 196 so as to apply camming forces to the rod 140 to move sealing surface 174 out of engagement with the annular surface 176 and permit the flow of fluid through the spiral

passageway 158, out between the space between the rod 140 and the central opening 152, into the chamber 202 and then out through the nozzle 24.

The dispensing means is assembled by sliding the sealing gasket 144, preferably an O-ring, over the rod 140 until it is seated in the groove 142; the rod 140 is then pushed into the sealing means 160 until the projection 170 snaps into the recess 172; the flow restrictor 154 is pushed into the sealing means 160 until the projection 166 snaps into the recess 168 to form a sub-assembly. The partition 146 is then press fitted into the housing 132 and the sub-assembly inserted in the housing 132. The sealing gasket is then moved over the housing 132 and into contact with the flange 178. The housing 132 is then press fitted into the closure 186 which closure 186 is then sealing fitted onto the flange 94 of the container 10 (not shown). An opening 204 is provided in the dispenser handle 190 and an opening 205 is provided in the pivot block 194 so that when the dispenser handle is in the closed position A, a locking pin (not shown) may be inserted through the openings 204 and 206 to prevent movement of the dispenser handle 190. This is particularly important during shipment and commercial storage of the disposable package.

The location of the flow restrictor 154 in the housing 132 during shipment and commercial storage is illustrated in Fig. 10. The housing 132 is provided with a plurality of openings 206. As illustrated in Fig. 10, the flow restrictor 154 is provided with a generally cylindrical outer surface 207 in contact with the inner surface 150 of the housing 132 so as to seal off the openings 206. In this position, there is no passageway between the fluid in the container and the means 174 and 176 for supplying fluid to the nozzle 24 so that no fluid may flow from within the container to such means 174 and 176. The flow

restrictor 154 is provided with an outwardly extending annular projection 208 and the housing 132 is provided with an annular recess 210 in its surface 150. When it is desired to dispense fluid from the container 10, the locking pin (not shown) is removed and the handle 190 is moved from the closed position A to the open position B. The movement of the handle A to the open position B moves the flow restrictor 154 in the direction of arrow 212 until the annular projection 208 snaps into the annular recess 210 and the flow restrictor 154 is locked in position. As illustrated in Fig. 9, when the flow restrictor 154 is in the locked position, the openings 206 are aligned with the spiral passageway 158 so that fluid may flow through the openings 206 into the spiral passageway 158.

A more preferred dispensing means is illustrated in Figs. 11 - 13 and comprises a hollow annular housing 214 having an open end 216 at one end thereof and fluid flow control means 218 at the other end. The fluid flow control means 218 comprises an integral hollow conical section 220 extending from the housing 214 with an integral hollow generally annular member 222 extending from the conical section 220. The annular member 222 has a first inner generally cylindrical surface 224 and a second inner generally cylindrical surface 225 having an inner diameter greater than the inner diameter of the first generally cylindrical surface 224. A rod 226 is mounted in the member 222 for reciprocal movement therein and has a first section 228 having a generally cylindrical surface 230 in sealing but slidable contact with the first generally cylindrical surface 224. If desired, a groove may be formed in the first section 228 with an O-ring gasket seated in the groove to form a fluid tight seal between the first inner generally cylindrical surface 224 and the first section 228. Spaced inwardly from the first section 228, the rod 226 is

provided with an arcuate annular recess 232 so as to form an annular space between the second inner generally cylindrical surface 225 and the recess 232. Between the recess 232 and the rod's inner extremity 234, the rod 226 is provided with a generally tapering outer surface 236 having an annular recess 238 formed therein. A sealing gasket 240 is seated in the recess 238. The bottom of the rod 226 comprises a generally flat surface 242. An integral annular flange like member 246 projects outwardly from the housing 214 and has a rim 248 extending in a direction toward the open end 216. A plurality of ribs 250 provide reinforcement to the rim 248. As illustrated in Fig. 11, the rim 248 is loosely fitted into the neck 18 of the container 10. An integral annular portion 252 extends outwardly from the flange like member 246 and is provided with sealing means 254 in contact with the surface 256 of the flange 94 on the neck 18 of the container 10. Annular clamping means 257 are used to retain the assembly and ensure sealing engagement between the sealing means 254 and the surface 256.

A flow restrictor 258 is mounted in the housing 214 and is provided with a projecting spiral rib 260 in contact with the inner surface 262 of the housing 214 so as to form a spiral passageway 264 for the flow of fluid therethrough. The housing 214 is provided with a plurality of openings 265 so that fluid may flow from within the container 10 through the openings 265 into the spiral passageway 262. The flow restrictor has a flat end surface 266 spaced a short distance away from flat surface 242. Resilient means 268 are positioned between and in contact with the flat surfaces 242 and 266. In the preferred embodiment, the resilient means 268 comprise two leaf spring members integrally molded with the rod 226 and in contact with the flat surface 266. If

desired, the resilient means could be integral with the flow restrictor 258 and in contact with the flat surface 242.

The spiral passageway 264 functions to reduce the pressure of the fluid as it flows through the passageway 264 and into the space 268 between the end of the flow restrictor 258, the flat surface 242 and the conical section 220. The length and cross-sectional area will vary in accordance with the type of fluid, such as a beverage, in the container 10 and the pressure being developed within the container 10 by the pressure pouch 30.

A handle means is illustrated in Figs. 11 and 12 and comprises a handle 270 rotatably mounted by a pivot means 272 seated in opening 274 in blocks 276 extending upwardly from the annular member 222. The lower portion 278 of the handle 270 is positioned in a cavity 280 in the rod 226 and has a cam surface 282 adapted to contact the wall 284 of the cavity 280. In the closed position with the handle 270 in an upright vertical position, illustrated by the solid lines in Fig. 11, the sealing gasket 240 is in contact with the intersection of the second generally cylindrical surface 225 and the inner surface 286 of the conical section 220 by the force exerted by the resilient means 268. When the handle 270 is moved to the open position (not shown), the cam surface 282 acts against the wall 284 to move the rod 226 against the force exerted by the resilient means 268 to move the sealing member 240 out of engagement with the intersection of the second generally cylindrical surface 225 and the inner surface 286 of the conical section 220. When the handle 270 is in the open position, fluid from within the container 10 will flow through openings 265 into the spiral passageway 264, into the space 285 between the flat surface 242 and 246 within the conical section 220, through the

opening between the sealing member 240 and the intersection between the second generally cylindrical surface 225 and the inner surface 286 into the recess 232 and then out through the nozzle 24.

The location of the flow restrictor 258 in the housing 214 during shipment and commercial storage is illustrated in Fig. 13. The housing 214 is provided with a plurality of openings 265. As illustrated in Fig. 13, the flow restrictor 258 is provided with a generally cylindrical outer surface 288 in contact with the inner surface 262 of the housing 214 so as to seal off the openings 265. The flow restrictor 258 is provided with an outwardly extending annular projection 290 and the housing 214 is provided with an annular recess 292 in its inner surface 262. In the position illustrated in Fig. 13, there is no passageway between the fluid in the bottle and the means 240, 225 and 286 for supplying fluid to the nozzle 24 so that no fluid may flow from within the container to such means 240, 225 and 286. The flow restrictor 258 is held in the position illustrated in Fig. 13 by a flow modulator 294 which is provided with a cam surface 296 opposite to a cam surface 298 on the end of the annular member 222. The flow modulator 294 is mounted on the end of the first section 228 of the rod 226 by means 300 which allow the actuator to be rotated but prevented from movement in an axial direction. The means 300 comprises a groove 302 in the flow modulator 294 and an annular rib 304 on the first section 228. The rib 304 is dimensioned to allow the modulator to be pushed over it and snap into the illustrated position. The position of the flow modulator 294 during shipping and commercial storage is illustrated in Fig. 14 wherein the greatest extent of the cam surface 296 is located opposite to and in contact with the greatest extent of the cam surface 298. In some instances, a

positive mechanical stop, such as a detent means, may be used to hold the flow modulator 294 in the position illustrated in Fig. 13 so that an extra positive force is required to move the flow modulator to an open position. When it is desired to move the flow restrictor 258 into an operable location, the flow modulator 294 is rotated so as to place the least extent of the cam surface 296 opposite to but spaced from the cam surface 298. This permits the handle 270 to be rotated which functions to move the rod 226 toward the flow restrictor 258 and to move the flow restrictor 258 in the direction of arrow 306 until the annular projection 290 snaps into the annular recess 292 and the flow restrictor 258 is locked in position. The force exerted by the handle 270 on the rod 226 to move the flow restrictor 258 must be greater than the force exerted by the pressure on the fluid in the container on the flow restrictor 258. As illustrated in Fig. 11, the flow restrictor 258 has been moved into the locked position with the openings 265 aligned with the spiral passageway 264 so that fluid may flow through the openings 265 into the spiral passageway 264 and the handle 270 has been returned to its upright closed position.

