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54 **Beverage dispenser.**

57 A beverage dispenser particularly adapted for use in the home is disclosed which dispenser includes a source of pressurizing fluid, a diluent tank, dispensing valves and packages of concentrate which are interchangeably insertable in the valves. The flows of pressurizing fluid and diluent are conducted through a manifold which is integral with the dispensing valves and the diluent tank and source of pressurizing fluid both being provided with quick disconnect

couplings to permit ease of removal and replacement, the elements of the dispenser disposed on a base with the diluent tank and source of pressurizing fluid surrounded by removable covers to provide an attractive, compact and low cost dispensing unit. The package of concentrate are of special design so that they can be interchanged, will not leak when removed from the machine, and will open in response to machine movement.

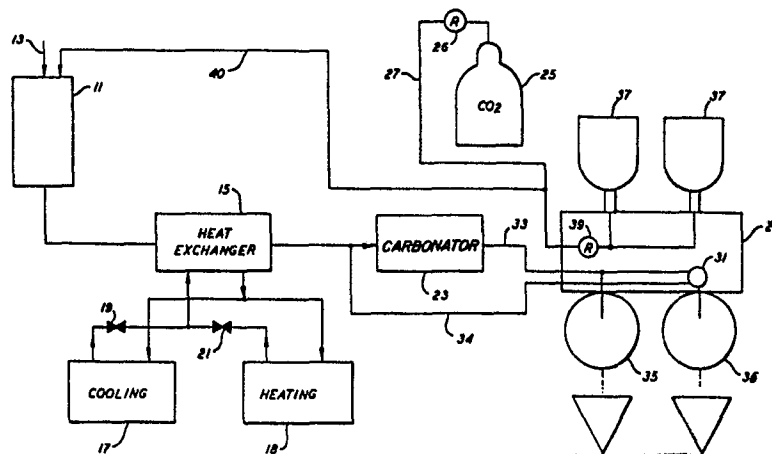


FIG. 1

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Background of the Invention

This invention relates to drink dispensers in general and more particularly to a dispensing device for making
5 carbonated beverages in the home and to concentrate packages for use therein.

Consumers throughout the world consume large quantities of carbonated beverages. Typically, carbonated beverages
10 which are consumed in the home are supplied to the consumer in either cans or bottles. Typically, cans are supplied in 12 ounce sizes and bottles in sizes up to two litres. A carbonated beverage is made up of carbonated water to which there is mixed a juice or syrup.
15 A good tasting beverage requires good water, the proper level of carbonation and the proper proportions between the syrup and carbonated water. Thus, in the production of bottles or cans of carbonated beverages under factory conditions the equipment used includes a carbonator for
20 carbonating the water, a concentrate, i.e., a juice or syrup, dispenser for dispensing the concentrate in the proper quantities and mixing it with the carbonated water, and a filling device for filling it into the bottles. Also included is a chiller unit for chilling the water
25 to be carbonated. Carbonation is carried out by bringing carbon dioxide and water into contact with each other in such a manner that the carbon dioxide dissolves into the water. Typically the water is over carbonated since in the step of dispensing into the bottles or cans, a

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certain amount is lost. Systems can be operated in which the water and syrup are mixed prior to or after carbonation.

5 In addition to bottled and canned carbonated beverages, carbonated beverages are also dispensed at restaurants, and at soda fountains and the like. The devices used for such dispensing are known as post mix dispensers, and include the same basic elements as one finds in a
10 carbonation plant. In other words, they include means for chilling the water, carbonating equipment for carbonating the water, a juice or syrup dispenser for dispensing metered amounts of concentrate and a tap for dispensing the mixture of concentrate and water into
15 a glass or cup. Typically, mixing of the concentrate and water is carried out at the tap.

It is felt that there is a need for domestic versions of such dispensers, because if carbonated beverages are
20 purchased in cans, for example, each time a can is used the contents of the whole can must be consumed. Any of the beverage left over for any period of time will lose its carbonation. Large reclosable containers to some extent overcome this problem. However, even though these
25 containers are reclosable, after a period of time, carbonated beverages in these containers, will lose their carbonation. Thus, the ability to in effect make carbonated beverages in the quantities needed in the home would be great advantage. However, for an in-home
30 dispenser to be practical, and economically feasible, it must be relatively inexpensive and easy to operate.

Until recently, there has been very little attention given to in-home carbonated beverage dispensers, and
35 in the in-home beverage dispensers which have been proposed, concentrate and carbonated water generally are mixed in ratios left to the judgement of the user. Thus

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someone making a drink would have to judge how much syrup to dispense into a given container, dispense that syrup and then add carbonated water or vice versa. Obviously, consistent consecutive beverages are not thus obtained.

5 Possibly, because of difficulties in using this type of device, in-home dispensers for carbonated beverages have not become as popular as it is felt they could.

10 In addition to carbonated beverages, large amounts of juices and other fruit drinks and large amounts of hot beverages are also consumed. In many instances, such beverages are also made by mixing a concentrate with a diluent and the present invention can be applied to the dispensing of such beverages.

15

The present invention relates to a system in which the concentrate for the dispenser is supplied in packages so that users, instead of carrying bottles and cans of carbonated beverage from stores to their homes, can simply
20 carry the packages of concentrate, which on a volume for volume basis will provide many more drinks than bottles or cans containing the same volume of carbonated beverage. The consumer therefore does not have to transport large quantities of water from store to home, which of course is a
25 considerable saving. As alluded to above many factors influence the creation of an efficient in-home dispensing system and the packages therefor. These factors include, but are not limited to, the size of the dispenser, the cost of producing a drink from the dispenser, as compared with
30 the cost of buying the equivalent drink from a supermarket or drug store, the number of flavours of drink which can be dispensed from the machine, the ease with which concentrate packages can be removed and replaced, the prevention of leakage and dripping of concentrate, the ability to dispense
35 the beverage in a continuous manner, the designing of the system so that certain sanitary conditions are met, and the keeping to a minimum cleaning of the device to keep it in a sanitary condition.

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It is perhaps because of the many difficulties which face in-home dispensers, that they have not been more widely used. The present invention provides a system for in-home drinks dispensing which, it is believed, either overcomes,
5 or goes a long way to overcoming, all of the aforesaid difficulties.

The system firstly provides a package for the concentrate to be used in the dispenser, and secondly a dispenser for use
10 with the said package.

A general object of the present invention is to provide an economical, efficient dispensing system (packages and dispenser) for beverages which are made by mixing a diluent
15 with a concentrate, in particular for carbonated beverages. Furthermore, by the use of such dispenser and packages, dispensing any of a plurality of different carbonated beverages such as cola, diet cola, quinine water, orange, rootbeer, etc., in an efficient manner, whould be possible.
20 In addition, such a dispenser should also be adaptable to dispensing still beverages such as fruit drinks or juices, and hot in addition to cold beverages. Although reference has been made herein to in-home use of the dispenser the dispenser and packages according to the invention can be
25 used anywhere, where post mix dispensing of beverages is required, such as in restaurants, bars soda fountains, etc.

Summary of the Invention

30 In accordance with the present invention there is provided a package for use in a beverage dispenser comprising:
a body for containing a quantity of concentrate to be dispensed and having a bottom, side wall means and a top;
a cap closing the top of the body;
35 a seal region defined by a first seal element on the top of the body; and a second seal element on the cap which sealingly engages the said first seal element to prevent in

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use the concentrate from passing the seal region;
means for mounting the cap on the body for movement relative
to the body to enable the first and second seal elements to
be relatively displaced to permit the liquid to flow past
the seal region when the package is in inverted
5 condition, and means in the cap for enabling fluid
communication between the interior of the package and a
source of propellant gas or atmosphere, to drive the
concentrate or enable flow of concentrate out of aperture
means subsequently formed in or provided in the cap when
10 the first and second seal elements are relatively
displaced.

The package of the invention therefore provides an excellent
means of distributing concentrate for beverages. If the
15 diluent is water, then if a person has a suitable dispenser,
and supply of water at its place of use it is not necessary
to transport large quantities of water as between the store
or supermarket and the place of use of the concentrate,
typically in a domestic dwelling.

20 The package is preferably designed so that no concentrate
will flow or drip therefrom when the package is lifted from
the dispenser, and to this end, the means whereby the
fluid communication can be established may comprise a
flexible split seal, acting as a one-way valve, which is
25 opened only when the package is in place on the dispenser
by means of a suitable projecting member of the dispenser,
and closed automatically when the container is removed from
the dispenser

30 Preferably, out-flow of concentrate from the container is
from an aperture, either provided by the user or provided
in the cap, such aperture being closed until the cap and
body of the package are relatively displaced to permit flow
of concentrate past the seal region and out of the outlet
35 aperture. By providing the outlet aperture in the cap, the
package can be arranged so that the concentrate which flows
therefrom is caught directly in the vessel from which the

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beverage is consumed, which represents a considerable advantage, as there will be no dilute beverage in contact with the dispenser, and the need for cleaning of the dispenser will be much reduced.

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The invention also provides the combination of a package as aforesaid and a dispenser and in accordance with this aspect of the invention there is provided the combination of a dispenser for dispensing beverages and a disposable package
10 for containing flavouring concentrate for the beverage, said package comprising:

a body containing a quantity of concentrate to be dispensed and having a bottom, side wall means and a top;

15 a cap closing the top of the body;

a seal region defined by a first seal element on the top of the body; and a second seal element on the cap which sealingly engages the said first seal element to prevent the
20 concentrate from passing the seal region;

means mounting the cap on the body for movement relative to the body to enable the first and second seal elements to be relatively displaced to permit the liquid to flow past the
25 seal region, when the package is in inverted condition;

means in the cap for enabling fluid communication between the interior of the package and a source of propellant gas or atmosphere, to drive the concentrate or enable flow of
30 the concentrate out of aperture means subsequently formed in or provided in the cap when the first and second elements are relatively displaced;

said machine comprising a liquid diluent outlet, means
35 enabling the dispensing of diluent from said outlet, a holder for holding the said package in inverted condition a movable component of said holder for displacing the

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cap relative to the body, to cause flow of concentrate therefrom and at the same time enabling the dispensing of diluent from said outlet whereby the diluent and concentrate can be caught in a drinking vessel.

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Furthermore, a novel form of dispenser is provided by the present invention. The dispenser of the present invention when for dispensing carbonated drinks is adapted to be either a self-standing unit which must be periodically
10 refilled with water, or to be a plumbed in unit to which water is supplied from the water mains. In addition, the dispenser of the present invention can optionally include a chilling unit, or alternatively, may be chilled using ice of the type of coolant known as "Blue Ice" commonly used or in cooler chests. Because of the flexibility of
15 the design of the dispenser of the present invention a range of embodiments suiting the particular needs and the pocketbooks of various consumers is thus possible.

20 The dispenser of the present invention contains all of the elements necessary in a carbonated drink dispenser packaged in a particularly compact unit which permits ease of dispensing and ease of interchange of different concentrates to permit dispensing as many different types
25 of drink as desired. The illustrated embodiment has the capability of containing two separate concentrate containers at one time. However, as will be evident below, the exchange of containers is particularly simple and straight forward, thus permitting the dispensing of
30 more than two different types of drinks without a great deal of effort. This is accomplished primarily through the use of the container aspect of the present invention.

As noted above, the dispenser of the present invention can
35 be self-standing or plugged into water lines. It is thought that a self-standing unit is more attractive to consumers at this time and for convenience the carbonator

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should be capable of being removed. A number of alternate carbonators are possible for use with the present invention. However, in a stand alone unit which must be periodically refilled with water, the simplest type of carbonator, one in which pressurized carbon dioxide is supplied at a low rate through a diffuser any undissolved gas collecting in a head space above the water, can be used. Thus, the system includes a pressure vessel for the water and includes means for admitting carbon dioxide under pressure to the diffuser from which it bubbles through the water.

Since this container is normally pressurized, it is necessary that safety features be provided to prevent danger to the user at the time of refilling the water container. Furthermore, the water container must be removeable for such purposes.

In accordance with another aspect of the present invention the carbonator contains a number of features to facilitate its removal and refilling in a safe manner. This includes a design of cover for the carbonator which is easy to use and prevents removal of the cover until pressure within the carbonator is released. This is accomplished by designing the threads by which the lid is screwed to the carbonator such that when under pressure great force is needed to rotate the lid and secondly by latching a relief valve in place as the cover is screwed on. The latch of the relief valve constitutes a stop preventing turning of the cover until pressure is released. Furthermore, a unique sealing arrangement of the cover is provided in which sealing occurs between the circumferential portions of the container and the cap so that it is not necessary that the cap be turned all the way in to insure pressure tightness, and if by some means the lid is rotated under pressure the seal is broken before the threads disengage and the pressure is released through the threads.

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Since normally, during operation, the carbonator is connected to a supply of carbon dioxide, means must also be provided to permit such connection to be quickly made and disconnected. Thus, the dispenser of the present invention also includes a quick release connection for the carbonator which contains appropriate valving means to shut off the carbon dioxide supply as the carbonator is removed from the dispenser and, at the same time, the water supply from the carbonator is disconnected. Since it is necessary that when the carbonator is in place it be held in contact with the quick release connection supplying the carbon dioxide, a special design of the handle including a pin for retaining the carbonator is provided. The handle on the carbonator is a folding handle which when folded into place inserts a pin into a base member on which the carbonator sits, holding the carbonator in place against connecting the block containing carbon dioxide and water supply parts. When the handle is extended to remove the carbonator the pin is removed from the base member permitting the carbonator to be pulled away. In accordance with an alternative embodiment of the present invention the carbonator is vertically mounted on the quick release connection thereby insuring proper contact by means of its weight.

25

As noted above, carbon dioxide is absorbed in water better when the water is chilled. Two possibilities for chilling of the water are provided. In accordance with one embodiment, thermoelectric chilling devices are provided with the carbonator resting on an assembly made of such. As an alternative, the carbonator rests on a cooling container which may contain a coolant commonly known as "Blue Ice". The "Blue Ice" container may be placed in the freezer, frozen and then inserted under the carbonator. Additional cooling may be obtained by either placing the carbonator, with water therein in a refrigerator overnight, and/or the placing of ice within the carbonator.

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The system also includes a carbon dioxide bottle which is provided with a regulator. Within the system, two separate pressures are required, a higher pressure for carbonating the water and for driving the carbonated water to the tap, and a lower pressure for pressurizing the concentrate container. Thus, two stages of regulation are required. Furthermore, the gas at the various pressure and the carbonated water must be transferred throughout the system. Typically, in existing dispensers, such is accomplished by tubes and hoses. However, in accordance with the present invention a unique manifold design is provided which permits carrying out essentially all of the distribution of materials using a single manifold block. Only a single tube connection between the manifold block and the carbon dioxide cylinder is required. Carbon dioxide from the cylinder which is regulated down to a pressure of 40 psi is supplied to the manifold which distributes it to the quick disconnect coupling for the carbonator. The quick disconnect coupling is a unit built into the carbonator which plugs into the manifold. Also, within the manifold is a regulator which drops the pressure of 40 psi down to 5psi for use in pressurizing the concentrate container. The manifold, through the quick disconnect coupling, also takes the carbonated water from the carbonator and supplies it to the diluent outlet.

Although the rotary valve used for dispensing can be made as a separate unit which plugs into the manifold, obtaining therefrom the carbonated water which it is adapted to dispense, and the low pressure carbon dioxide which it is adapted to supply to the concentrate container, in accordance with the preferred embodiment, the manifold and rotary valve are made into a single compact unit, further simplifying the construction of the dispenser. Because the length of the runs are short within the manifold, pressure drops are smaller and as the

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concentrate is not required to flow within tubes a low pressure of 5 psi is all that is required for pressurizing the concentrate container.

- 5 The total unit is disposed on a base and is enclosed by a plastic cover designed to allow easy heat evacuation. It is particularly compact, attractive, sanitary and inexpensive.
- 10 Although the dispenser of the present invention is disclosed primarily as a unit for dispensing carbonated beverages and also as an in-home dispensing unit, it is not limited to such functions. Obviously, as will become evident, the dispenser, with appropriate modification, can
- 15 also be used in restaurants, soda fountains and the like. Furthermore, in addition to dispensing carbonated beverages in which carbonated water is mixed with a concentrate such as a flavouring syrup, quinine concentrate or the like, the apparatus of the present
- 20 invention may also be used for dispensing still beverages and for dispensing hot beverages. In other words, it is generally adaptable to dispensing any beverage in which a concentrate is mixed with a diluent. The diluent need not be still water or carbonated water although in most cases
- 25 it will. As alluded to the above, by disposing the metering valve for the concentrate within the package and disposing the package above the dispensing valve, the concentrate need not touch any part of the dispensing apparatus. What this means is that dilute concentrate
- 30 which, particularly when it is something like syrup, can result in the growth of mold, never contacts the machine. This maintains sanitary conditions. Furthermore, the container is particularly adapted to filling in a near sterile condition which may be of particular importance
- 35 with respect to some types of hot and still drinks. In operation, when pressurized by a pressurizing gas, which could be an inert gas such as nitrogen where carbonation

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is not desired, the gas may be used to maintain near sterile conditions and to maintain flavour integrity in the apparatus over periods of time. In such a case, this pressurized gas would, of course, also pressurize the water supply. In other words, the various features of the present invention which give it its simplicity and compactness will be of advantage in dispensing other types of beverages, i.e., still cold and hot beverages, in addition to cold carbonated beverages. For example, the quick disconnect connection of the water supply, the manifold design, the valve and container design each will perform the same functions and give the same advantages.

Brief Description of the Drawings

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Fig. 1 is a block diagram of the dispensing system of the present invention.

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Fig. 2a is a front perspective view of a dispenser according to the present invention.

Fig. 2b is a rear perspective view of the dispenser of Fig. 2a.

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Fig. 3 is a plan view of the dispenser according to Figs. 2a and 2b.

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Fig. 4 is a plan view of the valve of Fig. 6 partially cut away showing the valve integral with a manifold.

Fig. 5 is a sectional elevation view of the pressure reducing valve of Fig. 4, the section being taken on line 5-5 in Fig. 4.

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Fig. 6 is an exploded perspective view of a practical embodiment of a package or container and a rotary valve according to the present invention.

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Figs. 6a, 6b and 6c are diagrammatic presentations illustrating the three possible positions of the valve of Fig. 6.

5 Fig. 7 is a section along the lines 7-7 of Fig. 4.

Fig. 8 is a section along the lines 8-8 of Fig. 4.

Fig. 9 is a section along the lines 9-9 of Fig. 4
10 illustrating the diluent flow channels.