In most instances, it is most convenient, in dispensing fluid from the bottle, to be able to move the handle 270 between a fully opened and a fully closed position. When the fluid in the bottle is a carbonated beverage, particularly if the beverage is beer, moving the handle to a fully opened position may produce some undesired effects such as too much foam. To compensate for this, the flow modulator 294 is rotated to some position between those illustrated in Figs. 11 and 14 so as to limit the movement of the rod 226 in response to the rotation of the handle 270 to control the size of the opening between the sealing member 240 and the intersection between the second

generally cylindrical surface 225 and the inner surface 286 so as to eliminate the undesirable effects and still permit the desirable operation of the handle 270 between a fully opened and a fully closed position.

An even more preferred dispensing means is illustrated in Figs. 15 and 16 and comprises a hollow annular housing 306 having an open end 308 at one end thereof and fluid flow control means 218 at the other end. Since the dispensing means illustrated in Fig. 15 has the same fluid control means 218 including the handle 270 and the flow modulator 294 and other associated parts as illustrated in Fig. 11, a detailed showing of these parts has been omitted in Fig. 15.

A flow restrictor 310 is mounted in the housing 306 and is provided with a projecting spiral rib 312 in contact with the inner surface 314 of the housing 306 so as to form a spiral passageway 316 for the flow of fluid therethrough. The housing 306 is provided with a plurality of openings 318 so that fluid may flow from within the container 10 through the openings 318 into the spiral passageway 316. An annular projection 320 on the flow restrictor 310 is seated in an annular recess 322 in the housing 306 to hold the flow restrictor 310 in proper relationship within the housing 306. The flow restrictor 310 has a flat end surface 266 having a central cylindrical recess 324. The flat surface 242 in Fig. 15 differs from that in Fig. 11 in that it is provided with a rod 326 projecting therefrom and with an annular recess 328 surrounding the rod 326. A coil spring 330 is seated in the recesses 324 and 328 to provide resilient means which function in the same way as the resilient means 268 illustrated in Fig. 11. The flow restrictor 310 is provided with a plurality of radially extending passageways 332 providing fluid communication between the spiral passageway 316 and the space 285, as described below.

The means for ensuring that there is no passageway between the fluid in the container and the means for opening and closing the passageway leading to the nozzle until it is desired to use the dispensing means for the first time to dispense fluid from the container in Figs. 15 and 16 differs from such means illustrated in Figs. 9 and 10 and Figs. 11 and 13. As illustrated in Fig. 15, the end wall 334 of the flow restrictor 310 is provided with an inwardly directed projection 335 having a central opening 336 extending from the recess 324 to the interior 338 of the flow restrictor 310. A plug 340 is mounted in the central opening 336 and has an outer surface 342 in contact with the inner surface 344 of the opening 336 so as to form a fluid tight seal therebetween. During shipping and storage, the plug 340 is located as illustrated in Fig. 15 wherein the outer surface 342 of the plug 340 covers the ends of the radial passageways 332 so that there is no passageway extending between the fluid within the container and the fluid flow control means 218. The pressure of the fluid within the container acts against the plug 340 to urge the plug 340 against the rod 326 to ensure that the outer surface 342 of the plug 340 covers the ends of the passageways 332.

When it is desired to use the dispensing means for the first time, the flow modulator 294 is rotated so as to place the least extent of the cam surface 296 opposite to but spaced from the cam surface 298. This permits the handle 270 to be rotated which functions to move the rod 326 against the plug 340 to move the plug 340 in the direction of the arrow 346 until the annular projection 348 on the plug 340 snaps into the recess 349 in the end wall 334. The force required to move the plug 340 against the force exerted by the pressure on the fluid in the container is substantially less than the force required to move the flow

restrictors 154 of Fig. 9 and 258 of Fig. 11. This is because the cross-sectional area of the plug 340 is substantially less than the cross-sectional areas of the flow restrictors 154 and 258. After the plug 340 has been moved to the position illustrated in Fig. 15, the flow modulator is rotated to the desired intermediate location so that the handle 270 may be moved between a fully opened position and a fully closed position as described above.

The most preferred embodiment of the invention is illustrated in Figs. 17 and 18 and comprises a hollow annular housing 350 having an open end 352 at one end thereof and fluid flow control means 28 at the other end. A pair of open ended slots 354 are formed adjacent to the open end 352 of the housing 350.

A flow restrictor 356 is mounted in the housing 350 and is provided with a projecting spiral rib 358 in contact with the inner surface 360 of the housing 350 so as to form a spiral passageway 362 for the flow of fluid therethrough. The flow restrictor 356 is provided with a flange 364 which contacts the end of the housing 350 so that fluid may flow from within the container 10 through the slots 354 into the spiral passageway 362. The end surface 366 of the flow restrictor 356 is provided with an annular projecting rib 368 which is located so as to contact and mate with an annular inwardly projecting rib 370 of the housing 350 so as to form a fluid tight seal therebetween.

The fluid flow control means 28 comprises an integral hollow conical section 372 extending from the housing 350 with an integral hollow generally annular member 374 extending from the conical section 372. A rod 376 is mounted in the member 374 for reciprocal movement therein and has a first section 378 having a generally cylindrical surface 380 in sealing but slidable contact with the generally

cylindrical inner surface 382 of the annular member 374. If desired, a groove may be formed in the first section 378 with an O-ring gasket seated in the groove to form a fluid tight seal between the generally cylindrical surface 382 and the first section 378. Spaced inwardly from the first section 378, the rod 376 is provided with an arcuate annular recess 384 so as to form an annular space between the inner generally cylindrical surface 386 and the recess 384. Between the recess 384 and the rod's inner extremity, the rod 376 is provided with a generally tapering outer surface 388 having an annular recess 390 formed therein. A sealing gasket 392 is seated in the annular recess 390. The rod 376 has an inner annular cavity 394 formed therein and terminates in an annular rim 396. A pair of leaf springs 398 extend from the annular rim 396 and bear against the surface 366 of the flow restrictor 356. In normal operation, the leaf springs urge the rod 376 to a closed position with the sealing gasket 292 in sealing relationship with the annular portion 400 of the conical section 372.

Handle means 402 are provided. The means for preventing movement of the handle means 402 to move the rod 376 is illustrated in Figs. 17 and 18. A locking means 404 comprising a member 406 is integrally formed on the handle 408. The member 406 is provided with a projection 410 extending inwardly toward the flow restrictor 356 and is provided with a mating surface in contact with the top outer surface of rod 376. In the position illustrated in Figs. 17 and 18, the member 406 prevents rotation of the handle 408 so that the rod 376 cannot be moved toward the flow restrictor. When it is desired to dispense fluid from the container 10 for the first time, the lower portion 412 of the member 406 is grasped and moved outwardly in the direction indicated

by the arrow 414 so as to break the member 406 away from the handle 408 along the juncture 416.

The end wall 418 of the flow restrictor is provided with a central annular opening 420 extending from the surface 366 to the interior 421 of the flow restrictor. A plurality of radially extending passageways 422 are provided in the end wall 418 to provide fluid communication between the spiral passageway 362 and the central opening 420. A plug 424 is mounted in the central opening 420 and has an outer surface 426 in contact with the inner surface 428 of the opening 420 so as to form a fluid tight seal therebetween. During shipping and storage, the plug 424 is located as illustrated in Fig. 17 wherein the outer surface 426 of the plug 420 covers the ends of the radial passageways 422 so that there is no passageway extending between the fluid within the container and the fluid flow control means 28. A member 430 extends from the plug 424 and abuts against the rod 376. The pressure of the fluid within the container acts against the plug 424 to urge the plug 424 against the rod 376 to ensure that the outer surface 426 of the plug 420 covers the ends of the passageways 422. If desired, additional means, such as a projection 432 on the plug 424 seated in a recess 434 in the inner surface 428, may be used to position the plug 424.

When it is desired to use the dispensing means for the first time, the member 406 is rotated so as to break the member 406 away from the handle 408. This permits the handle 408 to be rotated which functions to move the rod 376 against the plug 424 to move the plug 424 in the direction of the arrow 436 until the outer surface 426 moves so as to open the passageways 422 to the central opening 420. The force required to move the plug 424 to an opened position is slightly greater than the force required

to move the plug 340 in Fig. 15 to an open position, but is substantially less than the force required to moved the flow restrictors 154 and 258 of Figs. 9 and 11 to the open position.

The disposable package of this invention is produced by fabricating all of the various components in separate operations. Label means are attached to the outer surface of the central portion 14 of the container 10. The surfaces of the first section 104 of the protective and support member 34 and the surface 118 of the seventh section 116 are coated with a suitable adhesive. The container 10 is then moved into contact with the adhesive coated surfaces. Any air or liquid trapped between the bottom portion 16 of the container 10 and the protective and support member 34 escapes through bleed holes 119. The container 10 is rinsed and a pressure pouch 30 is activated and placed in the container 10. The container 10 is then placed in an upright position and filled with a desired amount of fluid, which in the preferred embodiment is beer. A dispenser means, such as that illustrated in Fig. 11, is then inserted into the opening 20 and the annular clamping means 257 is secured to the flange 94 of the container 10. The dispenser handle 270 is in a closed position with the flow modulator 294 in place to prevent accidental opening of the dispenser handle 270. The flow restrictor 258 is in the location illustrated in Fig. 13. The container 10 is then moved into the protective and support member 32 until the projection 54 has moved over the tapered surface 52 and into its final assembled position with the surfaces 90 and 92 in contacting relationship and the surfaces 82 and 88 in contacting relationship so as to prevent relative linear movement between the container 10 and the protective and support member 32, as described above. The close fit of the surfaces 90 and 92 and 82 and 88

provides sufficient frictional forces to prevent relative rotational movement between the container 10 and the protective support member 32.

In order to maintain the quality of the beverage in the container, particularly when the beverage in the container is beer, it is important that the pressure in the container be kept substantially constant and equal to or somewhat greater than the natural carbonation pressure of the beer. This is particularly important during the dispensing of the beverage from the container in order to minimize foaming. The nature of the design is such that the pressure that remains in the container when all the fluid has been evacuated therefrom is approximately the same as the pressure when full. This enables the use of lower pressures that are close to the natural carbonation pressures of the beverages in the container.

The disposable package of this invention is preferably for use in the marketing of relatively large quantities of fluids such as four or more liters of a beverage and is particularly suited for use in marketing beer in one container containing the equivalent of twenty-four twelve fluid ounce containers.

It is contemplated that the inventive concepts herein described may be variously otherwise embodied and it is intended that the appended claims be construed to include alternative embodiments of the invention except insofar as limited by the prior art.

CLAIMS

1. A self-contained, portable, disposable, non-return, keg-type package for holding and storing and transporting and dispensing a relatively large volume of a beverage such as a beer or a soft drink and having a weight such as to enable transport by use of one hand of a purchaser and a size and shape such as to enable storage in a conventional home refrigerator comprising:

a hollow container means made of one piece of integrally molded, lightweight plastic material for holding a beverage to be selectively dispensed therefrom when located in a dispensing position;

a separate self-contained, self-operated lightweight pressure applying means located in said container means for continuous application of pressure to said beverage to enable said beverage to be selectively dispensed from said container means;

selectively operable valve means permanently fixedly mounted on said container means for selective movement between a closed position whereat said beverage is confined in said container means and an open position whereat said beverage is dispensed from said container means under pressure applied by said pressure applying means;

said container means having an elongated central generally cylindrical wall portion, an integral generally spherical closed first end wall portion, and an integral generally spherical second end wall portion having a central longitudinally extending neck portion with a relatively large diameter central opening of sufficient size for filling said container means with a beverage and for inserting said pressure applying means and having means for securing said valve means thereto;

first container support means fixedly attached to

said first end wall portion of said container means and second container support means fixedly attached to said second end wall portion of said container means for supporting said container means in said dispensing position;

each of said container support means being made of one piece of integrally molded plastic material and having a cylindrical band portion extending circumferentially about and being fixedly attached to said cylindrical central portion of said container means and having mutually cooperable support surfaces for supporting said container means in said dispensing position; and

handle means on said container support means for carrying said container means from place to place.

2. A package as in claim 1 and further comprising:

stacking means on said first container support means and stacking means on said second container support means so that one container can be mounted on another container with their longitudinal axes in alignment.

3. A package as in claim 1, and further comprising:

locking means on said second container support means and said neck portion for preventing relative linear movement therebetween.

4. A package as in claim 3, wherein said locking means comprises:

an annular inwardly directed projection on said second container support means;

an annular outwardly directed projection on said neck portion located between said valve means and said annular inwardly directed projection; and

an annular surface on said second container support means in contact with a portion of said second end wall portion.

5. A package as in claim 4, and further comprising

an annular inclined surface on said annular inwardly directed projection having its smallest inner diameter closer to said valve means; and

said second container support means formed from

a suitable material so that the inner diameter of said annular inwardly directed projection will be gradually increased when sufficient force is applied to said second container means to move said annular inclined surface over said annular outwardly directed surface and to return to its original diameter after said annular inwardly directed projection has moved completely over said annular outwardly directed projection.

6. A package as in claim 2, and further comprising:

said valve means projecting outwardly in an axial direction from said second end wall portion;

a spout on said valve means projecting in a downward direction when said container is supported in said dispensing position;

protecting means on said second container support means projecting outwardly in an axial direction from said second end wall portion to protect said valve means when said one container is stacked on said another container; and

an opening in said protecting means so that a receptacle may be positioned therein to receive beverage from said spout.

7. A package as in claim 6, and further comprising:

support portions projecting outwardly from said cylindrical band portions of said first and second container support means; and

said support portions having aligned, parallel, generally planar surfaces for supporting said container in said dispensing position.

8. A package as in claim 2, and further comprising:

said first container support means having a relatively large inwardly facing surface area having a configuration corresponding to a portion of said first end wall portion so that said first container support means may be readily secured to said first end wall portion by adhesive.

9. A package as in claim 8, and further comprising:

locking means on said second container support

means and said neck portion for preventing relative linear movement therebetween;

said valve means projecting outwardly in an axial direction from said second end wall portion;

a spout on said valve means projecting in a downward direction when said container is supported in said dispensing position;

protecting means on said second container support means projecting outwardly in an axial direction from said second end wall portion to protect said valve means when said one container is stacked on said another container;

an opening in said protecting means so that a receptacle may be positioned therein to receive beverage from said spout;

support portions projecting outwardly from said cylindrical band portions of said first and second container support means; and

said support portions having aligned, parallel, generally planar surfaces for supporting said container in said dispensing position.

10. A method for forming a self-contained portable disposable non-return keg-type package for holding and storing and transporting and dispensing a relatively large volume of a beverage such as beer or a soft drink and having a weight such as to enable transport by use of one hand of a purchaser and a size and shape such as to enable storage in a conventional home refrigerator, and comprising:

integrally molding a hollow container from a lightweight plastic material for holding a beverage to be selectively dispensed therefrom when located in a dispensing position;

inserting a separate, self-contained, self-operated, lightweight pressure applying means into said container means for continuous application of pressure to said beverage to enable said beverage to be selectively dispensed from said container means;

pouring a beverage into said container;

mounting a selectively operable valve means in a permanently fixed position on said container means for selective movement between a closed position whereat said beverage is confined in said container means and an open position whereat said beverage is dispensed from said container means under pressure applied by said pressure applying means;

forming said container means to have an elongated central generally cylindrical wall portion an integral generally spherical closed first end wall portion, and an integral generally spherical second end wall portion having a central longitudinally extending neck portion with a relatively large diameter central opening of sufficient size for filling said container means with a beverage and for inserting said pressure applying means and having means for securing said valve means thereto;

fixedly attaching a first container support means to said first end wall portion of said container means and a second container support means to said second end wall portion of said container means for supporting said container means in said dispensing position;

integrally molding each of said container support means from a plastic material with each of said container support means having a cylindrical band portion extending circumferentially about and being fixedly attached to said cylindrical central portion of said container means and having mutually cooperable support surfaces for supporting said container means in said dispensing position;

providing handle means on said second container support means for carrying said container means from place to place; and

providing stacking means on each of said first and second container support means so that one container may be stacked on another container with their longitudinal axes in alignment.

11. Apparatus for use in controlling the dispensing

of a fluid from a container which apparatus is secured to and shipped with the container comprising:

container means having a fluid contained therein;

self-generating pressure means in said container means for applying a constant pressure on said fluid in said container;

fluid dispensing means secured to said container means;

a nozzle on said dispensing means through which portions of said fluid may be withdrawn from said container means;

a first passageway in said dispensing means;

valve means for opening and closing said first passageway and normally resiliently urged to a closed position;

a second passageway in said dispensing means extending between said valve means and the interior of said container means;

first sealing means for closing said second passageway; and

moveable means for opening said valve means and for moving said first sealing means to an open position to open said first and second passageways so that fluid may flow through said first and second passageways and be withdrawn from said container means through said nozzle.