Fig. 10 is a section along the lines 10-10 of Fig. 4 showing the valve of Figs. 4 and 6 in the dispensing condition.

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Fig. 10a is a section along the lines 11-11 of Fig. 4 illustrating the camming action within the container.

Fig. 10b is an unfolded view of the camming slot of Fig.
20 10a.

Figs. 11 and 12 respectively show two alternative, modified arrangements of the container arrangements.

25 Fig. 13 shows a further modified form of the container sealing arrangement.

Fig. 14 shows a further embodiment of the package invention.

30

Fig. 15 shows the arrangement of Fig. 14 when in the open condition.

Fig. 16 is a sectional elevation of a package according to
35 another embodiment of the invention.

Fig. 17 is a sectional elevation of the package shown in Fig. 16, but in the dispensing condition.

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Fig. 18 is a sectional elevation of a package according to yet another embodiment of the package invention.

5 Fig. 19 is a cross sectional view through an alternate embodiment in which the valve comprises relatively rotatable parts each containing an opening which can be aligned.

10 Fig. 20 is a cross section through the view of Fig. 19.

Fig. 21 is a similar cross sectional view of another embodiment in which two holes are lined up to open a valve to carry out dispensing in response to linear movement.

15 Fig. 22 is a cross section through the embodiment of Fig. 21.

20 Fig. 23 is a cross sectional view of an embodiment of the present invention utilizing a conventionally threaded bottle and cap in which rotation without opening is accomplished by means of a slotted rotating part in the dispensing valve.

25 Fig. 24 is an unfolded view of the inside of the rotating valve part shown in Fig. 23, showing the shape of the slot.

30 Figs. 25a-c are cross sectional views through the rotating part and cap of Fig. 23 showing the operation of this embodiment of the invention.

Fig. 26 is an exploded perspective view of the dispenser showing the carbonator section.

35 Fig. 27 is a sectional elevation view of the carbonator of Fig. 19.

Fig. 28 is a sectional elevation view of a thermoelectric

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cooling arrangement for the carbonator.

Fig. 29 is a schematic diagram of the cooling system of Fig. 23.

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Fig. 30 is a sectional elevation view of the carbonator lid of Fig. 19.

10 Figs. 31a-d are views of an alternative embodiment of a closure for the carbonator lid.

Fig. 32 is a perspective view of an embodiment of the valve adapted as a sink dispenser.

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Detailed Description of the Invention

The present invention will be described in detail in connection with an in-home dispensing unit particularly adapted for carbonated beverages. However, the various aspects of the present invention are also useful in other environments, such as in restaurants, soda fountains, etc. Furthermore, in addition to being useful for preparing carbonated drinks, the dispenser of the present invention can also be used for making still drinks, for example, for mixing a fruit juice concentrate with water to make a juice, and also for making hot drinks by mixing hot water with a suitable concentrate.

Thus, Fig. 1 is a generalized block diagram of a system according to the present invention. The system includes a water source 11. In more general terms, this is a source of diluent which is later mixed with a concentrate. Although it will, in most cases, be water, other diluents might be used. Shown in connection with the water source is an inlet 13. The inlet 13 may be an inlet which is plumbed into the plumbing of the location where the

dispenser is used or may simply be an opening in the water tank which permits refilling. The water from the water source is shown passing through a heat exchanger 15. Shown associated with the heat exchanger 15 is a cooling unit 17 and a heating unit 18. Cooling can be supplied to the heat exchanger 15 by opening a valve 19 and heating or cooling will be associated directly with the water source or water tank 11. In general terms, the heat exchanger 15 and associated cooling 17 and heating 18 simply comprise means for adjusting the temperature of the diluent. At the outlet of the heat exchanger 15 is a carbonator 23. Carbonator 23 is supplied with carbon dioxide from a tank 25 through a reducing valve 26, a line 27, a manifold 29. When the carbonator is in use, carbonated water is supplied over line 33 to the manifold 29. The manifold 29 supplies this water or other diluent to dispensing valves 35 and 36 in accordance with the present invention. Still water is applied over a line 34 to a mixing valve 31 which has a second inlet supplied with carbonated water from line 33 and permits supplying to dispensing valve 36 any desired proportions or mixture of still and/or carbonated water. Also located at the dispensing valves 35 and 36 are containers 37 filled with a concentrate which is to be mixed with the diluent. As will be more fully described, the metering valve for concentrate is in the container 37 and is coupled to and cooperates with the dispensing valves 35 and 36. That is, the container 37 with the concentrate includes valving means to meter the amount of concentrate in response to a relative movement of two parts of a container brought about by the dispensing valve 35 or 36. The supply of carbon dioxide over line 27 is also used to pressurize the concentrate in the containers 37 after being coupled through a reducing valve 39. Also shown is a line 40 coupling carbon dioxide to water source 11 to supply the diluent at a constant pressure. As with the means for changing the temperature of the diluent the

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carbonator may also be built into the water container as is the case in the embodiment to now be described. In that case, water source 11 is also the carbonator. Furthermore, although carbon dioxide is shown as the pressurizing gas, in embodiments where carbonation is not
5 desired, it may be replaced by any inert gas such as nitrogen.

The Dispensing System

10 The embodiment of the dispenser of the present invention illustrated in perspective view of Figs. 2a and 2b includes a supporting structure 41 which is preferably of molded plastic. Structure 41 includes a base 43 and an upstanding T-shaped portion 45. The T-shaped portion 45
15 includes a top wall 47 front and rear walls 49 and 51, respectively, and a central divider 53. At the one end of the unit, as best seen in Fig. 2b, mounted to the base 43 is a cooling unit 55. Shown in the cooling unit 55 are ventilation openings 57 which communicate with additional
20 ventilation openings 59 formed in the base 43. Disposed atop the cooling unit 55 is a diluent tank, e.g., a water supply and carbonator tank 61 to be described in more detail below. Surrounding this portion of the unit is a cover 63 which has a depending flange portion 65 which
25 engages corresponding lip 67 on the central portion 45. As will be described in more detail below, the carbonator is adapted to be easily removed and refilled with water when necessary. As an alternative to a cooling unit 55, a heating unit, or combined heating and cooling unit, can be
30 provided to permit the possibility of dispensing either cold or hot drinks.

At the other end of the dispensing apparatus, supported on the base 43, is a tank of a pressurizing gas, e.g., a
35 carbon dioxide tank, 68 shown in the phantom. The carbon dioxide tank or bottle 68 is connected to a reducing valve 69 by means of a quick disconnect clamp 71 to permit ease

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of replacement of the carbon dioxide bottle 68 which may be a conventional commercial unit. Extending through the dividing wall 53 and secured to a bracket 73 thereon by means of screws or bolts 75 is a manifold 77 which will be described in detail below. The manifold 77 distributes the pressurizing gas and diluent, e.g., carbon dioxide and carbonated water. The front portion of the manifold 77 is visible on Fig. 2a. Integral with the manifold are two dispensing valves 79A and 79B to be described in detail below. Disposed above each of the dispensing valve 79A and 79B is a container 81 containing therein a concentrate to be mixed with the diluent supplied from the diluent tank 61. Below valves 79A and 79B is a removable tray 82, retained magnetically for example, for catching any spillage. Tray 82 may be removed and rinsed periodically. Again, although disclosed hereinafter as supplying carbonated water, it will be recognized that, by disconnecting the carbonator apparatus, still beverages can be dispensed, and, by heating instead of cooling the diluent, hot drinks can also be dispensed. As will become more evident below, the containers 81 are particularly adaptable to packaging and storing all types of concentrate in a sanitary manner.

Covering the carbon dioxide tank 68 is a second cover 83, which similarly has a depending flange 85 engaging a lip on the T-shaped central structure 45.

Fig. 3 is a plan view of the dispenser of Figs. 2a and 2b with the covers 63 and 83 removed and the T-shaped center section 45 also removed for clarity of presentation. In this view, the carbon dioxide bottle 68 is visible along with its quick disconnect clamp 71 and reducing valve 69. The reducing valve is semi-rigidly mounted and coupled by tubing 87 to the manifold 77. Portions of valves 79A and 79B which are molded integrally with the manifold are also shown. Also shown in cross section is the carbonator tank

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61. The carbonator tank contains a coupling 89 which permits a quick disconnect with the manifold 77.

Reducing valve 69 reduces the carbon dioxide pressure to
5 40 psi. CO₂ at this pressure is fed through a passage
91 in the manifold 77 to the disconnect coupling 89. From
that point it flows through tubing 90 to a restrictor 93,
and thence to a diffuser 95. Carbonated water is removed
10 from the carbonator tank through a line 97 extending to
the bottom of tank 61 and leading to the coupling 89
whence it enters a passage 99 in the manifold. This
passage connects with two smaller passages 101 and 103,
which lead to outlets 105 and 107, in the portion of the
valves which is integral with the manifold. At each of
15 the outlets an O-ring seal 109 is provided. Carbon
dioxide is also fed through a further pressure reducing
valve 111 which is built into the manifold, where the
pressure is reduced to 5 psi. From valve 111 the carbon
dioxide flows in a passage 113 to which are connected two
20 passages 115 and 117, which lead to elongated openings 119
and 121 in the portion of the manifold which comprises
part of the valve. Again, in each case an O-ring seal 123
of neoprene or the like is inserted. Although the
manifold 77 can be made of various materials, a plastic is
25 preferred. With such plastic the manifold can be molded
and any necessary machining carried out to form the
various passageways.

The Manifold

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The manifold 77 and the dispensing valves are shown in
more detail in Fig. 4. At the inlet for carbon dioxide, a
threaded fitting 125 is provided in the manifold. As
illustrated, this communicates with a channel 127 which is
35 connected directly to the passage 91. This is seen in
more detail in Fig. 5 which is a cross section through the
reducing valve. Inserted into appropriate bores 129 and

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131 on the left side of the manifold 77, are tubular fittings 133 and 135. These are press fitted into their respective bores 129 and 131. Each contains, threaded therein, a check valve, i.e., a Schrader type valve, 137a and 137b respectively. The fittings 133 and 135 insert into the quick disconnect coupling 89 in the carbonator tank 61 and are sealed by O-rings 136. Within a bore 130 in the coupling 89, mating with the fitting 129, is disposed an anvil 139 followed by a check valve 141 which is blown open by carbon dioxide pressure from the line 91. In a bore 136 of the coupling 89 which mates with the fitting 135 is inserted another Schrader valve 143. The valve 143 abuts against the valve 137b opening both valves when the quick disconnect coupling 89 is attached to the manifold. Similarly, the anvil 139 opens the valve 137a. In this manner, when the carbonator is disconnected from the manifold, there is a check valve in both passages of the manifold and in both passages into the carbonator to prevent release of pressure. The coupling 89 also contains, at its inside, threaded bores 144 and 146 for connecting lines 90 and 97 of Fig. 3. The stub connections 104, 118 are for connection to a remote dispensing valve.

The pressure reducing valve 111 is shown in more detail in the cross section of Fig. 5 which is taken along the line 5-5 of Fig. 4. Carbon dioxide at a pressure of 40 psi reaches the channel 91 through the inlet passage 127 shown on Fig. 4. After passing through the pressure reducing valve, gas at 5 psi is fed to the channel 113 by means of an outlet passage comprising a bore 145 in the manifold. The manifold in an area above the bore 145 contains a large bore 147. Extending down from the bore 147 and in the center thereof is a smaller bore 149. This bore intersects with the passage 91 containing the 40 psi CO₂. The upper portion of bore 149 is threaded and contains a guide and valve seat 151. Guide 151 guides a tube 153 attached to a diaphragm 155 by means of a supporting plate 157. The diaphragm is secured in place

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between a body member 159 which is inserted into the bore 147 and a cover piece 161, body member 159 may be integral with the manifold. The actual valving which carries out the pressure reducing takes place between the guide 151 which forms a valve seat and a valve member 163 containing in its central portion a gasket 165. The valve member 163 abuts and seals to the end of the rod 153 and is biased outward by a spring 167. The spring tends to bring the valve member 163 with its gasket 165 into engagement with the seat on the guide 151. Spacing between the member 163 and the guide and valve seat 151 determines the pressure of the gas which reaches a chamber 169 from whence it flows out the outlet bore 145. On the cover piece 161 is mounted an adjustment knob 171, having thereon a threaded rod 173 which acts on a nut 175 which is prevented from rotating by being contained in a suitable recess in the cover piece 161. Thus, rotation of the knob 171 results in linear up and down motion of the rod 173. A flange 176 secured to the rod acts upon a biasing spring 177 which is disposed between the flange 176 and the disc 157 at the diaphragm 155. This arrangement with the spring 177, the pressure of which is adjustable by the knob 171 and the diaphragm, coupled to the tube 153 which operates the valve member 163, results in the seating and unseating of the valve member 163 on the seat of guide 151 such as to maintain the pressure in the chamber 169 in accordance with the biasing pressure set with the spring 177. In this manner, by adjusting the knob 171 the desired pressure of 5 psi is obtained at the outlet 145.

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The Dispensing Valves and Concentrate Containers

The construction of the dispensing valves 79A and 79B shown in Fig. 2a can best be understood first with reference to Figs. 6, 6a, 6b and 6c, in addition to Fig. 4. In the illustrated embodiment, each valve is made up

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of four basic parts. These include a base portion 181 which is molded as part of the manifold 77. However, it should be recognised that such base portions can be made separately with appropriate connections for carbon dioxide pressure line 117 and water inlet line 103.

Since both valves are identical, only the right hand valve 79B will be described in detail. The base portion 181 of the valve is a member containing a large cylindrical bore 182. At the bottom of this bore is located the inlet opening 121 for the carbon dioxide with its O-ring seal 123 and the inlet opening 107 for the diluent, e.g., carbonated water, with its O-ring seal 109. Also located in the base portion is a vent hole 183, an opening 185 through which the concentrate, e.g., a syrup, will be dispensed in a manner to be described below, and a drain passage 187 for the residue of diluent, e.g., carbonated water, after it has passed through the valve. Inserted into the bore 182 is a central rotatable valve member 189. It is supported within the bore 182 for rotation therein in response to operation of a handle 191 and seals against O-rings 109 and 123. Overlying the central rotatable member is an adjustment disc 193. The adjustment disc remains essentially fixed but is adjustable to take into account different environmental conditions in metering of the concentrate. This adjustment is accomplished by an adjusting screw 195. As can best be seen from reference to Figs. 4 and 6, the adjusting screw includes a knob 196 on the end of a shaft 198. The shaft passes through and is rotatable within a threaded plug 197. The threaded plug 197 is screwed into a cover portion 201 of the valve which fits over and retains in place central member 189 and adjusting disc 193. Near the end of the shaft 198 is a worm gear 199 which is secured thereto. When inserted into the cover portion 201, the end 203 of the shaft 198 is supported for rotation in a bore 207, as best seen in Fig. 4. The worm gear 199 is exposed through an opening

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194 and engages appropriate teeth 209 on the adjustment disc 193 permitting a limited degree of rotation thereof. Once adjusted by the adjustment screw 195, however, the disc 193 remains fixed.

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As shown in Fig. 6, container 81 includes a body in the form of a necked bottle 238 and a cap 230. The bottle may be of a transparent or translucent material so that the contents can be viewed when the container is in use, and a user can see at glance the level of the contents of the container. Dispensing of the concentrate from the container 81 is in response to a relative rotation of its cap 230 with respect to tabs 211 on the neck of the bottle 238. This opens a valve in container 81 and carries out a metering action in a manner to be described more fully below. To accomplish this rotation, the cap 230 also contains a tab 213. The tab 213 engages in a notch 215 in the central member 189. The tabs 211 engage in notches 217 in the adjustment disc 193. The central valve member 189 is arranged to rotate a given amount to open the metering valve within the container by rotating cap 230 which is engaging the notch 215 in the central valve member 189. Fine adjustment of this metering is possible by means of the adjusting screw 195 which increases or decreases the initial setting of the position of the cap 230 relative to the body 238 so as to vary the rate of flow of concentrate from the container upon a pre-set and subsequent rotation of the cap 230.

30 The dispensing valve performs three separate functions. It performs a function of venting the container, a function of pressurizing the container with the low pressure carbon dioxide and a function of causing the simultaneous dispensing of concentrate and diluent. The central valve member 189 contains a central bore 219 in and at the bottom of which there is provided a cylindrical member 221, containing a partial bore 232 in the upper

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portion thereof, and supported by three struts 223. One of the struts 223 contains therein a passage 225 (Figs. 6a; 6b), which communicates with the bore 232. The other end of the passage 225 is brought through to the bottom of the central valve member 189 and at a location permitting alignment with vent hole 183 and outlet 121 in the base member 181 of the valve. As best seen from Figs. 7 and 8 inserted within the bore 232 is tubular member 227. This tubular member communicates with a tube 229 (Fig. 7) extending to the bottom of the container 81 (which will be the top with the container 81 in the inverted position shown) for the purposes of venting and pressurizing, in a manner to be more fully described below.

With reference to Fig. 6a, the position of the valve with the handle 191 fully to the left is shown. In this position containers are inverted into and removed from the equipment and the passage 225 is aligned with the vent hole 183 permitting venting of the container 81 through tube 229, a tubular member 227 (Fig. 7) in bore 232, passage 225 and vent hole 183. This corresponds to the cross sectional view of Fig. 7.

In the position shown in Fig. 6b, which is a quiescent position of a container in the machine, the interior of the container is pressurized but there is no flow of concentrate or diluent from the machine, and the container cannot be removed from the machine, handle 199 is centered, the passage 225 is overlying the opening 121 and is sealed by the O-ring seal 123. This admits the low pressure carbon dioxide to the passage 225 from whence it can flow through the tubular member 227 into the container through tube 229, to pressurize the container with a constant pressure. In this position, the diluent outlet 107 with its seal 109, is still covered by the bottom of central valve member 189. This corresponds to the cross section of Fig. 8.

Finally, in the position shown in Fig. 6c, which is the dispensing position in which concentrate and diluent flow from the machine, and the container cannot be removed, handle 191 is all the way to the right, and an inlet opening 231 in central valve member 189 is aligned with the opening 107 to permit a flow of diluent, e.g., carbonated water, through and out of the valve. At this time, because of the elongated opening 121, the passage 225 is still in communication with the carbon dioxide supply to maintain pressurization of the container. This corresponds to the cross section of Fig. 9 and 10. Movement of the handle 191 to the right takes place against the biasing force of a spring 233 which is arranged to return the handle 191 to its middle position.

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Once pressurized, if it is desired to remove the container with the concentrate and replace it with another, it is only necessary to move the handle 191 to the position shown in Fig. 6a, to vent the container 81 to permit relieving the pressure therein and allow removal.