12. Apparatus as in claim 11, wherein said valve means comprises:

rod means mounted for reciprocal movement in said dispensing means;

handle means mounted on said dispensing means and connected to said rod means so that movement of said handle means causes movement of said rod means;

said first passageway having an open end at a location remote from said connection between said handle means and said rod means; and

second sealing means on said rod for opening or closing said open end of said first passageway in response

to the reciprocal movement of said rod.

13. Apparatus as in claim 12, and further comprising:

locking means for locking said rod means in a closed position during shipment of said container means.

14. Apparatus as in claim 12, and further comprising:

retaining means for holding said first sealing means in said open position.

15. Apparatus as in claim 12, and further comprising:

flow control means for acting on said fluid during movement through said second passageway so as to reduce the pressure on said fluid.

16. Apparatus as in claim 15, wherein said flow control means comprises:

a spiral, closed passageway having a first end in fluid communication with said fluid in said container and a second end in contact with and sealed by said first sealing means during shipment of said container means.

17. Apparatus as in claim 15, wherein said flow control means comprises:

a spiral, closed passageway having a first end in fluid communication with said first passageway and a second end in contact with and sealed by said first sealing means during shipment of said container means.

18. Apparatus as in claim 15, and further comprising:

flow modulating means mounted on said rod means for limiting said movement of said rod to an open position so as to control the capacity of the flow of fluid through said nozzle.

19. Apparatus as in claim 12, and further comprising:

locking means for locking said rod means in a closed position during shipment of said container means;

retaining means for holding said first sealing means in said open position; and

flow control means for acting on said fluid during movement through said second passageway so as to reduce the pressure on said fluid.

20. A method for use in controlling the dispensing of a fluid from a container using dispensing means which are secured to and shipped with the container comprising:

providing container means having an opening therein and through which fluid may be introduced into said container means;

introducing fluid into said container means through said opening;

inserting a self-geneating pressure means into said container means for applying a constant pressure on said fluid in said container means;

securing a fluid dispensing means in said opening so that said opening is sealed by said fluid dispensing means;

forming a first passageway passing through said dispensing means;

connecting a nozzle to one end of said first passageway;

providing said dispensing means with valve means for opening and closing said first passageway;

forming a second passageway in said dispensing means extending between said valve means and the interior of said container means;

sealing said second passageway between said valve means and the interior of said container means to prevent the movement of fluid from said container means through said second passageway; and

opening said first and second passageways so that fluid may flow out of said container means through said first and second passageways and be withdrawn from said container means through said nozzle.

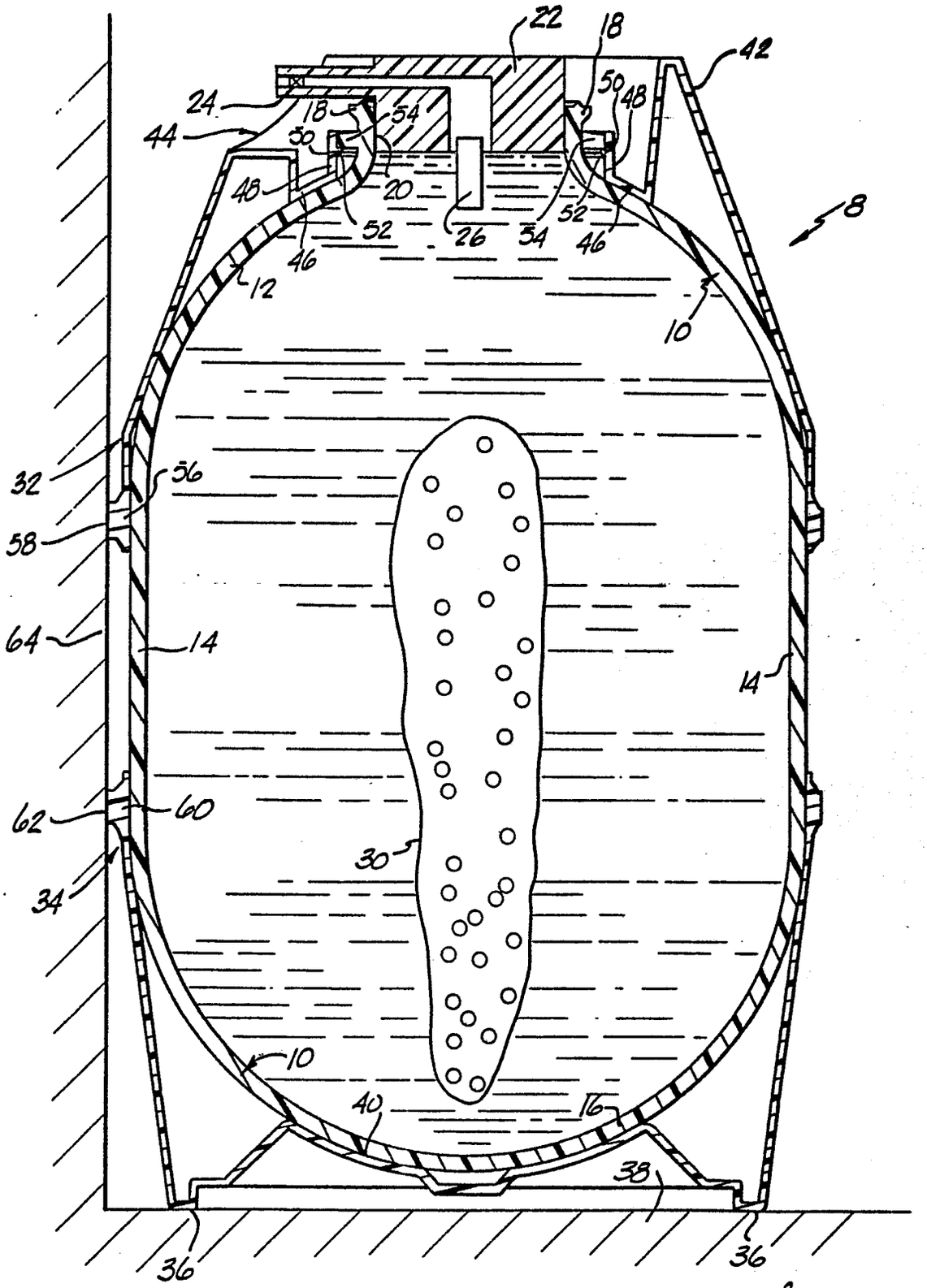
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FIG. 1.

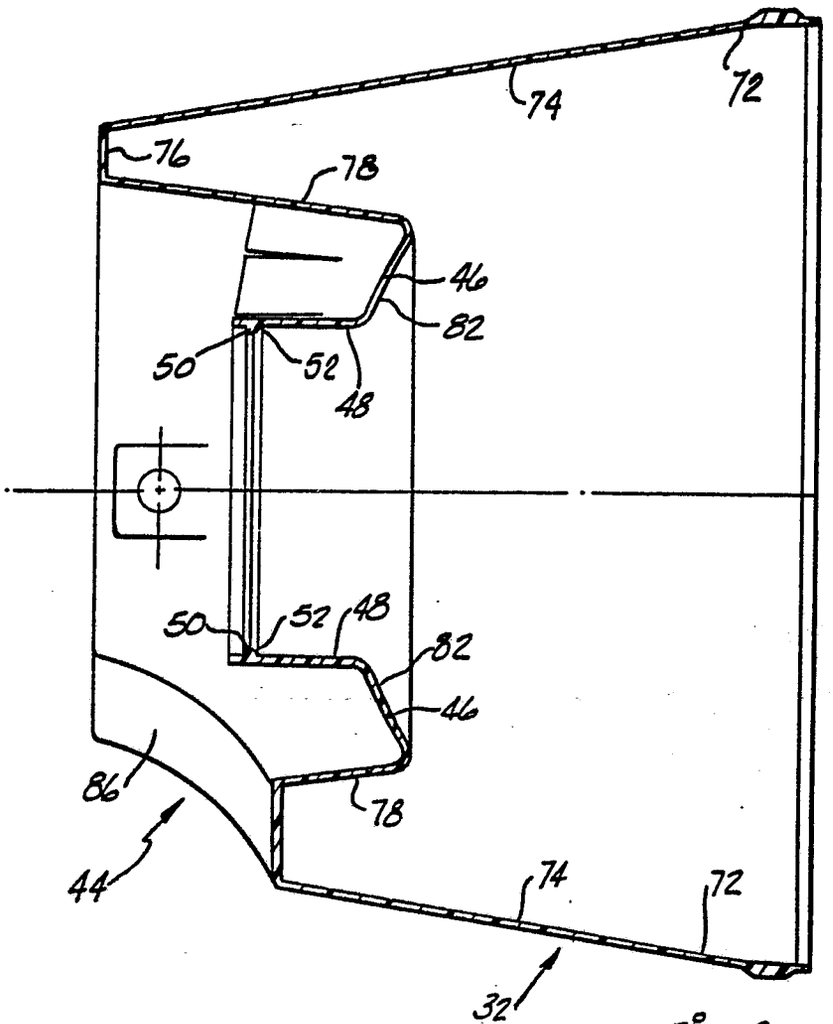
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FIG. 2.