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The cross section of Fig. 10 shows the passage 225 still aligned with the opening 121 during dispensing. The passages for the carbonated water in this position, i.e., the position also shown in Fig. 6c, is illustrated by Fig. 9. Shown is the passage 103 which communicates with the opening 107 which is surrounded by the O-ring seal 109, sealing against the rotary valve member 189 and communicating with the passage 231 therein. The diluent thus flows into a pressure reducing chamber 235, and thence out of a spout 237, which is carried by member 189. It will be appreciated that spout 237 therefore moves with member 189 and because it projects under the base 181 the base is provided with a lobe cut-out 237A (Fig. 4) to permit the spout so to move. The spout is directed at an angle to cause mixing of the diluent and concentrate in a manner to be seen more clearly below in connection with

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Fig. 10. Chamber 235 is designed for minimum agitation of the diluent to prevent excessive loss of carbon dioxide. The dimensions of chamber 235 and spout 237 are such that an adequate flow of diluent is maintained, and that with a
5 predetermined diluent pressure, the outlet flow rate is sufficient to obtain the necessary mixing with the concentrate without excessive foaming. When the handle 191 returns to the position shown in Fig. 6b, the passage 231 overlies the drain passage 187 which has a downward slope.
10 Thus, any diluent remaining in chamber 235 can drain into a glass or cup placed below.

Referring now to Figs. 8 and 10, it will be seen that the bottle 238 has a plug 239 in its neck. The plug contains
15 a central bore 241 having a sloped portion, i.e., of somewhat conical shape, 243 at its inner end. There is a central passage 245 through the inner end of the plug. The plug is of generally cylindrical shape and is press fitted into the neck 247 of the bottle 238.
20 Alternatively, it can be molded as part of the bottle 238. At its outer end, the plug contains a circumferential flange 249 which extends beyond the neck 247 of the bottle. Placed over the neck of the bottle is the cap 230. The cap contains, in its central portion, a
25 cylindrical shaped member 251 which terminates in a conical section 252 at its inner end. Conical section 252 abuts against the tapered conical section 243 of the plug 239. Inwardly extending member 251 contains at the inner end thereof, a bore 253 into which is inserted the dip
30 tube 229. The dip tube extends through the opening 245 in the plug with a spacing. At the outer end of the cap, in the center thereof, is a larger bore 255 extending into member 251 and communicating with bore 253. At the inner end of this bore a check valve 257 is disposed. In the
35 case of the present embodiment, the check valve is in the form of a split seal valve. However, any other type of check valve can be used. The split seal check valve is

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held in place by a cylindrical insert 259. The fitting 227 which is surrounded by an O-ring seal 260 to seal inside the cylindrical insert 259 in cap 230, is inserted into the center of the insert 259 and acts against the check valve 257 to open it permitting carbon dioxide to flow into the container through the dip tube 229. In the portion of the container above the plug 239, the concentrate will be contained. The cooperation between the plug 239 and the inward projecting member 251 on the cap perform the valving action needed to dispense a metered amount of concentrate. The conical surface 243 of plug 229 forms a valve seat for the conical tip 252 of member 251. It can be seen, that movement of the member 251 away from the plug 239 will permit a flow of concentrate around the dip tube 229 and into the area between the member 251 and the plug 239.

What happens when such movement occurs is illustrated by Fig. 10. As shown by the arrows 261, concentrate flows around the dip tube 229 and into a space 263 between the plug 239 and the member 251. At the same time, the flange 249 has been lifted away from the cap 230 and an opening 265 formed in the cap is exposed. In the closed condition, a double seal is provided. First there is the seal between conical surfaces 252 and 243. Second is the seal provided by the flange 249 over opening 265. With the cap 230 moved downward, concentrate can now flow through opening 265 under the pressure which is maintained in the container because of the CO₂ and drop, through a gap between the struts 223 shown in Fig. 4, and Fig. 6c, into a cup 267, placed below the dispensing valve. The flowing concentrate 269 flows essentially straight down. The diluent, e.g., the carbonated water, flows from the spout 237 at an angle intersecting the flow of concentrate in free space and mixing with it prior to reaching the cup 267.

As noted above, the valve within container 81 is opened in response to rotation of its cap 230 with respect to its body 238 brought about by rotation of central valve member 189 with respect to adjustment disc 193 which, once
5 adjusted by adjusting screw 195, remains fixed during operation. The manner in which the rotary motion of the central valve member 189 brings about a separation of the plug 239 and the cap 230 is best illustrated by Figs. 10a and 10a. In Fig. 11a the insertion of the tabs 211 into
10 the slots 217 in the adjustment ring 193 is illustrated. As described above, this holds bottle 238 fixed. Furthermore, the manner in which the tab 213 on the cap 230 is inserted into the slot 215 to cause the cap 230 to rotate with central valve member 189 is also evident. The
15 relationship between these parts is also illustrated in Fig. 6 and Fig. 4.

As illustrated in Fig. 10a, the neck 247 of bottle 238 contains a pair of opposed projecting nibs 271. These
20 projecting nibs fit into cam slots or grooves 273 formed on opposite sides of the inside of cap 230.

A view of a portion of the cap 230 unfolded is shown in Fig. 10b. In this figure, the shape of the slots 273 is
25 evident. The slot contains a horizontal portion 275 followed by a sloping or angled portion 277. It can be seen that, as the central valve member 189 is rotated, it carries with it the cap 230 because of the insertion of the tab 213 in the slot 215. Rotation while the nibs are
30 in the horizontal area 275 of the slot will result in no relative linear up or down motion between the cap 230 and the bottle 238, and thus the valve formed by the plug 239 and the member 251 remains closed. Travel in the horizontal portion 275 takes place between the positions
35 of central valve member 189 shown in Fig. 6a and 6b. However, with further rotation to the position shown in 6c the nibs 271 will begin to move into the angled portion

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277 causing the projection 251 to move away from the insert 239, in order to reach the position shown in Fig. 10, to dispense the concentrate at a preset metered flow rate. It will be arranged that the nibs 271 will be in a position in the said straight portions 275 intermediate the ends thereof when the container is in the machine and the rotary valve is in the position shown in Fig. 6a to enable ring 193 to be adjusted in both directions but that movement of the rotary valve to the Fig. 6b position will not cause the nibs 271 to ride up the angled portion 277. Also, the angled portions 277 should be of sufficient length that the nibs lie between the ends of the angled portions 277 when the machine is in the Fig. 6c position, again to permit the adjustment of said ring 193.

Also shown in cross section on Fig. 10a is the worm gear 198 of the adjustment screw 195 of Figs. 4 and 6. it is evident, that the dispensing action, i.e., the opening of the valve in the container takes place because of a relative movement between the cap 230 and the bottle 238. During normal operation, the bottle 238 is held fixed because of the insertion of the tabs 211 in the slots 217 in the adjustment ring 193. Thus, during normal dispensing, the starting position i.e. when in the position of Fig. 6b of the nibs 271 in slots 273 and the degree of rotation of the cap 230 by means of the tab 213 in the slot 215 in the central valve member 189 determines the degree of opening of the valve i.e. the amount of travel of nibs 271 in sloping portions 277. This total amount of rotation of cap 230 is fixed, in that movement of the lever 191 of Fig. 6c is limited by the spring 233. Normally, for a given concentrate, the nibs 271 will be positioned, as explained herein, during manufacture so that when the container is inserted in the valve, movement of the member 189 between the Figs. 6a and 6c position, will give the desired amount of valve opening based on the viscosity of the concentrate and on a

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standard ambient temperature, e.g., 20°C, without any adjustment of the adjustment screw 195. However, if the drink dispenser is operated under ambient conditions where a higher or lower temperature exists, this will affect the flow rate for a given opening of the valve. For example, although in the temperature climates a temperature close to 20°C. will normally be maintained in wintertime, in the summertime temperatures considerably higher may occur. The higher temperatures in many cases will lower the viscosity of the concentrate and too much concentrate may be dispensed. The adjustment screw 195 is utilized to solve this problem. If the user finds that too much or too little concentrate is being dispensed, the adjustment screw can be turned. This rotates the adjustment ring 193 and in effect causes a relative rotation between the cap 230 and bottle 238 to bias the nibs 271 in one direction or the other. In turn, this means that for a given rotation of the central valve member 189 the nibs 271 will move up the angled or sloped portion 277 a greater or lesser extent. This in turn will control the degree to which the valve is opened. To enable the adjustment to take place, the said slots 277 must, as explained herein, be of sufficient length.

25 The Operation of the Valve and Container

The operation of the dispensing valve will now be explained. With reference to Fig. 3 a carbon dioxide bottle 68 will be in place and the carbonator 61 will be filled with water which has been carbonated by passing carbon dioxide through it, the carbon dioxide being passed through the diffuser 95. The carbonator will be at the pressure of 40 psi to which the regulating valve 69 is set, i.e., this pressure will be maintained in the head space above the water in carbonator 61. The detailed operation of the carbonator and the manner in which it is refilled will be described below. Furthermore, the water

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in the carbonator will have been cooled by the cooling means 55 shown on Fig. 2b. These, too, will be explained in more detail below. Low pressure, 5 psi carbon dioxide will be available in the passage 113, and, because of the
5 pressurization of the carbonator 61, carbonated water under pressure will be available in the passage 99. Thus, at each of the valves a supply of carbon dioxide will be available at the outlets 119 or 121 and a supply of carbonated water at the outlets 105 and 107. Containers
10 of the desired concentrates are then inserted into the dispenser. For example, the concentrates may comprise a syrup for making soft drinks such as cola, orange soda, root beer, etc., or can comprise, for example, an additive to make quinine water and so forth. In an alternate
15 embodiment where water was not carbonated, the concentrate could be a fruit juice concentrate, or, where it was desired to make a hot drink, for example, a coffee, tea or hot chocolate concentrate.

20 With the valve in the Fig. 6a position, the container 81 with the concentrate is inserted into the valve or valves (the illustrated embodiment includes two valve mechanisms' however, a single valve or more than two could be provided). It is inserted so that the tabs 211 are in the
25 slots 217 and the tab 213 inserted into the slot 215, as best seen from Figs. 6 and 11. As it is inserted the member 227 will open the check valve 257 (Fig. 8). At this point, the handle 191 will be in the position shown in Fig. 6a. This will bring the dip tube 229 which is in
30 communication with the inside of the container in communication with the vent hole 183 through the passage 225 shown on Fig. 6a.

Next, the handle is moved to the position shown in 6b. No the passage 225 is lined up with the outlet 123 and carbon
35 dioxide passes to the fitting 227 and through the check valve 257 and the dip tube 229 into the bottle 218 to

pressurize it. During this movement between the position of Figs. 6a and 6b, the nibs 271 move in the straight section 275 of the slot 273 in the cap 230 shown in Figs. 10a and 10b.

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When it is desired to dispense a drink, the handle 191 is pushed to the right from the Fig. 6b position to that shown in Fig. 6c against the force of the return spring 233. In this position, the channel 225 is still lined up
10 with the opening 121 and the container remains pressurized. The water outlet 231 lines up with the opening 107 and carbonated water is dispensed from the spout 237 shown on Figs. 9 and 10. The nibs 271 have now moved into the slanted section 277 of the slot 273 in the
15 cap 230. This results in the cap being moved away from the bottle so that the member 251 moves away from the plug 239, opening the metering valve for the concentrate which now flows in the direction of the arrows 261 shown on Fig. 10 into the space 263 and thence out the hole 265 in the
20 cap and down toward a cup 267 in a stream 269. The downward flowing stream 269 intersects the stream 270 of carbonated water in free space causing the two to mix intimately as they are dispensed into the cup 267. When the desired amount of drink has been dispensed, the handle
25 191 is released and returns to the position shown on Fig. 6b. The bottle 238 remains pressurized, but the flow of concentrate is stopped because of the closing of the valve therein and the flow of carbonated water stopped because of the movement of the outlet 231 away from the opening
30 107.

Any water left in chamber 235 or inlet 231 of Fig. 9 can drain both through spout 237 and drain outlet 187 to completely drain all diluent. From this point on,
35 additional drinks can be dispensed simply by moving the handle 191 to the position shown in Fig. 6c.

Assume for the moment that the two concentrate containers 81 contain respectively cola and diet cola. Assume it is

now desired to dispense quinine water. One of the containers 81 must thus be removed and replaced with another containing a quinine water concentrate. The container 81 to be removed is, of course, pressurized. To
5 relieve the pressure in the container 81 the handle 191 is moved to the position shown in Fig. 6a. In this position, the container is now vented, venting taking place through the passage 225 and the vent opening 183. With the pressure relieved on the concentrate container 81 it may
10 now be removed. As it is removed, referring to Fig. 8, it is evident that once it is lifted upward and the fitting 227 is no longer acting against the check valve 257, the check valve 257 will close. This prevents any possibility of the concentrate getting into or dripping out of the
15 dip tube 229. The new container is then put into place after which the steps described above are followed.

Typically, the cola concentrate will be a relatively thick syrup whereas the quinine water concentrate will be
20 relatively thin. This requires different degrees of opening of the valve made up by the member 251 and plug 239. The necessary metering which must be carried out is accomplished by adjusting the positioning of the tabs 213 with respect to slot 273 on the cap 230 during
25 manufacture. In other words, in the rest position, referring to Fig. 10b, for a cola syrup the nib will be relatively close to the angled section 277, but not so close as to cause flow of concentrate from the container when the rotary valve is in the Fig. 6b position. On the
30 other hand, for something like quinine water it will be placed further to the left so that, with movement of the valve to the Fig. 6c position, the nibs 271 will only ride up on the angled portion a small amount. Alternatively, this control can be obtained by using different angles on
35 the angle portion 277.

The various advantages both with respect to construction

and operation of the dispensing arrangement including the valve and container should be evident. It can be made essentially of all plastic parts which are easily molded, other materials can of course be used. For example, the
5 bottle 238 may be made of glass or metal. By forming the dispensing valve in one piece with the manifold and through the design of a manifold which essentially carries the supply of materials to the valve, the need for numerous tubes and the disadvantages associated therewith
10 is avoided. The design of the valving in the container permits presetting at the factory with the adjustment screw on the manifold giving the fine adjustment necessary to take care of temperature variations or personal taste. Furthermore, it is important to note, when referring to
15 Fig. 10 that the concentrate passes directly from the container into the cup. It has been well established, that mold growth is likely to occur with dilute syrup. With the disclosed dispensing arrangement the syrup is diluted only after leaving the dispenser. This offers
20 great advantage over most prior art dispensers in which mixing took place within the machine and which could lead to unsanitary conditions.

It is possible to design the package or container
25 according to different methods and several alternative constructions are illustrated in Figs. 11 to 18.

Referring to Figs. 11 and 12, in these drawings are shown two alternative sealing constructions to the seal
30 arrangement 243/253 shown in Figs. 7, 8 and 10.

In the arrangement of Fig. 11 the dip tube 28X is provided with a reduced diameter valve portion 80X, and where the portion 80X widens to the larger diameter at the lower end
35 thereof, it engages in a sealing fashion against an injection moulded plug 82X, sealingly and friction fitted in the package neck 12X. In use, when the cap 18X is

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rotated as described previously and moves away from the body 10X, the reduced diameter portion 80X moves to the dotted line position shown in Fig. 11, so that the concentrate can flow past the plug 82X, and the reduced
5 diameter portion 80X of tube 28X and out of apertures 32X to meet the flowing carbonated water.

In the arrangement shown in Fig. 12, the tube 28X has a flexible bulbous portion 90X which sealingly engages the
10 shoulder 13X of the package neck 12X, and when the cap 18X is rotated, as described previously, relative to the body 10X, the bulbous portion 90X changes shape as shown in dotted lines in Fig. 12, whereby the syrup can flow past the tube 28X and past the now deformed bulbous portion 90X
15 and flow out aperture 32X. When the cap 18X is once more rotated in the opposite direction, in either the Figs. 11 or 12 embodiment, sealing is once more established between the tube 28X and the shoulder in the case of Fig. 11 embodiment or the bulbous portion 90X and shoulder 13X in the case of Fig. 12 embodiment.

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The arrangement shown in Fig. 13 is essentially similar to that shown in Fig. 11 in that the tube 28X is again provided with a restriction 80X but in this case, the plug
25 82X, in the closed condition of the container, frictionally and sealingly engages the larger diameter portion of the tube 28X at the lower end thereof. As the cap 18X is rotated in a dispensing action (movement from the Fig. 6b to the 6c position), the apertured region of
30 the plug 82X encircles the restriction 80X, creating fluid communication between the interior of the package and the outlet aperture 32X, so that syrup can flow from the container whilst carbonated water also flows as previously described. In each of the embodiments illustrated in
35 Figs. 11 and 13, the cap 18X is not easily removable by virtue of the upper portion of the tube 28X being of enlarged diameter.

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Turning now to Figs. 14 and 15, the embodiment of the invention of the container illustrated in these Figs. is different from the previously described arrangements, in that the cap is integral with the package body, but the operation of the container bears similarity to the operation of the arrangement described in Fig. 12. In the Figs. 14 and 15 arrangement, the body is again illustrated by numeral 10X, but numeral 120X illustrates an integral combined neck and cap, this cap being integrally connected to the container body 10X by means of an inwardly waisted portion 122X which sealingly engages a bulbous portion 90X of the tube 28X which again as shown is integral with the cap 120X. Again, the outlet aperture 32X is provided in the cap, but in addition the cap has outwardly directed integral bayonet pins 124X which slide through slots or keyways 41X and 43X in the members 193 and 191 (refer to Fig. 6) which replace slots 217 and 215. The slots 41X extend through the entire width of the member 193 whilst slots 43X extend only as far as circumferential cam slots 45X. Fig. 14 shows the arrangement immediately after the package has been inserted in the apparatus. When the member 191 is rotated so as to effect discharge of concentrate from the package as described herein, by virtue of the pins 124X engaging in the circumferential cam slots 45X, the cap 120X is forced downwardly in Figs. 14 and 15 as indicated by arrow 126X causing the cap 120X to move away from the body 10X, the member 193 preventing any bodily movement of the package in a downwards direction. This action has the effect of lowering the tube 28X, and also of opening up the waisted portion 122X as shown clearly in Fig. 15 so that there is established a path of fluid communication as indicated by the arrows in Fig. 15 between the interior of the package and the outlet 32X, which condition will prevail when, as described herein, the other components of the dispenser cause discharge of the carbonated water simultaneously to produce a carbonated beverage in a container. The

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5 advantage of the package illustrated in Figs. 14 and 15 is that it can be sold as a completely sealed unit, outlet 32X being for example covered by means of a tear strip or rip cap, or it may be provided simply by forming a hole in the container before use in the machine to provide the outlet 32X. When the member 191 is rotated in the opposite direction by the spring 233, i.e., to terminate the flow of syrup and carbonated water, the resiliency of the waisted portion 122X assists in returning the cap 120X to the Fig. 14 position in which the bulbous portion 90X once more closes the interior of the package body from the outlet 32X, and flow of syrup ceases. It is appreciated that other embodiments of the invention based upon the principle described with reference to Figs. 14 and 15, can be devised. For example, the bulbous portion 90X may lie above the waisted portion 122X or indeed the tube 28X can be of a construction as shown in Fig. 11 or Fig. 13.