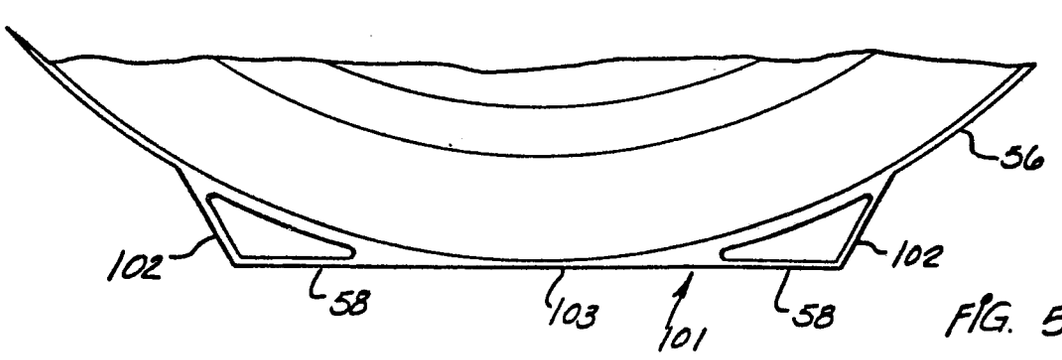
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FIG. 5.

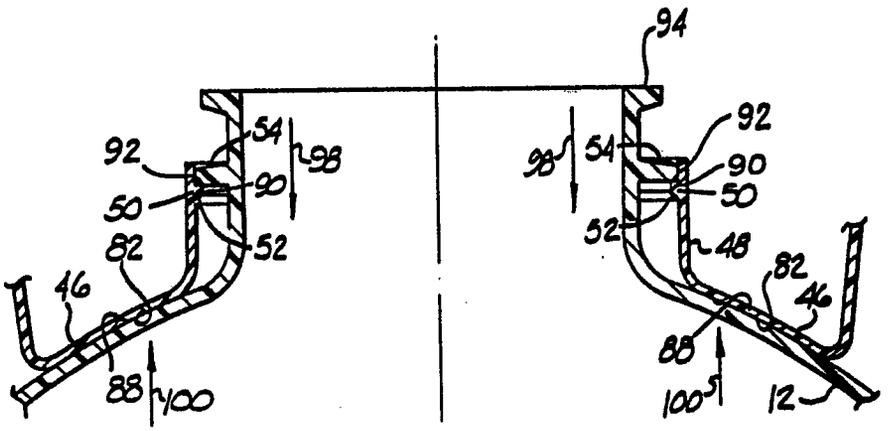
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FIG. 3.

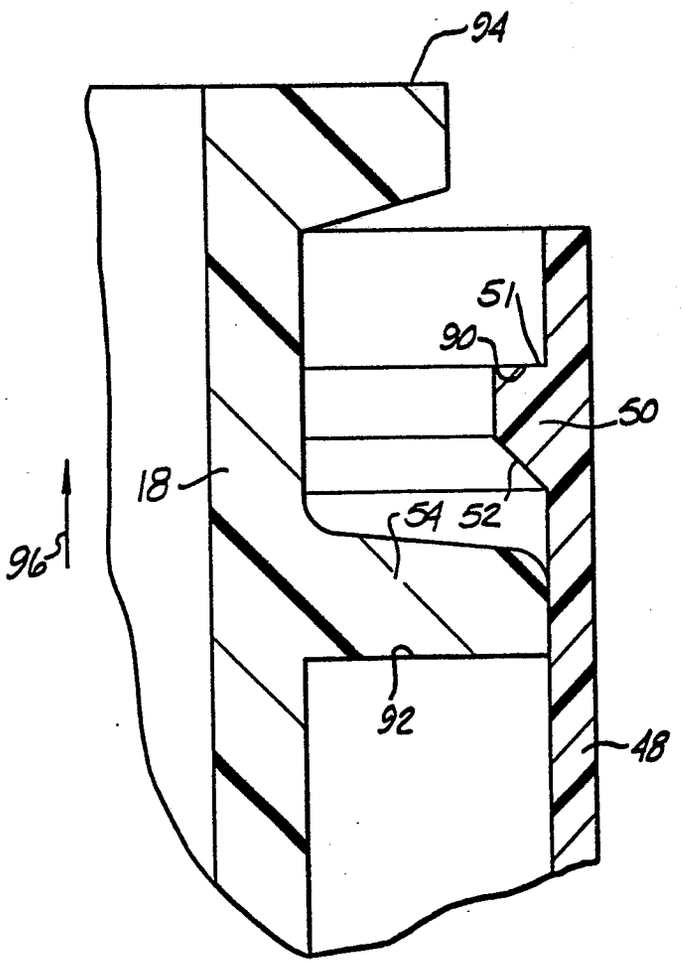
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FIG. 4.

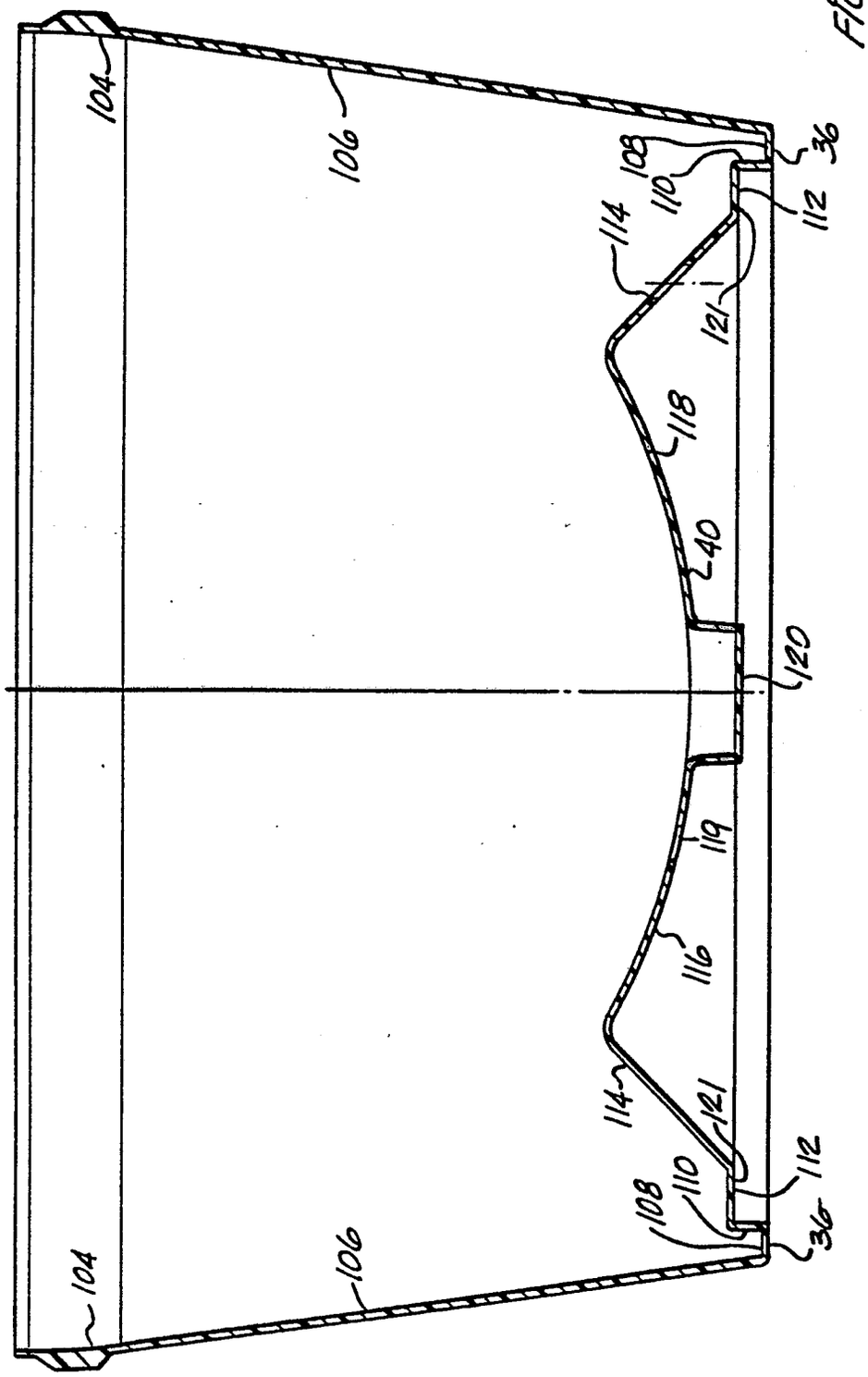
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FIG. 6.