20 Instead of providing a split seal or other type of one way valve in conjunction with the dip tube 229, 28X or it is possible to provide the inner end of such tube with a "blow-off cap" such as shown in Fig. 7 which keeps the dip tube closed until it is used. Cap 9 is not present when a one way valve is used. As an alternative, cap 9 may be made of flexible material such as rubber with a slit to act as a check valve, which could be advantageously used in near sterile conditions to maintain an inert atmosphere. In such cases there may be a check valve in the carbon dioxide line which is opened only in response to a package being inserted in the machine.

35 In the already described embodiments of the invention, as related to the package or container, a propellant gas (CO_2) is used to drive the concentrate from the package through the outlet aperture, when the cap is displaced. It is also possible to arrange within the scope of the invention for the package to be a "gravity feed"

dispensing device, and the embodiments of the invention of the package shown in Figs. 16 to 18 are the so-called gravity feed arrangements.

5 Referring to the embodiment shown in Figs. 16 and 17, the body of the package is represented by numeral 200X, and like the previous embodiments is provided with a reduced diameter neck portion 202X, the mouth of which forms a seal. The cap 204X is connected to the neck in a fashion
10 similar to that already described, and is provided with a central tube 206X having a sealing shoulder 208X which, in the closed position of the package shown in Fig. 16, sealingly engages the reduced diameter neck portion 202X.

15 In addition, the said tube 206X is closed by means of a check valve in the form of a split seal 210X which, in the in-use position shown in Fig. 16 is opened by a venting nipple 212X in much the same manner as the Figs. 1 to 11 embodiment. As shown in the in use position nipple 212X
20 is sealed by O-ring seal 217X to a cylindrical insert in cap 204X, which retains the split seal in place. The cap, similar to the previous embodiments, has a discharge outlet 214X for the dispensing of the flavouring concentrate therefrom.

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The package described is operated in a manner similar to the described except that there is no supply of propellant gas to the inside of the package 200X. When the package is in the transportation condition, the split seal 210X is
30 of course closed and the cap 204X closes the body 200X. When the package is to be used it is inverted as shown in Figs. 16 and 17, and is fitted to the appropriate part in the dispenser, and at the time of fitting the nipple 212X opens valve 210X. If now the cap 204X is rotated relative
35 to the body 200X to cause the shoulder 208X to unseat from the neck portion 202X, the flavouring concentrate can run past the shoulder 208X and out of the aperture 214X. At

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the same time, as shown in Fig. 17 which shows the open position of the package, air is drawn into the interior of the package through the nipple 212X as represented by the bubbles 216X in Fig. 17 to make up for the liquid which
5 flows from aperture 214X as indicated by arrow 218X in Fig. 17. Because of this arrangement, in fact the liquid is dispensed from aperture 214X under the influence of a constant head represented by the head H shown in Fig. 16, because at the top of the tube 206X there exists, and
10 always exists, atmospheric pressure, and indeed in the head space, 220X in the container there exists a sub-atmospheric pressure, represented by the symbol- p_x which is less than atmospheric pressure.

15 The advantage of the construction shown in Figs. 16 and 17 is that no propellant source connection is required, and the package can much more readily be removed from the machine. Additionally, it is not necessary to vent the package prior to removal of same.

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There is one possible difficulty with the arrangement of Figs. 16 and 17, which arises if the package is used in an environment in which there are significant temperature fluctuations. For example, if the temperature of the said
25 environment increased, then the pressure in the head space 220X will increase due to expansion of the gas therein. This could cause back-flow of syrup through the vent tube 212X, which would be undesirable. In a modification therefore, as shown in Fig. 18, the package is provided
30 with an internal compensating vessel 222X, which is an inverted, closed cup, integral with the reduced neck portion 202X, but provided with a compensating aperture 224X, connecting the interior of the compensating vessel with the interior of the package body 200X. It is to be
35 noted that the compensating vessel 222X and the reduced neck portion 202X are integral, but form a separate unit from the body 200X. The unit is in fact frictionally and

sealingly engaged in the neck of the body 200X. The mode of the operation of the package shown in Fig. 18 is that when the package is closed, as shown in Fig. 18, the liquid inside the body 200X flows through aperture 224X and fills up the inverted compensating vessel to the level 226X which is coincident with the uppermost point of the aperture 224X. Atmospheric pressure prevails at said level 226X by virtue of the connection to atmosphere through the nipple 212X which means that the sum of the pressures hx being the head of liquid above the said liquid 226X and the pressure in the head space 220 will equal atmospheric. The liquid will therefore be dispensed from around the tube 206X, when the package is open for the dispensing of liquid through the aperture 214X. With this arrangement,

if there is a change in temperature, for example to cause the gas in the head space 200X to expand, this expansion is accommodated for by an increase of the level 226X within the compensating chamber, and there will be no unwanted discharge of liquid through the vent tube 212X.

The packages according to the invention have particular application in the dispensing of carbonated beverages from small dispensers as described herein, and designed for in-home use, and a further and particular advantage of the invention is that the package and its contents can be removed from the equipment at any time, and the rotary valve can receive a further package containing concentrate of a different flavour. The packages are preferably designed to be of the throw-away variety, and to this end the components thereof are preferably constructed from plastics material.

Various modifications may be made without parting from the scope of the invention, and the examples described are only specific embodiments of constructions of packages.

Figs 19-25c illustrate some possible modifications of the present invention with respect to the valving action. In these embodiments, operation in all other respects than discussed will be the same as previously described. Only
5 the parts of the valving mechanism which are different will be discussed in detail.

Fig. 19 illustrates a particularly simple embodiment of the invention. Shown is a bottle 505 with tabs 507
10 thereon for insertion in a rotary valve, of the type previously described in connection with Fig. 4 for example. On the end of the neck of the bottle, which terminates in a planar annular portion 509, is snapped a cap 511 with a tab 513 adapted to insert in a slot in a
15 rotatable valve member of the type described above. The cap is shown as having a dip tube 514 extending therefrom to permit the introduction of the pressurizing gas in the manner described above. Cap 511 has a hole or opening 519 therethrough which forms the dispensing outlet. The
20 annular surface of the bottle also contains a hole 521 better seen in Fig. 20. As is evident from an examination of Fig. 20, rotation of the tab 513 in the direction of arrow 523 through a predetermined angle will result in the alignment of the holes 519 and 521 to bring about
25 dispensing. Control of the amount dispensed can be brought about by controlling the size of the opening 521 and/or preferably by the overlap of the openings 521 and 519. With this embodiment, it is noted that adjustment through the use of an adjustment ring although possible
30 cannot be carried out as well as in the embodiments previously described.

Fig. 21 illustrates a further embodiment of the present invention employing a bottle 605. On the end thereof is a
35 cap 611 quite similar to the cap 511 shown in Fig. 19. The cap however, contains a semi-cylindrical projecting portion 613 along one side thereof. This forms a channel

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615 which constitutes the dispensing outlet. Extending through the wall of the cap and leading into the channel 615 is an opening 617. The neck of the bottle 605 also contains an opening 619. Movement of the cap in the direction of the arrow 621 results in alignment of the two holes to permit the concentrate to be dispensed through the openings 619 and 617 and the channel 615. A key 622 on bottle 605 inserts in a keyway 623 on cap 611 to prevent rotation.

10

Fig. 23 illustrates an embodiment in which a bottle 705 has a conventional thread 707 on its neck. Screwed onto the thread 707 is a cap 709, of the same general type described in connection with Figs. 8 to 10, the primary difference being that the cap and neck contain matching threads rather than cooperating nibs and slots. In all other respects, the construction of the bottle and cap will be essentially the same. In other words, an insert in the bottle neck will be provided and the cap will have a projecting portion cooperating with the insert to form a valve. As previously described, an opening is formed into the cap to permit the dispensing of the liquid. The bottle 705 possesses tabs 711 and is inserted into appropriately shaped slots 714 in a fixed part of the rotary valve mechanism. Similarly, as in the previously discussed embodiments, the cap 709 contains a tab 713. This slides into a slot 715 in the rotatable valve part. However, slot 715, unlike the slots in the previous embodiment, permits movement of the rotary valve part 189a with respect to the cap 709 between positions corresponding to the positions of Figs. 6a and 6b. This is accomplished by forming the slot 715 so as to have a vertical portion 717 to allow insertion of the cap of the bottle and a horizontal portion 719. A further vertical portion 721 is provided for a reason to be described below. Thus, initial rotation of the rotating part 189a will result in no movement of the cap. The tab 713 will

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slide in the horizontal portion of the slot 719. Positions corresponding to those of Figs. 6a and 6b are shown by Figs. 25a and 25b. In the view of Fig. 25a, the tab 713 is at the bottom of the vertical slot 717. During the first part of the motion, the tab slides in the slot 719 until it comes into abutment with the edge 723. This corresponds to the position of Fig. 6b. Now, further rotation of the rotating part 189a will carry the tab 713 with it and will begin to unscrew the cap 709 from the bottle neck to open the valve in the manner described above. This is indicated by the position shown in Fig. 26c. When this occurs, as the cap is unscrewed it will move downward, and the tab will move downward into the vertical portion 721. Now, when it is desired to return the valve to the closed position, the surface 725 will act against the other side of the tab 713 screw to the cap 709 back onto the neck of the bottle 705, by means of the threads 707, to close the valve. Further rotation will disengage tab 713 from slot 721 and allow it to slide in slot 719. In this embodiment, and in other embodiments, it is possible to form the necessary slots in the cap or bottle respectively and to dispose and to place the necessary tabs on the valve parts. It will be recognized that equivalent operation will be obtained.

25

Finally, in the various embodiments, it is generally indicated that dispensing is accomplished by rotating a handle such as the handle 191 of Figs. 6a-6c. In many instances, it might be desired to simply press a glass, into which dispensing is to take place, against an actuator such as is common in water dispensing apparatus in restaurants. The present invention can be adapted to such simply by providing conventional means for converting motion of this nature into the rotary motion needed to rotate the rotating part of 189 of the valve. It is believed that such linkages are well within the scope of those skilled in the art and will not be described in

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detail herein. Modifications of the nature just described and other modifications can be made without departing from the spirit of the present invention.

5 In each embodiment there is control of the degree of opening of the package valve. Control of the degree of opening the valve is necessary for a number of reasons. In the first place, different concentrates will have different viscosities. Thus, assuming the use of diluent
10 at a predetermined constant rate and where, to get a properly flavoured drink, a certain amount of concentrate must be mixed with that diluent, different degrees of openings will be necessary in order to accommodate the different flow characteristics of different concentrates
15 due to their different viscosities, that flow being under essentially constant pressure. Secondly, changes in environmental conditions, particularly temperature can effect the viscosity and may require further adjustment. Finally, although standards have been set with respect to
20 the mixing of a diluent and concentrate such as the mixing of a syrup and carbonated water, which standards are used in making bottled drinks, personal tastes do differ and someone using the container of the present invention in a dispensing apparatus may wish to adjust it to his own
25 personal taste.

The last two types of adjustments mentioned are adjustments which must be done at the dispensing apparatus. The first type of adjustment i.e., adjustment
30 to take into account different viscosities can be accomplished either through proper dimensioning of the container parts or through a combination of dimensioning of the container parts and an adjustment in the dispensing valve in the machine with which the container is used.
35 Providing such control by means of dimensioning at the container is thought to be preferable. This is because it requires no further adjustment by the user other than to

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accommodate that variation. The dispensing valve with which the container or package cooperates can then be constructed so as to bring about a pre-established amount of movement of the first and second parts with respect to each other utilizing the means provided on the package for effecting the movement of these first and second parts. In such a case, these means for effecting the movement will be so constructed and dimensioned that for this pre-established amount of movement the separation of the two valve parts will give the desired degree of opening for the particular concentrate contained within the package. Alternatively, the packages may well be dimensioned identically and the dispensing valve with which it cooperates made adjustable in order to allow different amounts of motion depending on the concentrate in use. This, of course, would require a step on the part of the user of setting the valve for the particular concentrate to be used. It would, however, simply manufacture of the packages since all could be identical.

Although certain embodiments of the present invention are disclosed in which the means for introducing an essentially constant head pressure include means for introducing ambient air at a constant head pressure, the preferred embodiment is one in which dispensing takes place under the pressure of a pressurizing gas. In such a case, it is necessary that means be provided for supplying the pressurizing gas to the container after it has been inserted into the dispensing valve of the dispensing machine. Although, it would be possible for this to be a separate connection to the package fed through a separate line and shut-off valve, in the embodiments of the present invention disclosed in detail, pressurizing takes place under control of the same valve which controls the dispensing operation. This valve, which as previously indicated, cooperates with the means for effecting movement of the first and second parts, in the case of a

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pressurizing gas, of necessity, includes a first position
where the pressurizing gas supply is cut off, a second
position where the pressurizing gas supply is available,
and the dispensing valve has acted on the means for
5 effecting movement of the first and second parts with
respect to each other to open the valve in the package and
is at the same time opening a passage for the supply of
diluent to be mixed with the concentrate in the package.
Since the dispensing valve is operatively coupled to the
10 package in each of these positions it is necessary that
movement of this valve between the first position where
the pressurizing gas is not available, i.e, shut off,
permitting insertion and removal of the package, and the
second position, where the pressurizing gas is
15 pressurizing the concentrate but dispensing has not yet
taken place, requires that there be provisions either in
the valve or in the package for permitting this movement
without opening the valve in the package. In the
preferred embodiment, this is accomplished by cooperating
20 surfaces of the two valve parts in the package. However,
an alternate embodiment is disclosed in which such is
accomplished within the dispensing valve.

The first and second valve parts can take any one of a
25 number of different forms. For example, the two valve
parts may comprise two disc-like members rotatable with
respect to each other, each disc containing an opening
therein, one opening in communication with the volume of
concentrate in the container and the other opening in
30 communication with the outlet. The degree of overlap of
the two openings and/or the size of the smaller of the two
openings will determine the flow rate of concentrate.
Thus, for example in such an embodiment the opening in the
second valve part which contains the outlet could be made
35 relatively large and the opening in the other container
part could be made of a size to meter the desired amount
of concentrate. Movement of the two openings into

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alignment with each other, in response to a preset degree of movement of the two container parts with respect to each other, would thus result in metering the desired amount of concentrate. The disadvantage of an embodiment of this nature is that it does not easily permit additional control to take into account temperature variations or the taste of the user. Similarly, rather than utilizing rotating movement in which two holes are aligned by rotation one can carry out a linear movement of for example a cap with respect to the neck of a bottle, each containing therein a hole. Again, the movement would be of a predetermined amount to align the two holes to cause flow of the concentrate.

15 The Carbonator and Cooling Systems

The remainder of the dispenser which has been generally described and partly described in detail with reference to Figs. 1 to 11 will now be described. This remainder is also designed with a view toward ease of operation and low cost. The fact that a quick disconnect coupling 71 is provided for the carbon dioxide bottle 68 has already been noted. In addition the quick disconnect nature of the carbonator has also been noted. The carbonator will now be explained in more detail in connection with Fig. 26 which is an exploded perspective view of the dispenser showing the manner of insertion and removal of the carbonator. In the disclosed embodiment of the drink dispenser of the present invention, the unit is self standing, i.e., it is not connected to the plumbing. It will be recognized that with respect to what has been previously disclosed, i.e., with respect to the dispensing arrangement and the manifold, such can be equally well used in a plumbed-in if provided with the necessary controls e.g. temperature level etc. In the unit of Fig. 26, the carbonator 61 comprises a metal tank 300 preferably of stainless steel or aluminium, having a lid

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301 which is removable in order to refill the carbonator 61 with water. As previously explained, the carbonator 61 includes a quick disconnect coupling 89 from which one line 90 leads through a restriction or orifice 93 to a dispersion block 95. Carbonated water is forced out of the unit through a line 97. Also shown in Fig. 26 is the end of the manifold 77 with the two connecting fittings 133 and 135 projecting therefrom. As explained in detail in connection with Fig. 4, these insert into appropriate bores in the fitting 89. As also explained in connection with Fig. 4, there are valves both in the fitting 89 and the connecting stubs 133 and 135 of the manifold. What this means is that, when the tank 61 is pulled away from the manifold, the pressure within the dispensing unit, i.e., that pressurizing the container 81 and the carbonated water in the various passages, which is under pressure, and the gas under pressure being fed from the CO₂ tank are not released. Without such valving, carbonated water would be released from the connecting fitting 135 and the 40 psi carbon dioxide would flow from the fitting 133.

At the same time, the valves within the coupling 89 prevent the carbonated water under pressure from being discharged from carbonator 61 and also prevent any discharge through the carbon dioxide inlet. In order to aid in the quick disconnect of the carbonator tank 61 and also aid in handling it when disconnected, i.e., to permit refilling, a folding handle 303 is provided. A view of the handle 303 is also provided in the cross section of the carbonator shown on Fig. 27. The handle includes a bracket 305 which is attached vertically to the carbonator tank 300. This is essentially a U-shaped bracket which contains a cutout portion 307 in its central portion, i.e., at this portion only the base of the U is present. The handle itself comprises two arm sections, an upper arm section 309 and a lower arm section 311. The two arm

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sections are hinged together by means of a pin or rivet 313. The upper arm section 309 is also hinged to the upper part of the bracket 305 by means of a pin or rivet 315. The other end of the lower arm 311 contains a pin or rivet 317 which passes through a slot 320 formed in the U-shaped bracket 305 near its bottom and is retained in place by washers 319. Also hinged to the pin 317 is a downwardly extending retaining pin 321. In the position shown in solid lines on Fig. 27, with the handle folded against the tank 300, the pin 321 extends through an appropriate slot 323 in a support plate 330 in the top of the cooling unit 55. This, along with the insertion of the connecting stubs 133 and 135, into the fitting 89, retains the tank 61 in place. Alternatively, coupling 89 could be on the bottom or vertically disposed on the side of carbonator 61 and the weight of carbonator 61 used to maintain the connection.

When it is desired to remove the tank, after removal of cover 63, the handle 303 is moved to the position shown in dotted lines. The pin 317 slides upward in the slot 320 at the same time carrying with it the retaining pin 321. It is now possible to remove the carbonator to refill it with water.

Since the carbonator after being removed for refilling will still be under a pressure of 40 psi it is essential that the pressure be released before the cover is removed.

Otherwise, the cover could possibly blow off causing serious injury to the user. Furthermore, it is important that a good seal be maintained between the cover 301 and the container 300. The present invention provides a novel design of the mating of the cover with the container which both insures that the cover cannot be removed until the pressure is released, and at the same time insures that the cover will always be adequately sealed, after the

carbonator is refilled. The manner in which the cover fits into the container 300 is best illustrated by Figs. 26 and 27.

5 The container 300 at its top 351 (the container is of solid welded construction) has a stepped profile. It has an upper recess 353 of first diameter in which a top flanged section 355 of the cover 301 rests. Following this is a portion 357 of somewhat smaller diameter
10 containing internal threads 358. The cover 301 contains matching external threads 359 which screw into the threads 358. This section is followed by a section 360 of still smaller diameter which contains on its vertical surface 361 an O-ring seal 363. O-ring seal 363 seals against
15 cylindrical circumferential portion 365 of the cover. Because of the location of the seal 363, a radial rather than the conventional axial type seal takes place. What this means is that the carbonator will be sealed even if the cover is not screwed on completely tightly, in
20 contrast, with an axial seal, where good sealing depends on the cover being screwed on tightly. This essentially eases operation for the user, typically a housewife, and does not require critical alignment or the application of a certain amount of pressure in order to get good
25 sealing.

In order to ensure that pressure is released before the cover is removed, a rotatable handle 371, shown on Figs. 26 and 30 is provided. This handle rotates to operate a
30 relief valve 372, the lower portion of which is visible in Fig. 27.

Handle 371 is hinged to a plunger 377 by means of a pin 379. Plunger 377 has, in a recess 381 at its end, a
35 rubber sealing disc 383. This seals against a plastic valve seat member 385 containing a central bore 380 which is screwed into a threaded bore 387 in the lid 301 and

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sealed against the bottom of lid 301 with an O-ring seal 387A. A spring 375 biases the plunger 377 against seat member 385. Rotation of handle 371 upward lifts plunger 377 off seat member 385, by means of a larger radius 388 at the handle end, to release the pressure in the carbonator 61. This valve also acts as a safety valve in that if the pressure exceeds an amount determined by biasing spring 375, the plunger 377 will lift off seat member 385.

10

Thus, rotation of the handle 371 upwards when it is desired to refill the container, opens the valve to release the pressure. Unscrewing of the cover 301 without operating the handle 371 is not possible. Such is prevented by having the handle 371 extend beyond the circumference of the uppermost portion 353 of the cover. A cutout 378 is formed in the top 351 of the container 300 as best seen in Figs. 26 and 27. When cover 301 is screwed into place, the handle 371 snaps into this cutout 378. When one attempts to unscrew the cover without lifting the handle 371 it will come into contact with the edge 380 of cutout 378 preventing further turning until the handle is lifted and the pressure released. Furthermore, because of the pressure, turning will be very difficult, by hand, without first releasing the pressure. This too is a reminder to operate handle 371. Finally, should someone use a wrench or the like to generate enough torque, leakage past the threads will bleed the pressure off before the cover 301 is free of tank 300.

30

Figs. 31a-d illustrate an alternate embodiment of a closure for the carbonator lid. Shown is a carbonator lid 301a with a cylindrical opening 501 therein. Inserted within the opening 501 is an insert 503 having a first cylindrical section 505 press fitted into the opening 501 followed by an outwardly flared section 507 and a terminating cylindrical section 509.

35

The closure, or stopper mechanism, which is utilized to close the opening in the cover 301a is of a nature similar to devices used as stoppers for vacuum bottles and also as boat plugs. However, as with the previously described
5 cover for the carbonator, it is necessary that such a closure incorporate means to insure that pressure is relieved before the cover or stopper is removed, and it is also desirable that the closure be capable of performing as a pressure relief valve. The arrangement illustrated
10 in Figs. 31a-d accomplishes all of these functions. The member which actually closes the opening comprises a compressible stopper of rubber, for example. The stopper, which is of cylindrical shape with a central bore 512, in the uncompressed state (See Fig. 31d), is fitted over a
15 tube 513. At its inner end tube 513 is threaded. At the inner end of the stopper is a washer 515 which is held in place by a nut 517 screwed on to the threaded end of tube 513. The stopper 511 is compressed between washer 515 and a washer 519 at the outer end of the stopper, also slid
20 over the tube 513. The tube 513 contains a bore 521 in its outer end which terminates in a conical valve seat 523. A smaller bore 525 extends from the valve seat through to the inner end of the tube 513. At the end of the tube projecting through the washer 519, the tube is
25 slotted to provide two diametrically opposed members or ears 527 and 529. Each of the ears 527 and 529 contains a hole 531 through the end thereof. A bolt 533 on the end of which is a nut 535 passes through these holes and through corresponding holes 537 in camming means 539.
30 Camming means 539 comprise a member of essentially U-shaped cross-section with two identical cam surfaces 541 on the legs thereof on the end of which is a U-shaped lever arm 543. The cam surfaces 541 act against the washer 519. In the position shown in Fig. 31a, the distances between
35 the bolt 533 and the circumference of the cam surface 541 is a maximum. This in turn causes the bolt and with it the tube 513 to move outward compressing the compressible

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stopper 511. In the position shown in Fig. 31c, the radius of the cam surface remains essentially the same, still maintaining compression. Finally, in Fig. 31d, the distance between the bolt 533 and the flattened portion 541a of the cam surface is now reduced to permit the compressible stopper to take the cylindrical form shown in Fig. 31d and allow its removal.

What has this far been described is a conventional compressible stopper arrangement typically used in vacuum bottles and as a boat plug. The primary difference is that the conventional device does not have a hollow rod such as the tube 513 but a solid rod.

In accordance with the present invention, seated against the valve seat 523 is a valve member 545, on the end of a rod 547. The rod extends, with a spacing, through a threaded plug 549, which is screwed into internal threads in the end of the tube 513 and provides a guide for rod 547. Biasing spring 551 is disposed between the guide 549 and the valve member 545 biasing the valve member against the seat 523. The end of the rod 547 is attached to an oval ring 553. Between the two ears 527 and 529, a cam 555 is mounted to bolt 533. Bolt 533, at least in the central part thereof, has a square cross-section so that the cam 555 turns with the bolt and the camming means 539. Ears 527 and 529 are, of course, mounted so that the bolt 533 turns within the ears, e.g., the bolt is round where it passes through ears 527 and 529.

30

In the position shown in Fig. 31a, there is a slight spacing between the oval ring 553 and the cam 555. This allows the biasing spring 551 to bias the valve member 545 against the seat 523 to prevent the passage of fluid. The spring force is selected to provide a biasing pressure which will counteract the design pressure within the vessel with which the closure is used. For example, when

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used in the carbonator of the present invention the spring would be set for a pressure slightly greater than 40 psi. If excessive pressure builds up within the carbonator tank the valve acts as a pressure relief valve. The biasing
5 force of spring 551 is overcome and the pressure within the tank will lift the valve member 545 off the seat allowing excess pressure to be relieved. The fluid, e.g., carbon dioxide, under pressure would flow through the bore 525 past the valve member 545 through the bore 521
10 escaping between the rod 547 and the opening in the guide member 549. In order to permit pressure relief, the rod is disposed within the guide member 549 with a small spacing. The nature of cam 555 is such that in the position shown in Fig. 31a, the distance between the axis
15 of the bolt 533 and the cam surface is a minimum. As noted above, in this position there is a slight spacing between the cam surface and the ring 553. At the position shown in Fig. 31c, in which the handle 543 has been rotated through 90°, a second, larger distance,
20 results.

Because of this, the cam surface comes into contact with ring 553 raising the ring and with it, the rod 547. This lifts the valve member 545 from the seat 523 and allows a
25 pressure reduction through the valve which will take place at a controlled rate based on the valve orifice and the cross-sectional area between the rod 547 and the hole in the guide member 549. As noted above, in this position, the cam surface of cam 541 is still maintaining the
30 compressible stopper in the compressed state. Finally, as shown in Fig. 31d, further rotation of the handle 543 releases the stopper while at the same time maintaining the valve member 545 raised from the seat 523. This results because the cam surface of cam 555 is such that
35 between the position shown in Fig. 31c and 31d it maintains the ring at the same distance from the axis of the bolt 533 holding the valve open.

As illustrated in Fig. 26, since the carbonator is cooled, the cover 63 will contain, on its inside, a layer of insulation 325. Cooling is accomplished one of two ways. In the embodiment shown on Figs. 26 and 27, cooling is done utilizing a pan 327 of essentially cylindrical shape and having a lip 329 at its top. The pan is filled with what is commonly known as "Blue Ice", a type of material typically used for cooling in picnic coolers. The pan containing the Blue Ice sealed therein is placed in a home freezer and frozen prior to use. It is then inserted into the dispenser. For this purpose, the support plate 330 having a circular opening 331 therein to receive the pan 327 is provided. The plate 330 is supported in conventional fashion on a rectangular frame which forms part of the cooling unit. In addition, the inside of the rectangular frame 331, this frame resting on the base 43 of the dispensing unit, contains insulation (Fig. 26) 333

An alternative embodiment for the dispensing valve is illustrated in Fig. 32. In some cases it may be desired to have the dispensing unit at a sink. In such a case the remainder of the above described apparatus would be disposed below the sink. In such a case, the valve would, of course, not be part of the manifold 73. Rather, referring, for example, to Fig. 4, the lines 113 and 99 would be brought out from the manifold through suitable fittings 104 and 118 similar to fittings 129 and 131, described above, containing check valves. A quick disconnect coupling such as the coupling 89 may mate to these fittings with tubing extending from the coupling to inlets at the rotary valve 76c. Valve 76c is disposed on the end of an angled arm 502 with a container 81 placed thereon. The arm is supported for rotation above a sink 504. For example, the opening in the sink normally used for a spray attachment can be used. When not in use, the arm 502 may be rotated counterclockwise to move the dispenser out of the way into a locked position. When it

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is desired to dispense, the arm 502 is moved to the position shown and dispensing will take place over the sink so that any spillage or drips will be caught in the sink. Preferably, the arm 502 and at least the visible
5 parts of the valve 76C in this case will be made of a material to match the sink fittings. Operation of the valve 76C in conjunction with the container 81 in all other respects will be the same as described above.

10 In this embodiment, and in the previously described to prevent rapid melting of the Blue Ice.

Shown on Fig. 26 are ventilation holes 57 in the rectangular frame, and ventilation holes 59 in the
15 base 43. These are not required with this type of cooling unit but are used with the cooling unit to be described in connection with Fig. 28 below. The plate 330 in which the pan 327 is inserted is preferably of a material with poor heat conductivity, such as polypropylene.

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In the alternate embodiment shown in Fig. 28, the dispenser is provided with an electrical cooling unit. Once again, this unit is inserted in, or provided in conjunction with, a plate 330, of poor heat conductivity.
25 Again, the plate contains an opening 323 for the insertion of the pin 321 on the handle 303 of the carbonator 61. The unit includes, below a plate 335 of good heat conductivity, a plurality of thermoelectric cooling units 337. The nature of these units is that they are cool on
30 one side and hot on the other side when electricity is passed through them. The thermoelectric units, which are essentially of a plate-like material, have their cold side abutting against the plate 335. Attached to their warm side are heat sinks 339. Below the heat sinks, a fan 341
35 is mounted for conducting heat away from the heat sinks. Power is supplied to the fan and to the thermoelectric cooling units 337 by means of the power line 343. The

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circuit of this unit is described below in connection with Fig. 29. When operating with such a unit, the warm air is expelled through openings 345 below the fan and is exhausted through the openings 57 and 59 shown in Figs. 26 and 2b.

Fig. 29 is a schematic diagram of the circuit for the thermoelectric cooling elements 337 of Fig. 28. The power supply cable 343 has on its end a plug 401 to be plugged into a conventional outlet to supply power at 115 volts AC to the cooling system. Fan 341 is coupled across the two sides of the AC power line 343. Also coupled across the line is the primary 403 of a transformer 405. The secondary 407 of transformer 405 is coupled to two diagonals 409 and 411 of a full wave rectifier bridge 413 comprising diodes 414-417. At the other two diagonals 419 and 421 of the bridge, rectified DC, at approximately 18 volts is taken off. A capacitor 423 is placed in parallel across the diagonals 419 and 421 to filter the DC voltage. The plurality of thermoelectric cooling elements 337 are arranged in series in two groups. The first group 425 comprises the elements 337 a-d series, and the second group 426 elements 337 e-i series. The free end of the thermoelectric element 337 a in group 425 is connected to the bridge terminal 419. The free end of the element 337d is coupled through a normally open relay contact 427 to the opposite diagonal 421 of bridge 413. The other group 426 has its one end, the free end of element 337i, coupled to the terminal 421 of the bridge 413, and its other end, the free end of element 337e coupled through a second set of normally open contacts 429 to the terminal 419 of the bridge. The end of the element 337e coupled to the contacts 429 is also coupled through a set of normally closed relay contacts 431 to the end of the element 337d coupled to the contacts 427. Contacts 427, 429, and 431 are operated by a relay coil 433 which is connected across the secondary 407 of transformer 405 in series with a

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switch 435.

In operation, once the plug 401 is plugged into an appropriate wall outlet and power is being supplied over the power line 343, the fan 431 will immediately begin operating. The line voltage applied across the primary 403 of transformer 405 will be stepped down to approximately 18 volts at the output terminals 419 and 421 of the bridge. This DC voltage will be smoothed and filtered by the capacitor 423. The polarity of the DC voltage is positive at the terminal 419 and negative at the terminal 421. The thermoelectric elements 337a-337i are appropriately poled in accordance with these polarities. In the condition shown, with the switch 435 open, the relay 433 will not be energized. Thus, contact 431 will be closed and the contacts 427 and 429 opened as shown. The DC voltage will flow from the terminal 421 through the series circuits 425 and 426 back to the terminal 419. In other words, in this condition, all of the thermoelectric elements 337a-337i are in series across the output of bridge 413. The nature of the thermoelectric elements is such that their degree of cooling is proportional to the current. Furthermore, the elements are resistive in nature. Thus, with all elements in series, the current which is determined by the sum of the resistances will flow. This establishes a first, lower level of cooling.

When the switch 435 is closed, the relay 433 is energized opening contact 431 and closing contacts 427 and 429. As a result, the two series circuits 425 and 426 are now connected in parallel across the output terminals 419 and 421 of the bridge 413. The current flowing through each of the two parallel branches comprising the series circuits 425 and 426 will now be determined by the number of elements in each of the series circuits. Since this is a smaller number in each case than when all elements were

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connected in series, greater currents will flow in each of the two parallel branches. This will then results in a greater cooling effect. The thermoelectric cooling elements can be of the type manufactured and sold by
5 Cambion Electric, Cambridge, Mass.

An alternative embodiment for the dispensing valve is illustrated in Fig. 32. In some cases it may be desired to have the dispensing unit at a sink. In such a case the
10 remainder of the above described apparatus would be disposed below the sink. In such a case, the valve would, of course, not be part of the manifold 73. Rather, referring, for example, to Fig. 4, the lines 113 and 99 would be brought out from the manifold through suitable
15 fittings 104 and 118 similar to fittings 129 and 131, described above, containing check valves. A quick disconnect coupling such as the coupling 89 may mate to these fittings with tubing extending from the coupling to inlets at the rotary valve 76c. Valve 76C is disposed on
20 the end of an angled arm 502 with a container 81 placed thereon. The arm is supported for rotation above a sink 504. For example, the opening in the sink normally used for a spray attachment can be used. When not in use, the arm 502 may be rotated counterclockwise to move the
25 dispenser out of the way into a locked position. When it is desired to dispense, the arm 502 is moved to the position shown and dispensing will take place over the sink so that any spillage or drips will be caught in the sink. Preferably, the arm 502 and at least the visible
30 parts of the valve 76C in this case will be made of a material to match the sink fittings. Operation of the valve 76C in conjunction with the container 81 in all other respects will be the same as described above.

35 In this embodiment, and in the previously described embodiments, the rate of flow of the diluent can be controlled either by dimensioning of the size of the

diluent tubing or passages e.g., passages 103, or by the insertion of a limiting orifice, for example, at the inner end of the stub 131.

CLAIMS

1. A beverage dispenser comprising:
 - a) a source of pressurizing fluid;
 - b) means for containing a supply of concentrate;
 - c) means for containing a supply of diluent;
 - 05 d) a dispensing valve which when operated causes said concentrate and diluent to be dispensed at controlled flow rates into a container to provide a beverage; and
 - e) a manifold comprising a block of material having
10 disposed therein a pressure reducing valve, said manifold having an inlet for connection to said source of pressurizing fluid, a first passage in communication with said inlet supplying said fluid to said means for containing diluent, a second passage in communication
15 with said inlet supplying said fluid to the inlet of said pressure reducing valve, a third passage at the outlet of said pressure reducing valve coupling said fluid at a reduced pressure to pressurize said concentrate container, and a fourth passage having an
20 inlet coupled to said diluent container and an outlet coupled to said dispensing valve.
2. A manifold for use with a beverage dispenser comprising:
 - 25 a) a block of material;
 - b) a pressure reducing valve disposed in said block;
 - c) an inlet for connection to said source of pressurization formed in said block;
 - 30 d) a first passage in communication with said inlet for supplying a pressurizing fluid to a diluent supply;
 - e) a second passage in communication with said inlet for supplying said fluid to the inlet of said
35 pressure reducing valve;

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f) a third passage at the outlet of said pressure reducing valve for coupling said pressurizing fluid at a reduced pressure to pressurize a concentrate source; and

05 g) a fourth passage having an inlet adapted to be coupled to the diluent supply and an outlet adapted to be coupled to a dispensing valve.

3. A beverage dispenser comprising:

10 a) a supporting base;

b) a source of pressurizing fluid disposed on said base;

c) a tank for containing diluent supported on said base;

15 d) a dispensing valve supported on said base;

e) at least one pressure reducing valve for said pressurizing fluid;

f) a manifold having one inlet coupled to said pressure reducing valve for distributing at least
20 pressurizing fluid and diluent within said dispenser, said manifold having at least a diluent outlet coupled to said dispensing valve;

g) first quick disconnect means for connecting said source of pressurizing fluid to said pressure
25 reducing valve;

h) second quick disconnect means for connecting said diluent tank to said manifold to obtain therefrom pressurization and to supply thereto diluent under pressure; and

30 i) means containing a supply of concentrate operatively coupled to said dispensing valve, said dispensing valve adapted to cause simultaneous dispensing of concentrate and diluent.