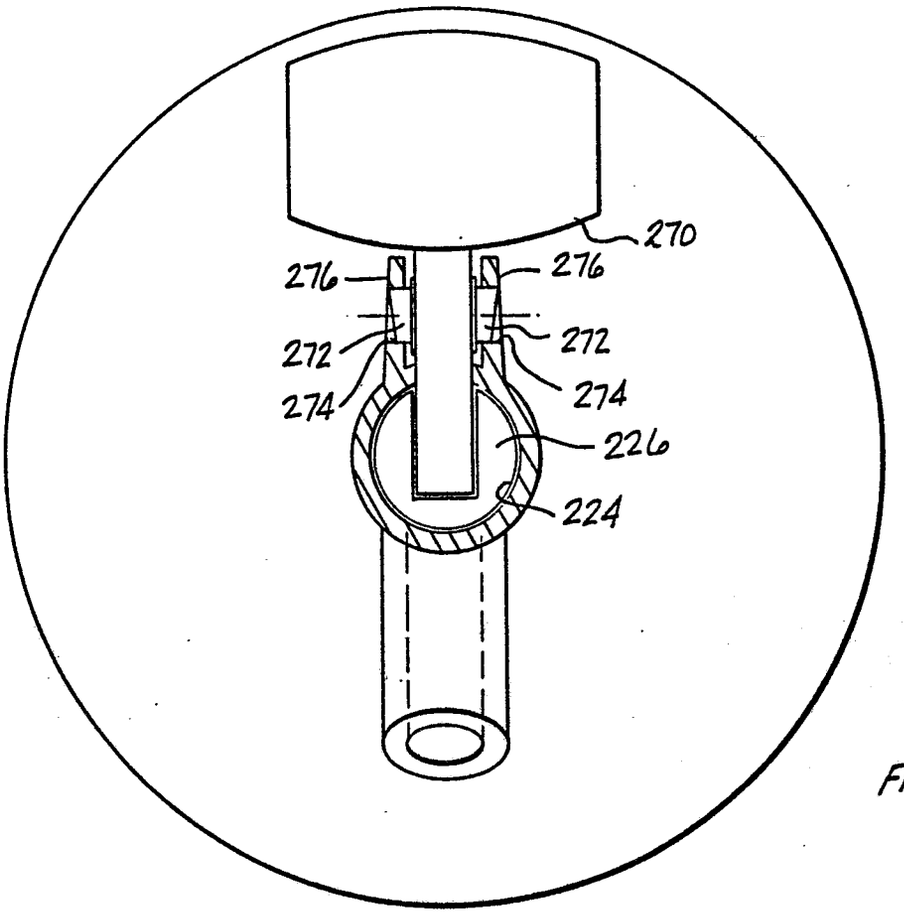

FIG. 12

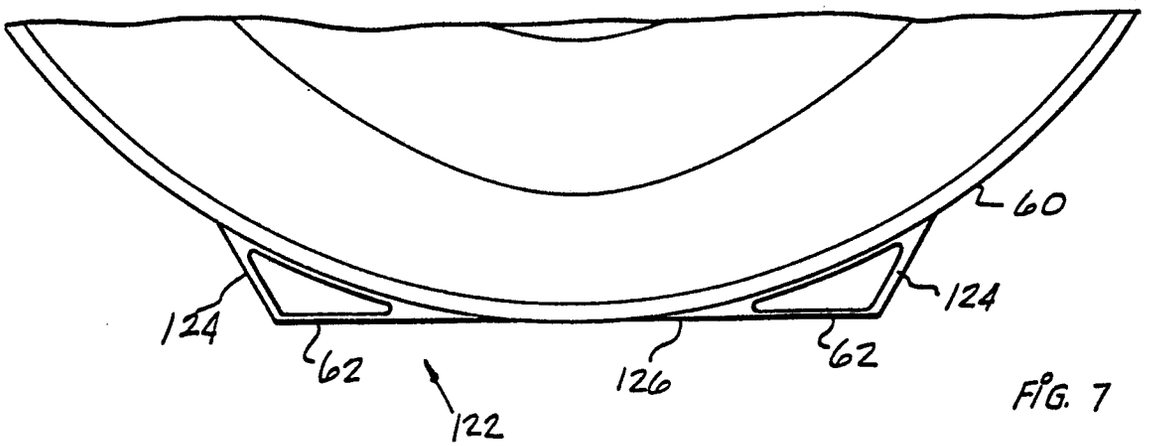

FIG. 7

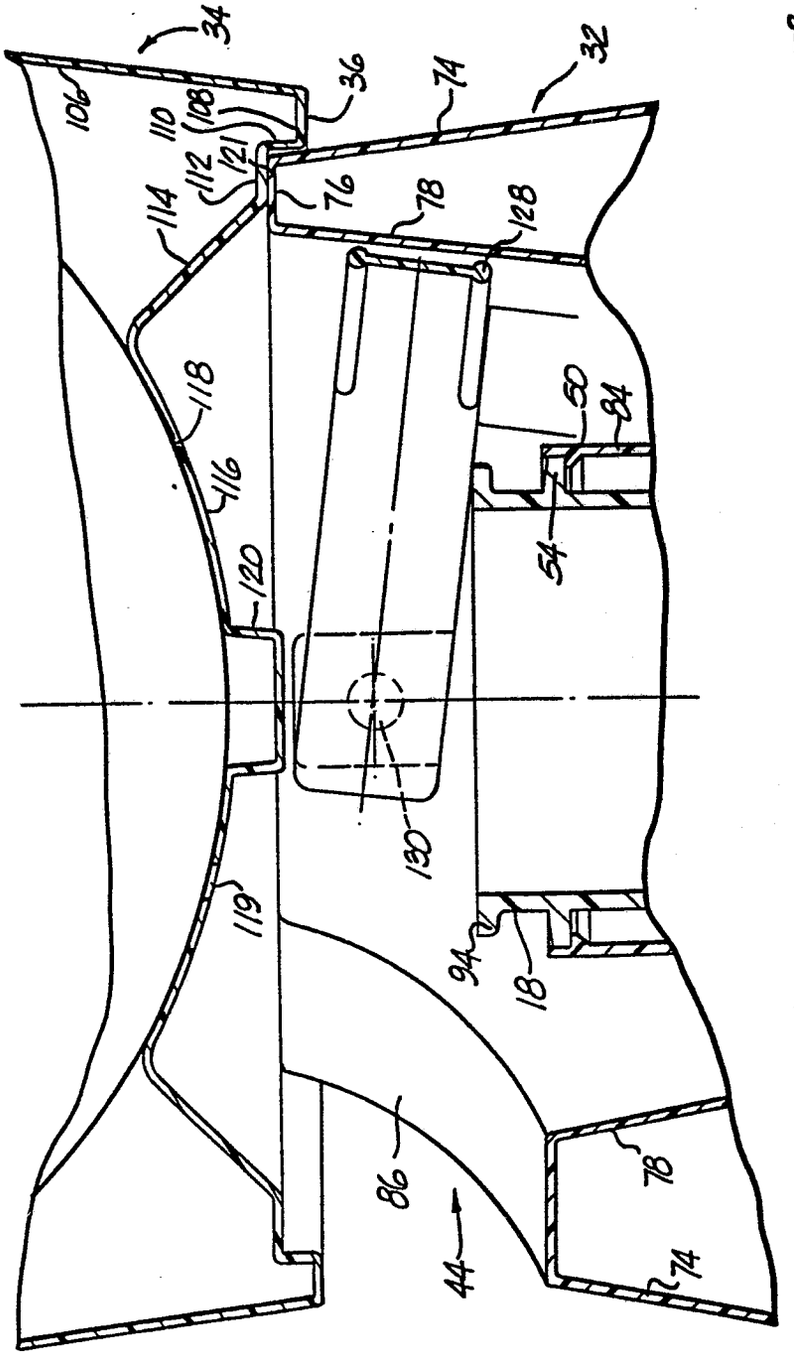
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FIG. 8.