35 4. A dispenser according to claim 3, wherein said dispensing valve comprises:

a) a bottom member integral with said manifold

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extending outwardly therefrom and containing therein a cylindrical bore extending partially through said bottom member, said third passage in said manifold terminating at an elongated opening in the bottom of said bore said fourth passage terminating in a further outlet in the bottom of said bore, the bottom of said bore also containing an open area through which concentrate can be dispensed;

b) 0-ring seals surrounding said elongated outlet and said further outlets;

c) a central rotatable valve member of generally annular shape so as to have a central opening having an outwardly extending handle therein disposed for rotation within said cylindrical bore with the bottom of said member resting against the bottom of said bore and sealing against said 0-ring seals, said central cylindrical valve member containing a central bore having a first vertical slot therein, said member also having a diluent outlet;

d) a cylindrical member in the centre of said central bore opening a partial bore formed in said member;

e) a plurality of struts supporting said cylindrical member in the centre of said opening;

f) a fifth passage extending between the bottom of said central valve member and the bore in said central cylindrical member in one of said struts, the inlet of said fifth passage adapted to be brought into alignment with said elongated slot over a range of rotation of said central valve member;

g) a sixth passage within said central valve member for coupling said further outlet in said bottom member with said diluent outlet when said central valve member is rotated to a pre-determined position within said range of rotation;

h) means having two diametrically opposed vertical slots on the inside thereof, said first slot capable of

- 64 -

being aligned with one of said slots;

i) a cover member for covering and retaining said central valve member in place.

05 5. The dispenser according to claim 4 wherein said means having two slots comprise:

a) an annular adjusting disc disposed over said central valve member having said second slot on the inside thereof; and

10 b) means for rotating said adjusting disc over a limited angular range, said means, when not operating to rotate said annular adjusting disc holding said adjusting disc fixed.

15 6. A dispenser according to claim 5 wherein said means for adjusting comprise means supported in said cover including an extending knob which may be grasped by the hand, a shaft extending from said knob having thereon a worm gear, and mating gears on said adjusting disc
20 engaging said worming gear, whereby rotation of said shaft by said knob will result in rotation of said adjusting disc.

7. A dispenser according to claim 3 wherein said
25 supply of concentrate comprises:

a) a container having a bottle portion with a neck and cap portion rotatable thereon, a valve seat disposed in said neck and a valve member disposed in said cap said cap having a central opening therein;

30 b) a dip tube attached to said central opening and extending through said valve seat with a spacing to the bottom of said bottle;

c) cooperating camming surfaces on said cap and bottle neck for converting a rotary motion of said cap
35 into a linear motion which will separate said valve member from said valve seat;

d) an outlet opening in the top of said cap

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aligned with the concentrate opening in said bottom member;

05 e) diametrically opposed tabs on the neck of said bottle and a tab on said cap, said container inserted into said valve such that the tab on said cap engages in said first slot in said central valve member and the tab on said neck in said second slot in said adjusting ring with said container in an inverted position;

10 f) a fitting inserted in the central bore in said cylindrical member in said central valve member; and

g) sealing means surrounding said fitting at its base, said fitting extending into said opening in said cap, said cap sealing against said sealing means, whereby, when the inlet to said fifth passage is
15 aligned with said elongated slot pressurizing medium will be conducted through said fifth passage, said fitting and said dip tube into said container to maintain concentrate therein under a constant pressure and whereby when said central valve member is rotated
20 in one direction the simultaneous alignment of said sixth passage with said further outlet from said fourth passage and said fifth passage with said elongated slot will occur along with a rotation of said tab on said cap with respect to the tab on said bottle to result in
25 the opening of the valve in said container, thereby causing concentrate and diluent to be simultaneously dispensed.

8. A dispenser according to claim 7, wherein said
30 diluent outlet includes a spout directed at an angle to the vertical such as to intersect with a downward flow of concentrate from the outlet in said cap, whereby said diluent and concentrate will mix while being dispensed into a cup.

35

9. A dispenser according to claim 8, and further including a diluent drain in said bottom member aligned

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with said sixth passage when said central valve member is not in a dispensing position.

10. A dispensing valve for dispensing concentrate and
05 diluent to make a beverage comprising:

a) a first member containing therein a cylindrical
bore having a first pressurizing gas passage
terminating at an elongated opening in said bore, and a
first diluent passage terminating in a further outlet
10 in said bore, the bottom of said bore containing an
open area through which concentrate can be dispensed;

b) seals surrounding said elongated outlet and said
further outlet;

c) a central, rotatable valve member of generally
15 annular shape disposed for rotation within said
cylindrical bore, a peripheral portion thereof sealing
against said seals, said rotatable valve member having
a diluent outlet;

d) means within the annulus of said rotatable valve
20 member for supplying pressurizing gas to a container;

e) a second pressurizing gas passage extending
through said rotatable valve member from said
peripheral portion to said means within the annulus,
the inlet of said second gas passage adapted to be
25 brought into alignment with said elongated slot over a
range of rotation of said rotatable valve member;

f) a second diluent passage and expansion chamber
within said rotatable valve member for coupling said
further outlet with said diluent outlet when said
30 rotatable valve member is rotated to a predetermined
position within said range of rotation;

g) means in said rotatable valve member for
engaging a first container part;

h) means for retaining said rotatable valve member
35 in place;

i) means fixed with respect to said first member
for engaging a second container part; and

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j) means to rotate said rotatable valve member.

11. The dispensing valve according to claim 10 and further including means biasing said rotatable valve member to a position where its peripheral portion is sealing against said seals and said second gas and second diluent passages are remote from said seals.

12. A dispensing valve according to claim 10, wherein said means for retaining comprises a cover fixed to said first member, said cover having an opening therein with means on the inside thereof for engaging said container part.

13. A dispensing valve according to claim 12 wherein said means for engaging said first container part comprises a slot in said annulus for engaging a tab on said first container part and said means for engaging said second container part comprises at least one slot in said opening in said cover.

14. A dispensing valve according to claim 10, wherein said first member is a bottom member, said cylindrical bore extending partially therethrough with said elongated opening in the bottom of said bore and further including a drain passage in said bottom adapted to align with the inlet of said second diluent passage when said rotatable valve member is in a non-dispensing position.

15. A dispensing valve according to claim 14 and further including a spout at said diluent outlet, said spout directed at an angle to the vertical.

16. A dispensing valve according to claim 13 wherein said means for supplying pressurizing gas comprises:

a) a member with a partial bore therein coupled to

- 68 -

said second pressurizing gas passage; and

b) at least one strut supporting said member essentially at the centre of the annulus in said rotatable valve member, said second pressurizing gas passage extending through said strut.

17. A dispensing valve according to claim 10, in combination with a supply of concentrate comprising:

a) a container having a bottle with a neck and a cap, rotatable thereon, a valve formed between cooperating portions of said neck and said cap, and said bottle cap having a central opening therein;

b) a tube attached to said central opening and extending through said valve with a spacing into said bottle;

c) cooperating camming surfaces on said cap and bottle neck for converting a rotary motion of said cap into a linear motion which will open said valve;

d) an outlet opening in the top of said cap aligned with the concentrate opening in said bottom member;

e) diametrically opposed to be on the neck of said bottle and a tab on said cap, said container inserted into said valve such that the tab on said cap engages said means for engaging a first container part in said central valve member and the tabs on said neck engage said means for engaging a second part, with said container in an inverted position, and further including;

f) a cylindrical fitting formed at the end of said member at the centre portion of said annulus;

g) sealing means surrounding said fitting portion at its base, said fitting portion extending into said opening in said cap, said cap sealing against said sealing means, whereby, when the inlet to said second gas passage is aligned with said elongated slot, pressurizing medium will be conducted through said

- 69 -

second gas passageway, said fitting and said tube into said container to maintain concentrate therein under a constant pressure and whereby when said control valve member is rotated by rotation of said means to rotate
05 in one direction, the simultaneous alignment of said second diluent passage with said further outlet from said first diluent passage and said second gas passage with said elongated slot will occur along with a rotation of said tab on said cap with respect to the
10 tabs on said bottle to result in the opening of the valve in said container, thereby causing concentrate and diluent to be simultaneously dispensed.

18. A dispensing valve according to claim 17, wherein
15 said diluent outlet includes a spout directed at an angle to the vertical such as to intersect with a downward flow of concentrate from the outlet in said cap, whereby said diluent and concentrate will mix while being dispensed into a cup.

20
19. A dispensing valve according to claim 18 and further including a diluent drain on said bottom member aligned with said second diluent passageway when said central valve member is not in a dispensing position.

25
20. A dispensing valve according to claim 18 and further including a valve in said tube in said cap and wherein rotation of said cap is operable to open said valve.

30
21. A dispensing valve according to claim 10 and further including means to adjust the relative rotational spacing of said first and second container parts.

35
22. A dispensing valve according to claim 21 wherein said means to adjust comprise:

- 70 -

a) a rotatable annular adjusting disc engaging said second container part; and

b) means for rotating said means with respect to said first member over a limited angular range, said
05 means, when not operating to rotate said annular adjusting disc holding said adjusting disc fixed with respect to said first member.

23. A dispensing valve according to claim 22, wherein
10 said means for rotating comprise means supported in said cover including an extending knob which may be grasped by the hand, a shaft extending from said knob having thereon a worm gear, whereby rotation of said shaft by said knob will result in rotation of said
15 adjusting disc.

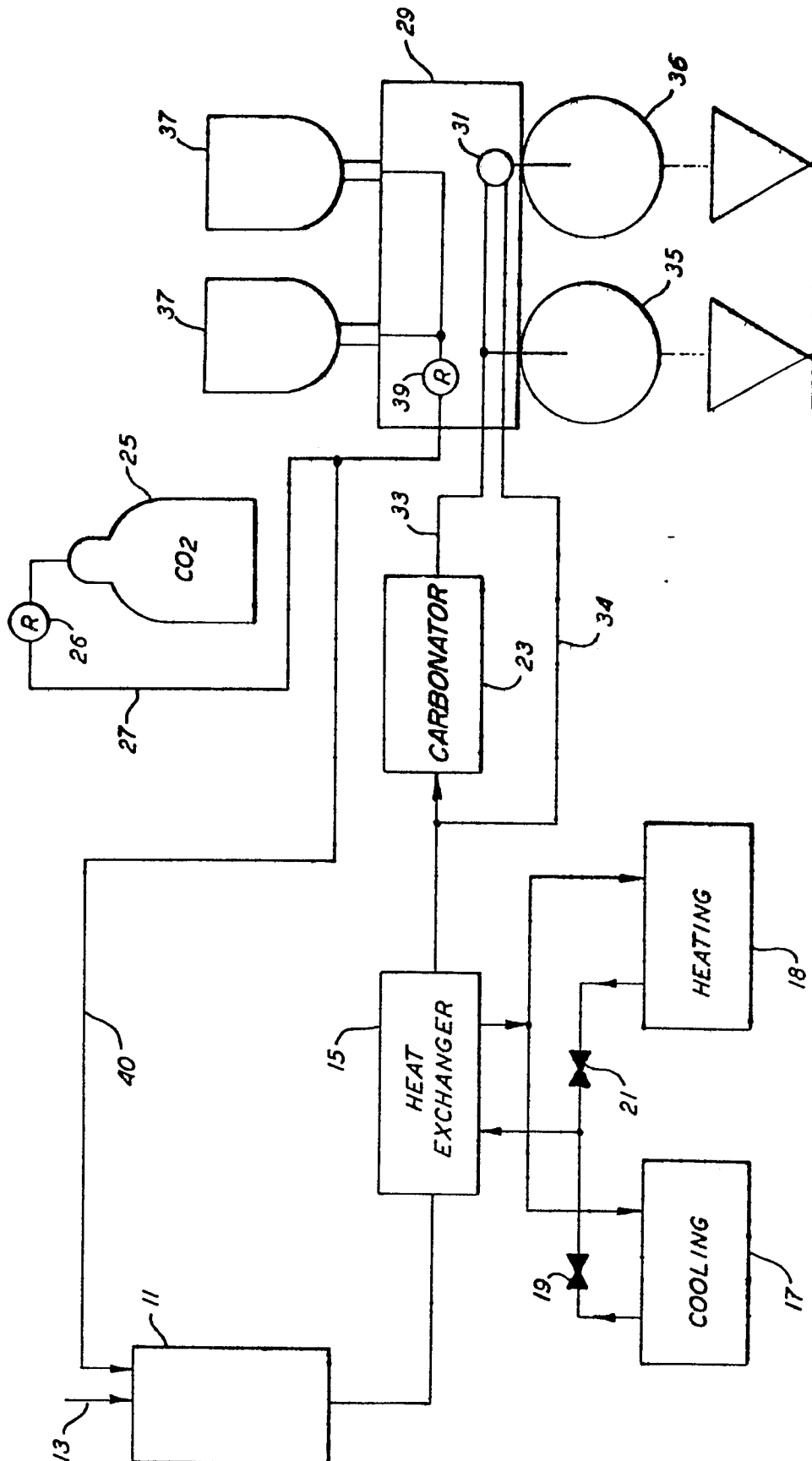
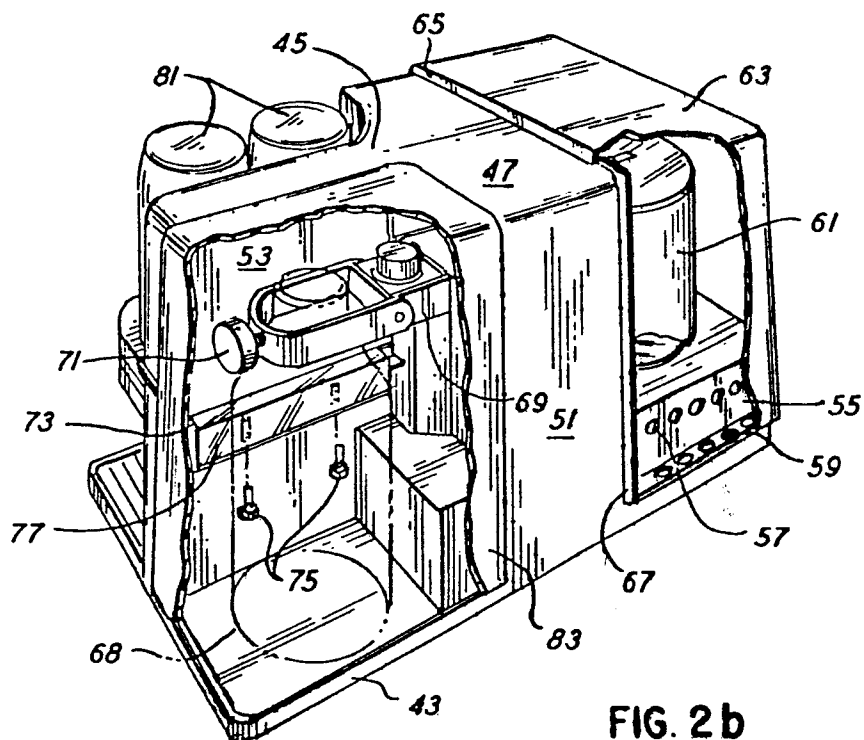
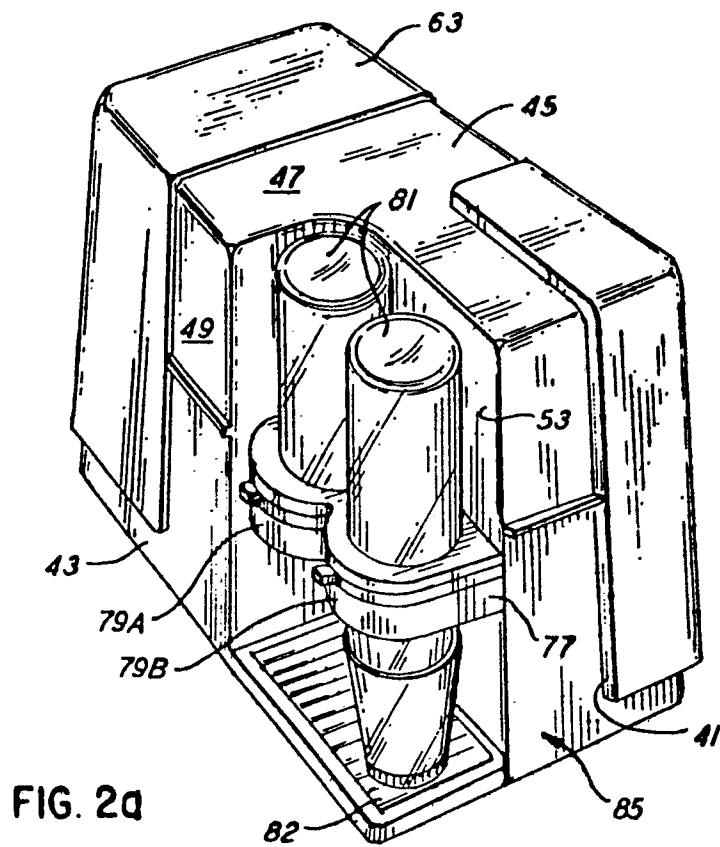


FIG. 1



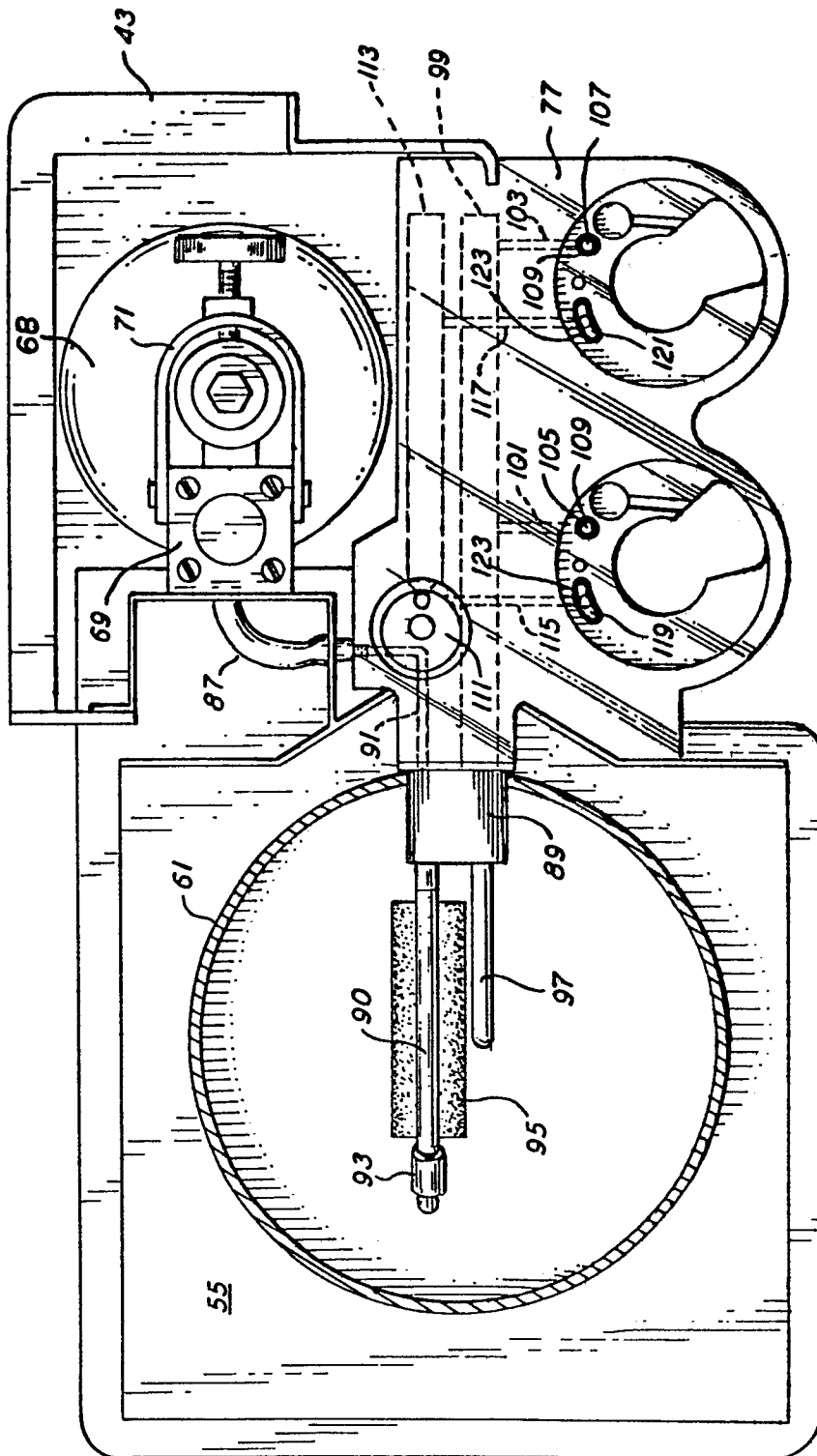


FIG. 3

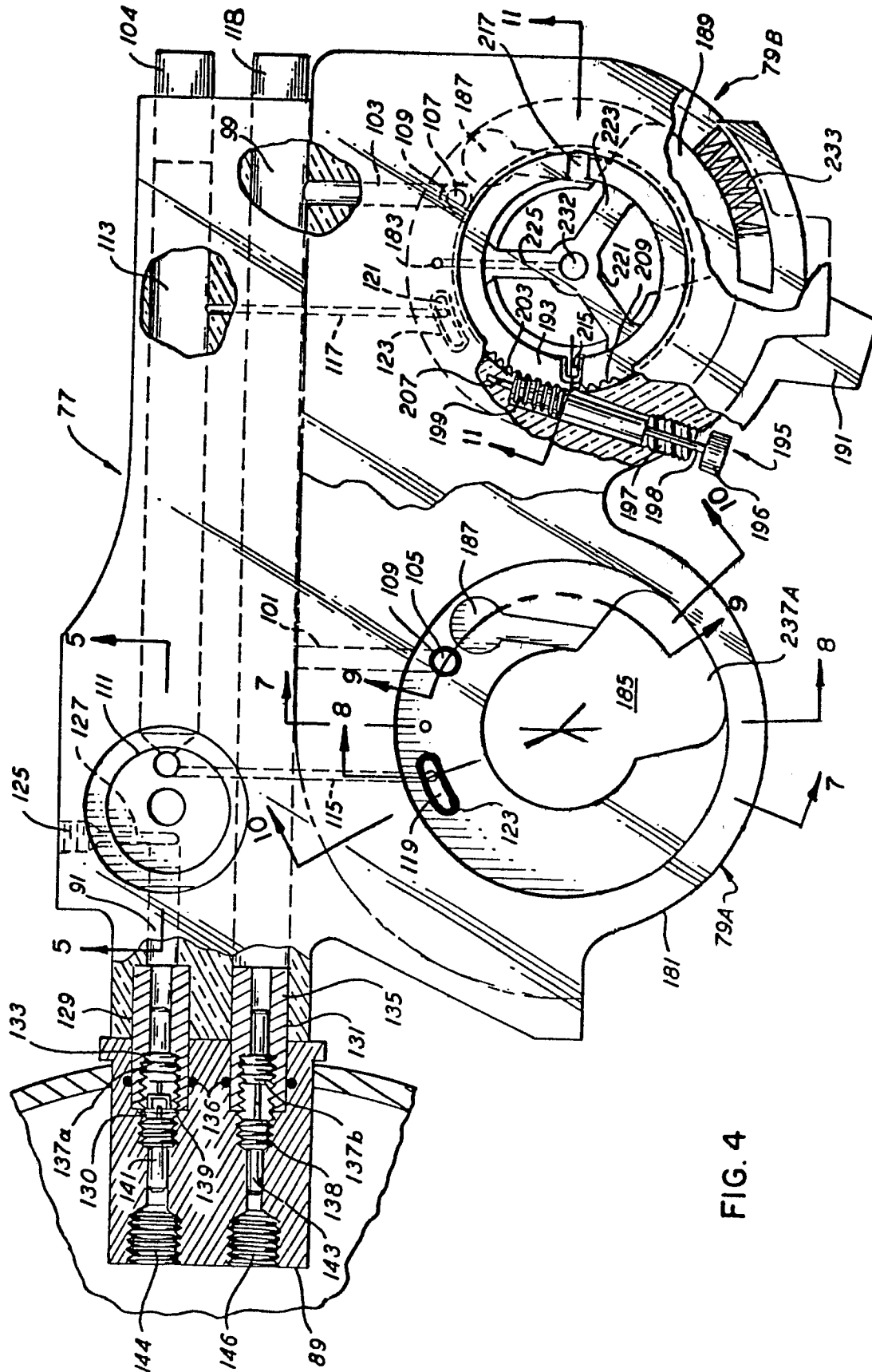
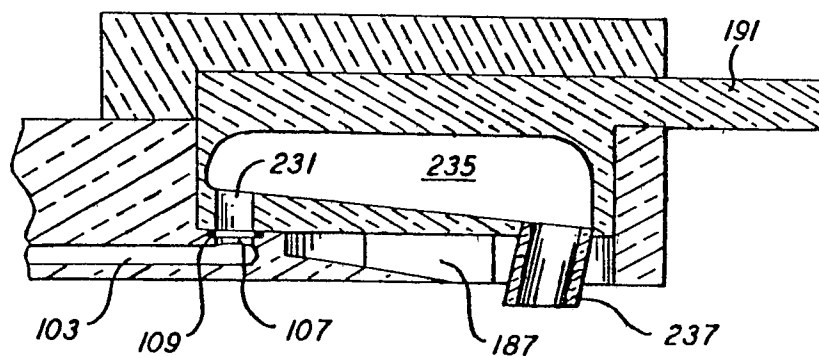
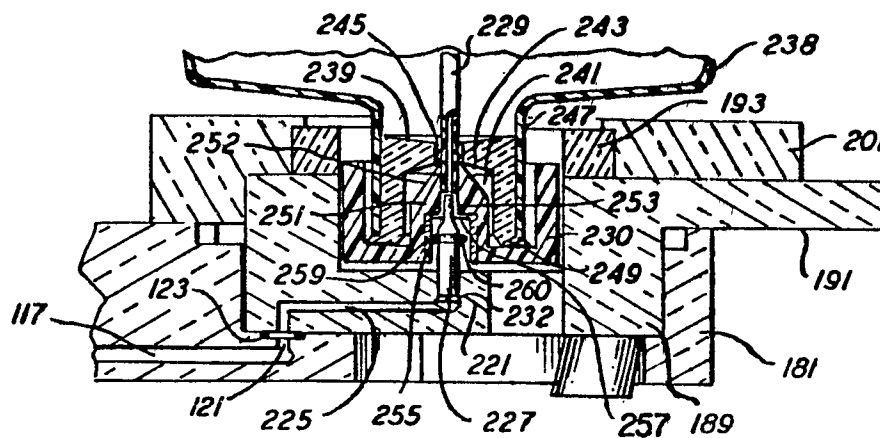
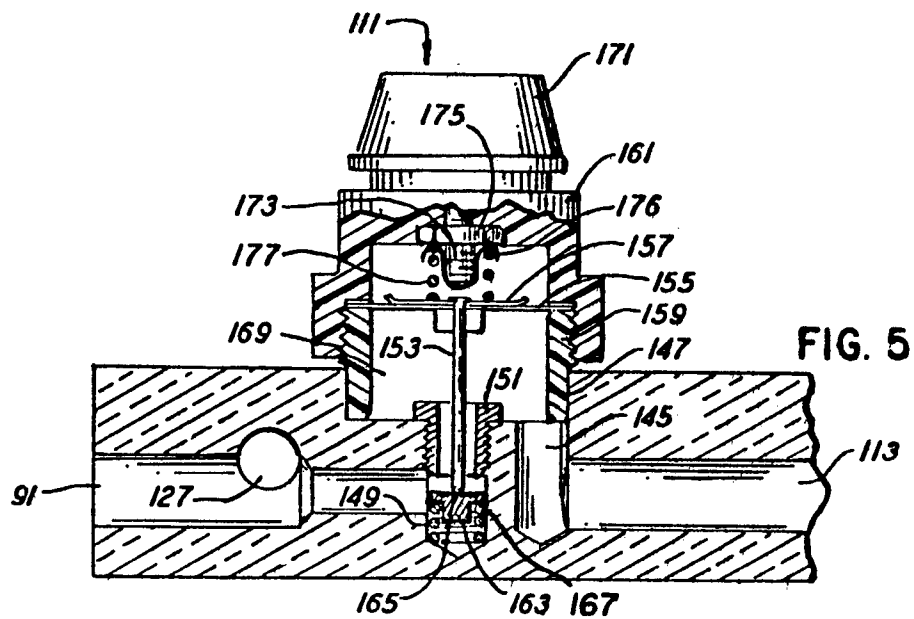
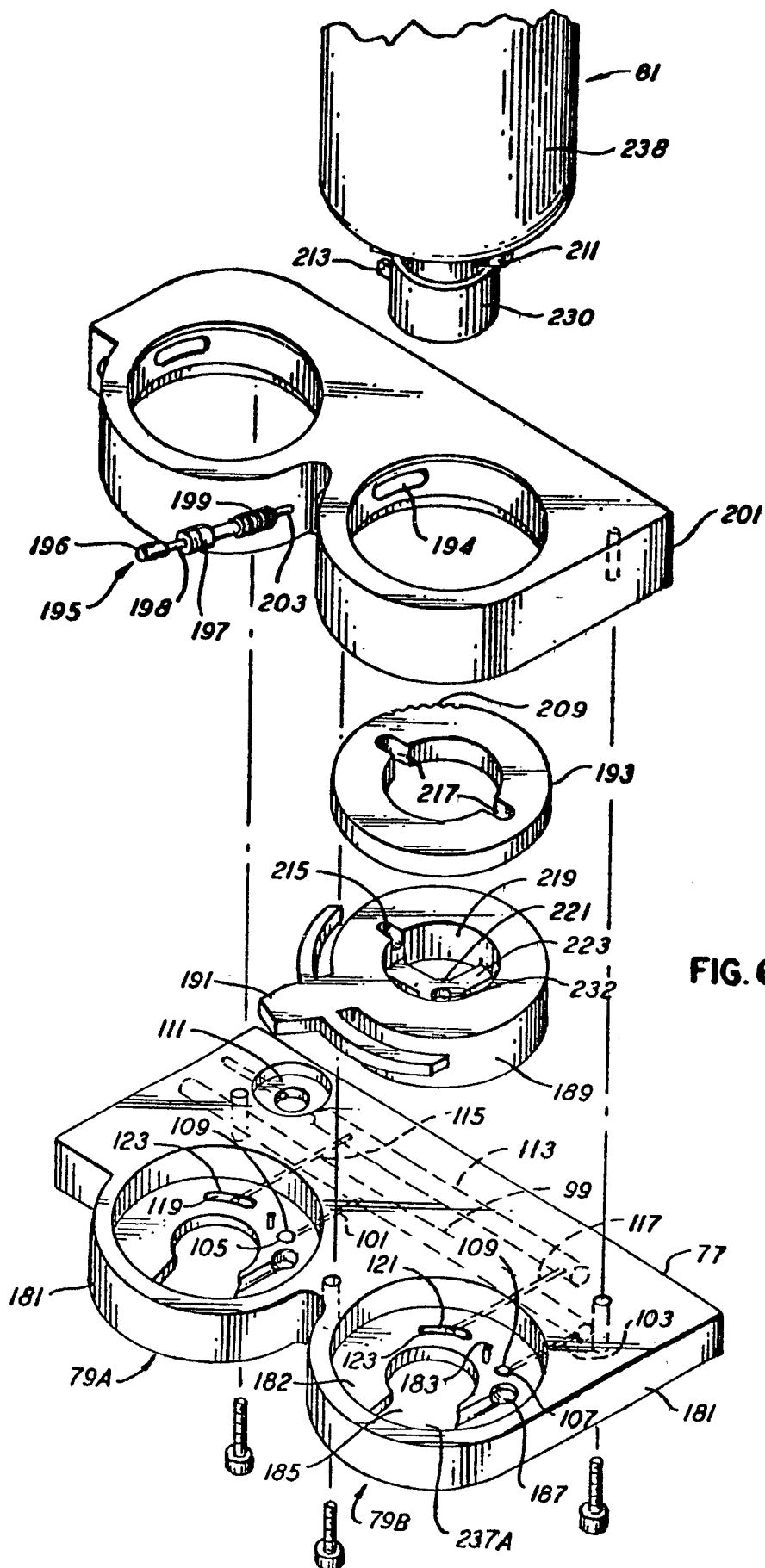


FIG. 4



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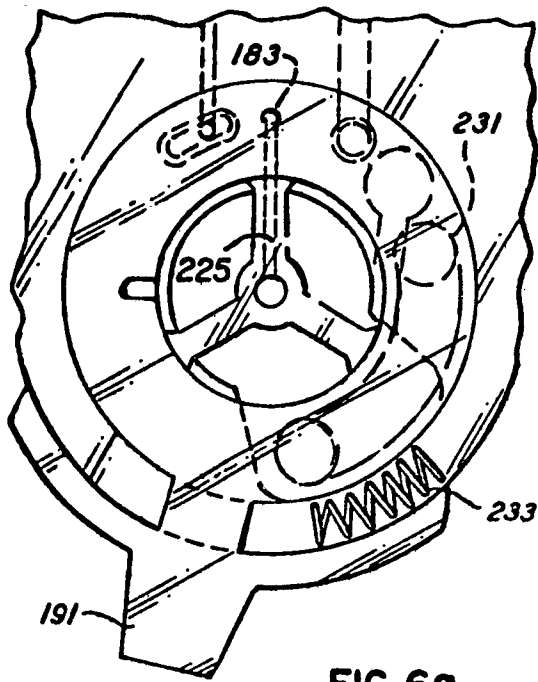