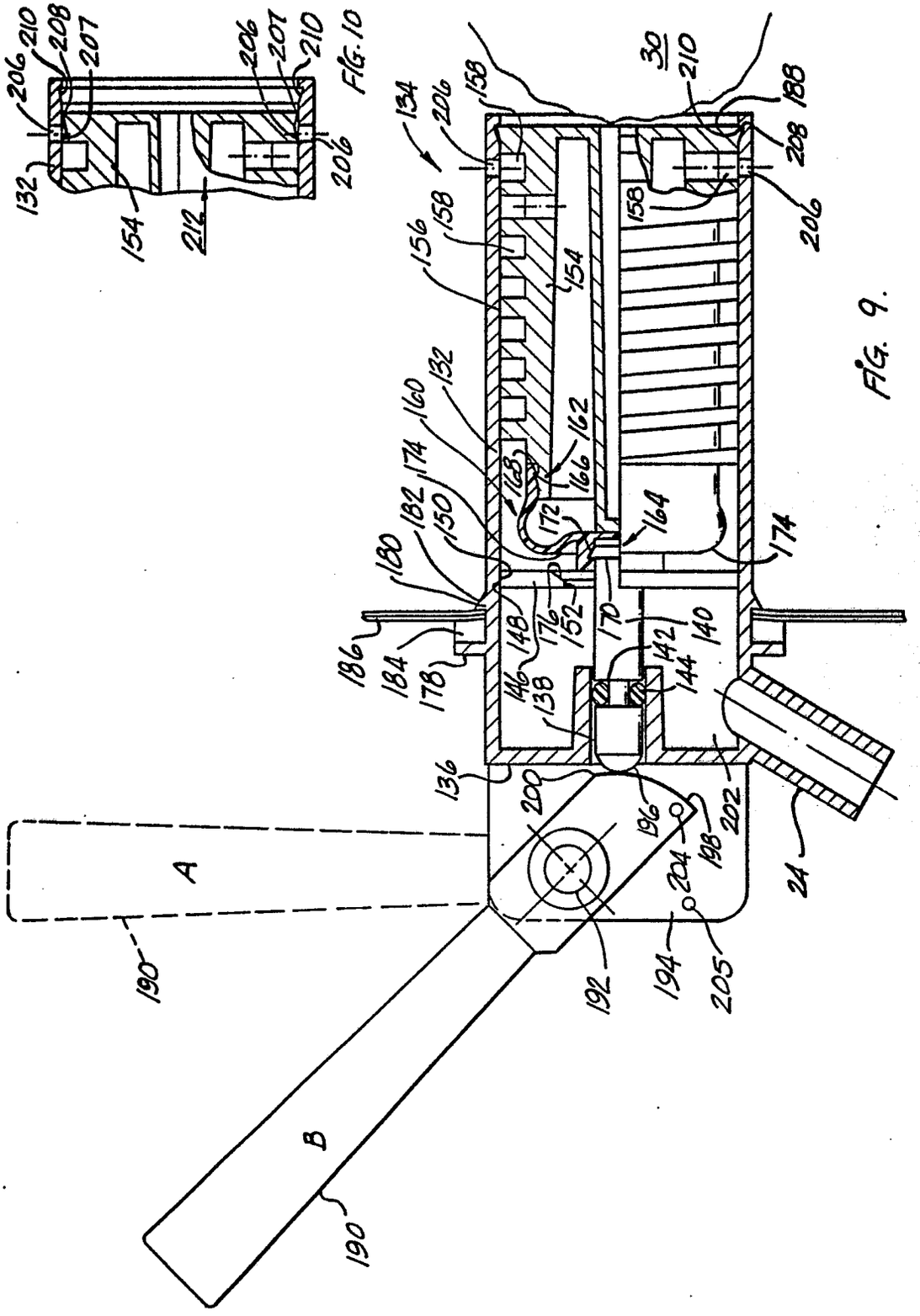
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FIG. 9.

FIG. 10

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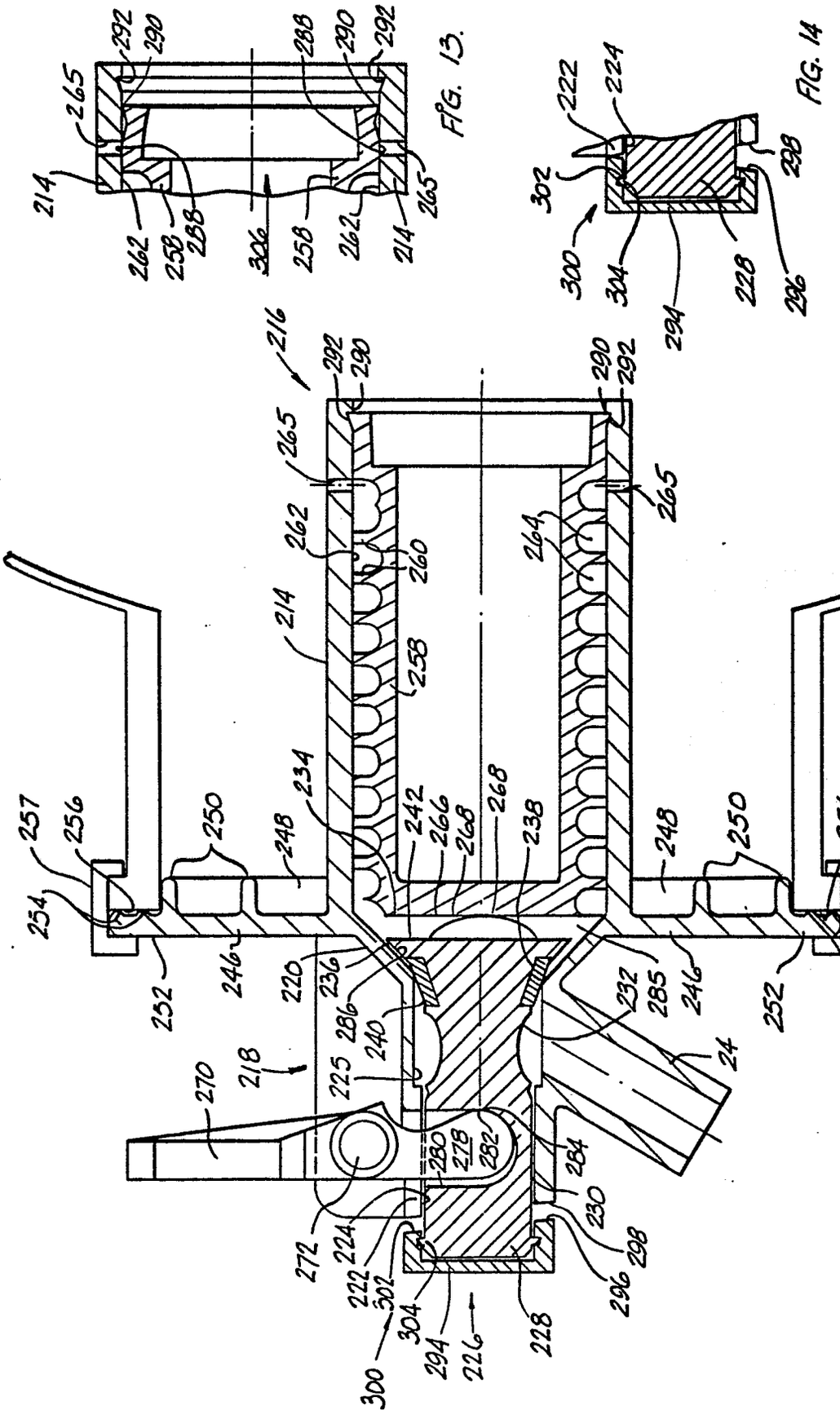

FIG. 11.

FIG. 13.

FIG. 14

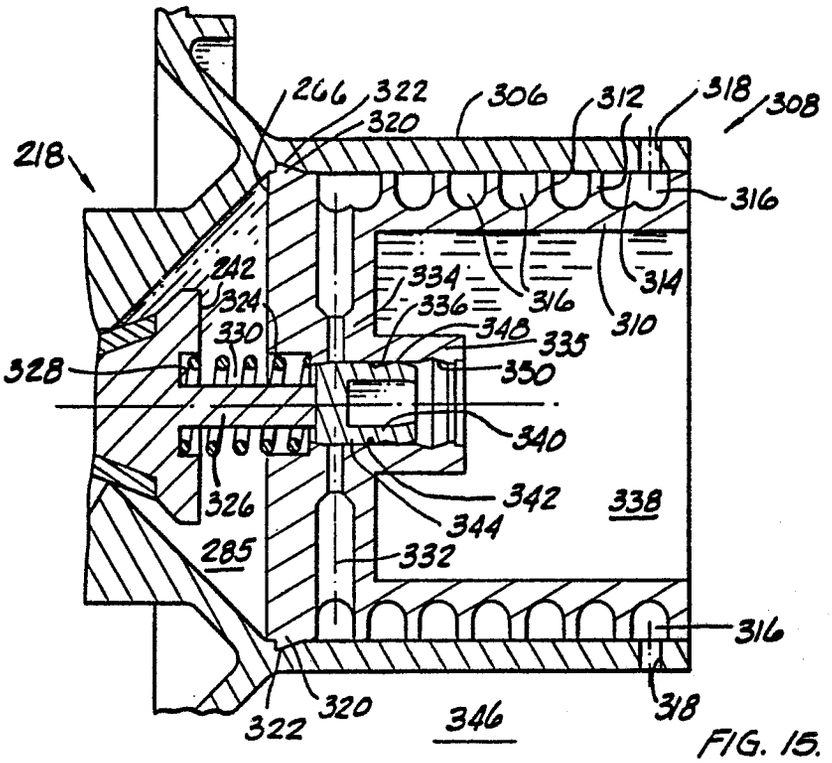
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FIG. 15.

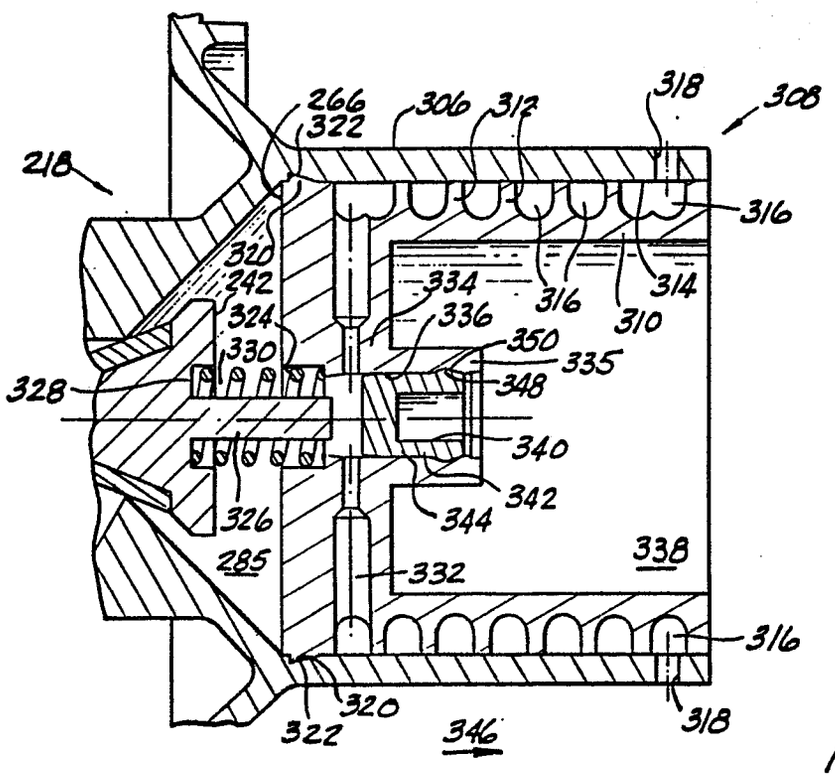
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FIG. 16.

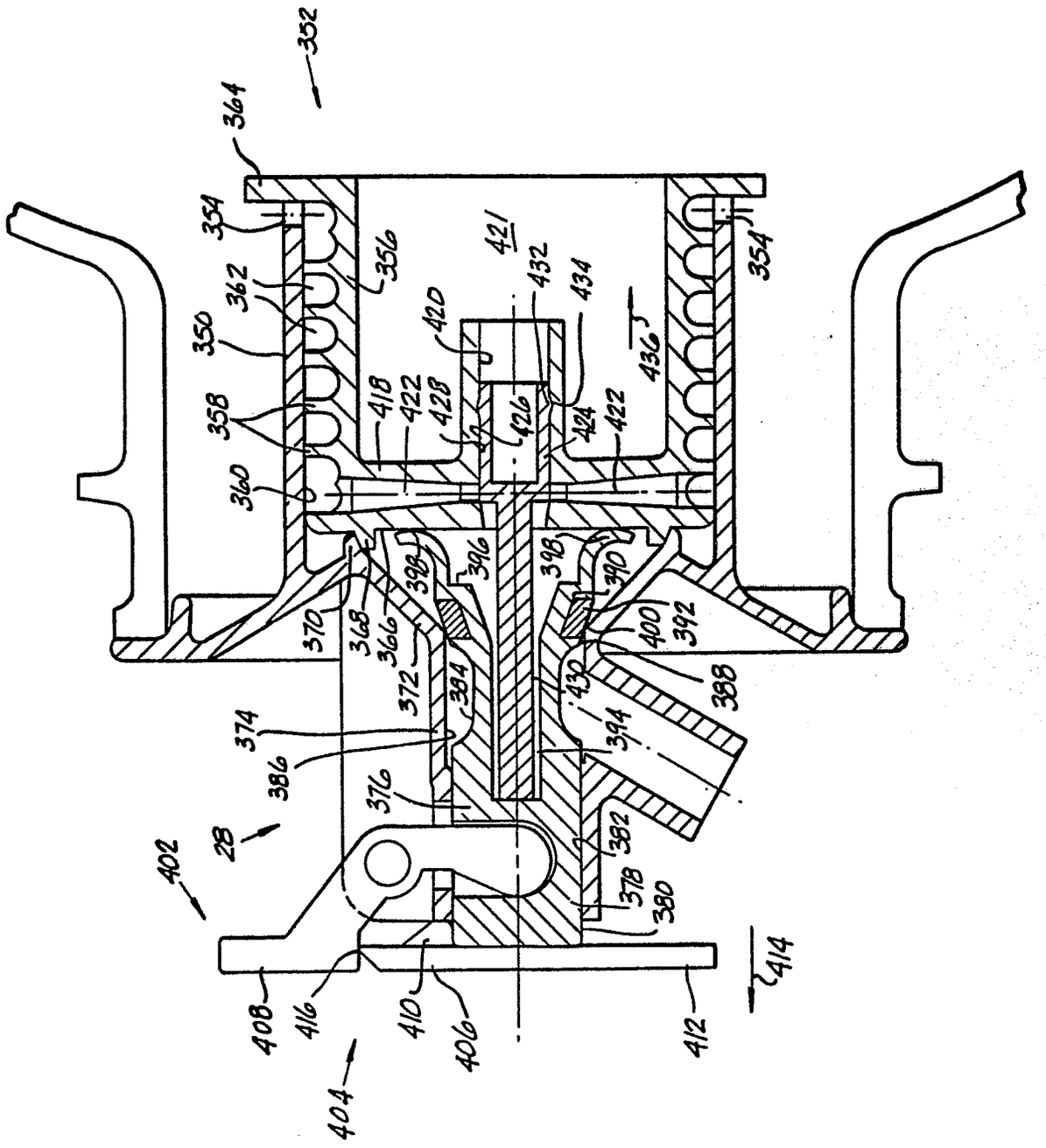
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FIG. 17.

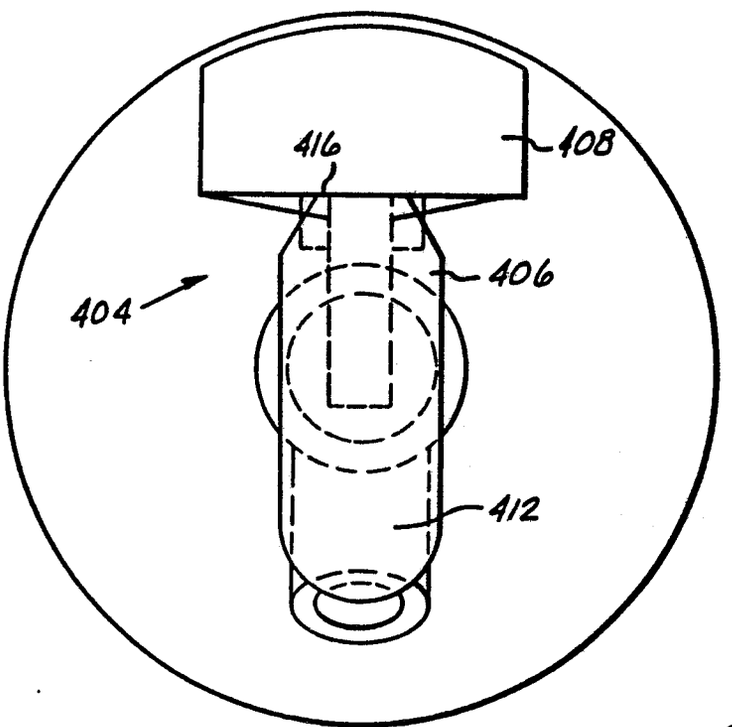

FIG. 18.