FIG. 6a

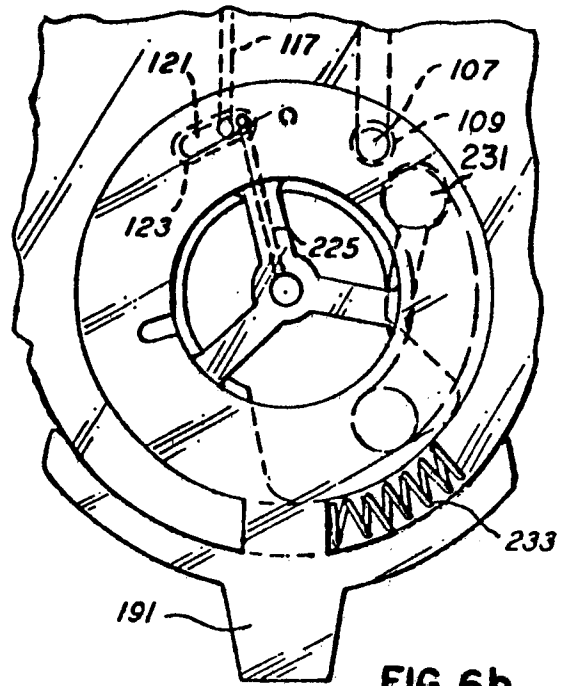


FIG. 6b

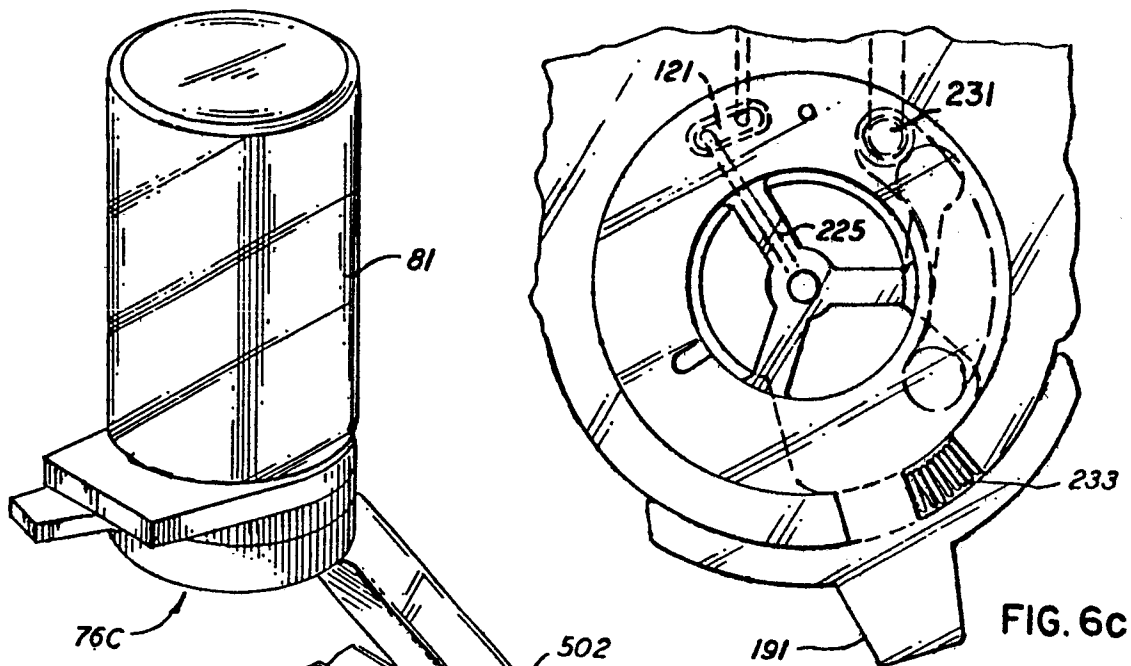


FIG. 6c

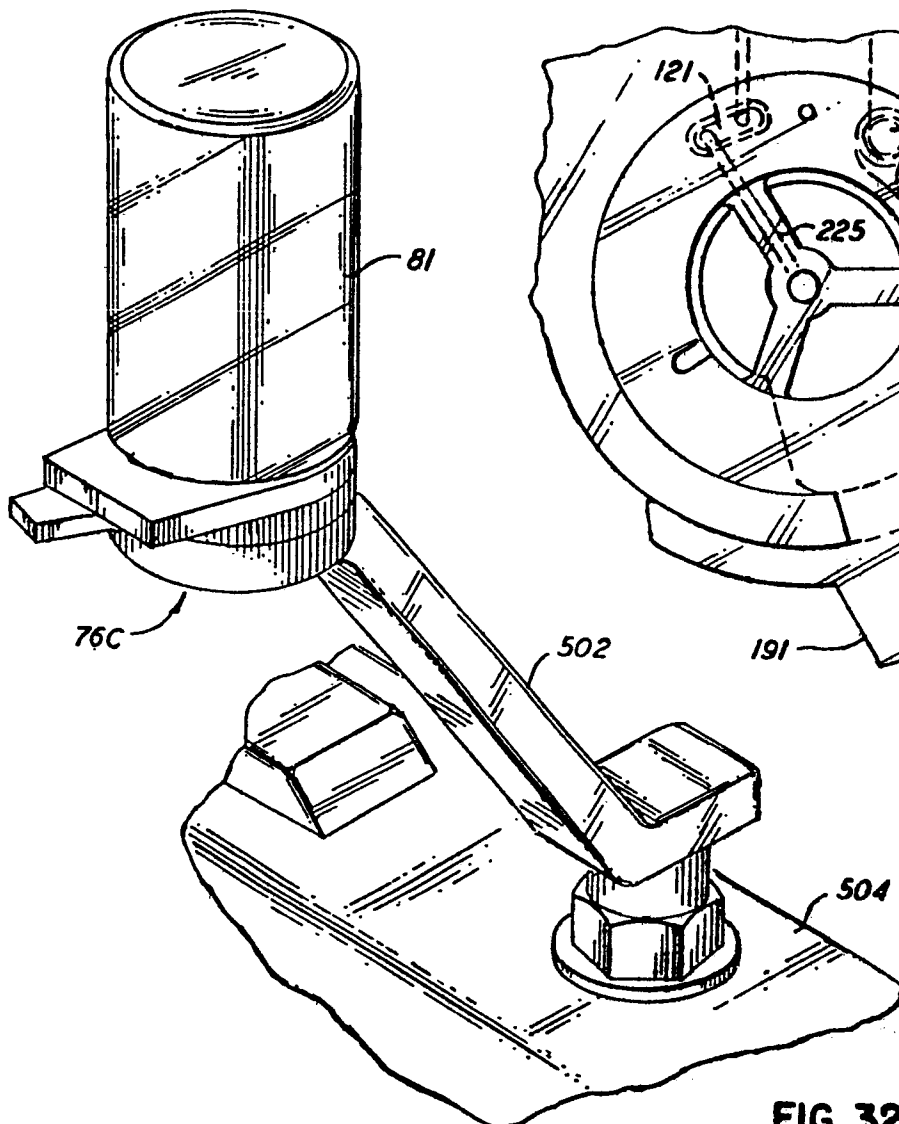
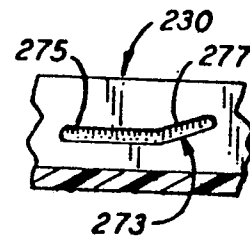
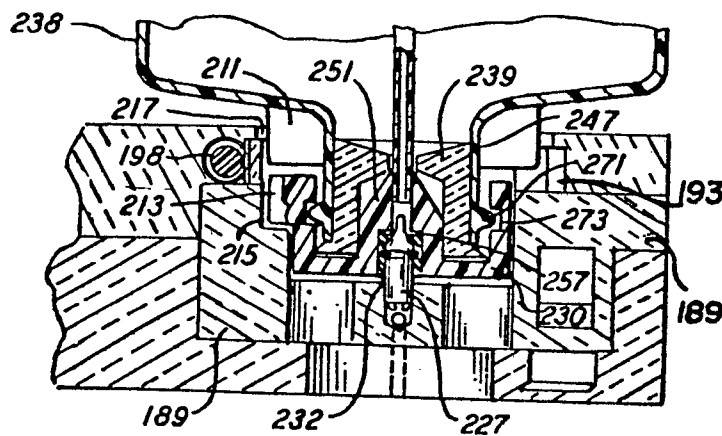
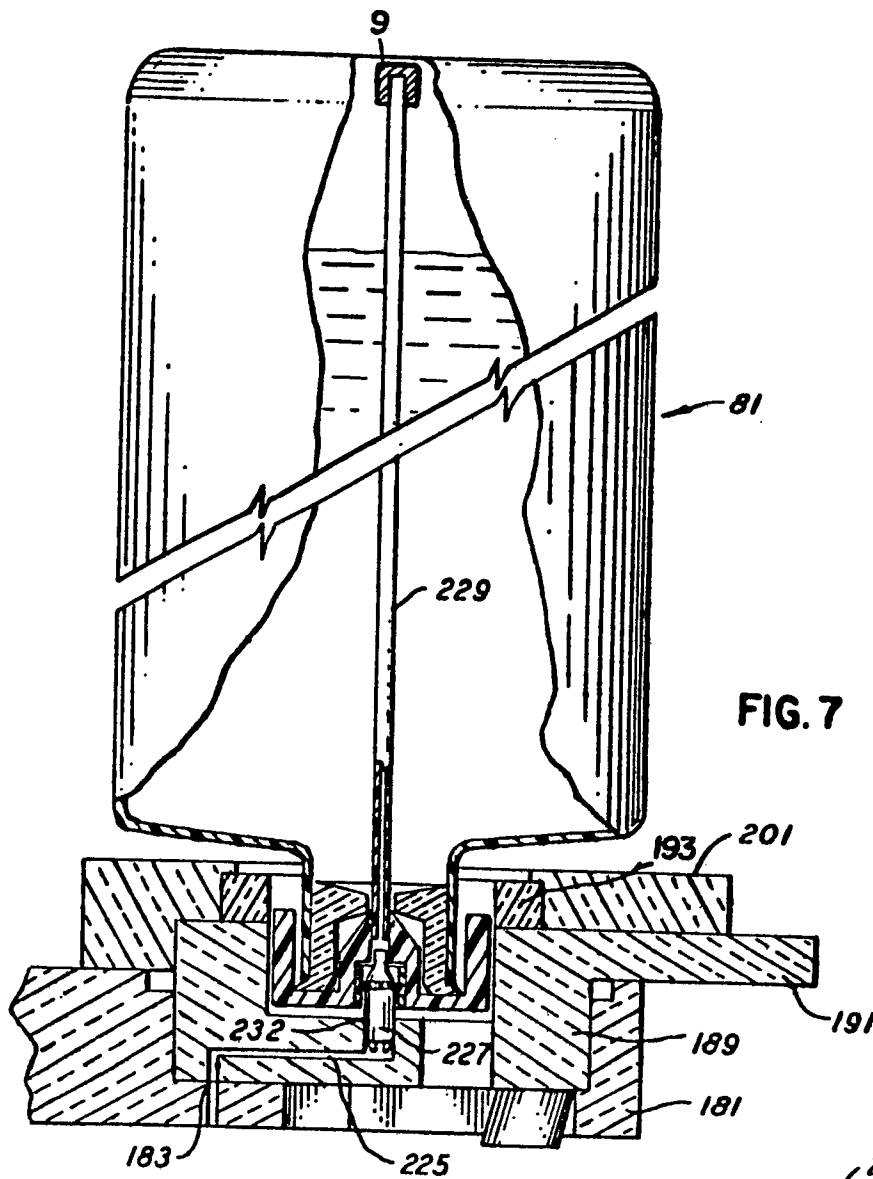


FIG. 32



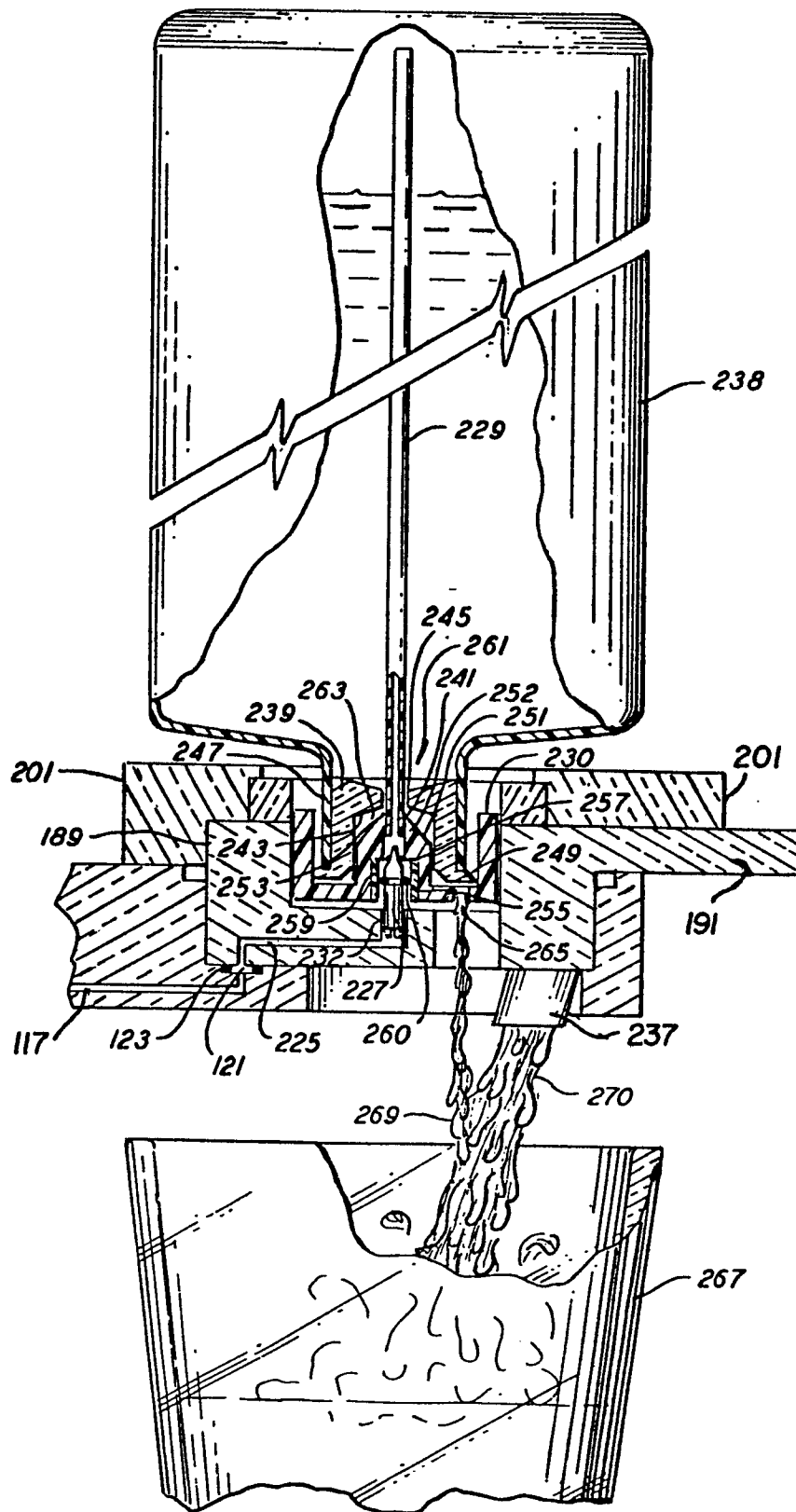


FIG. 10

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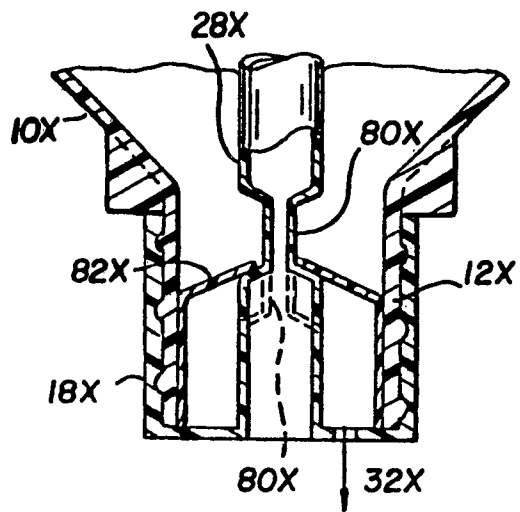


FIG. 11

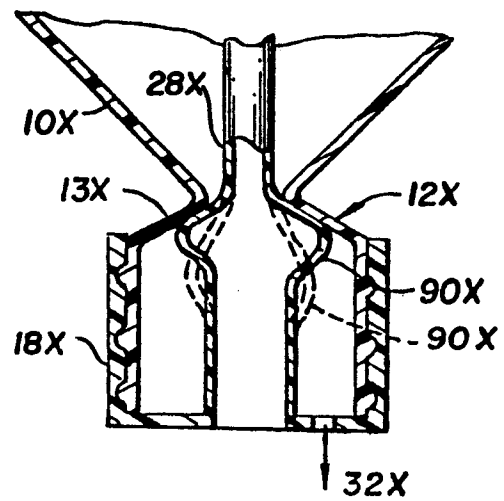


FIG. 12

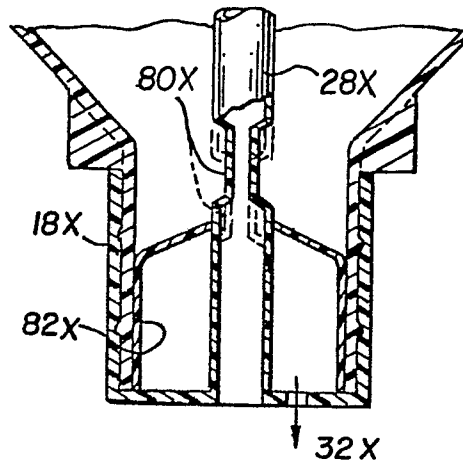


FIG. 13

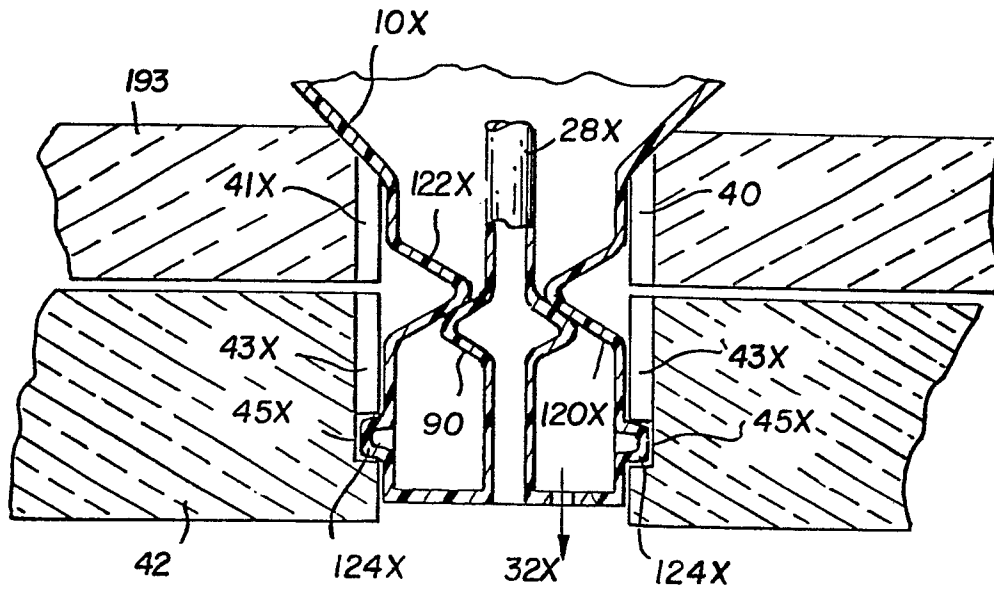


FIG. 14

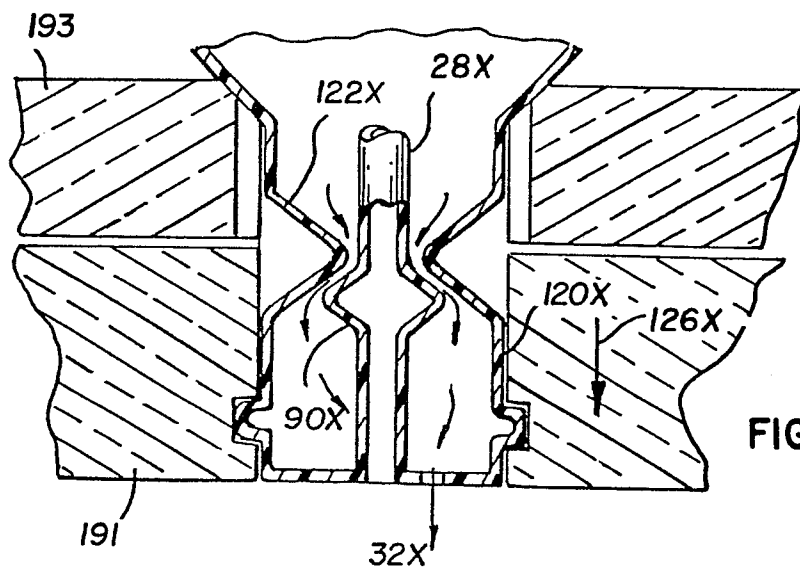


FIG. 15

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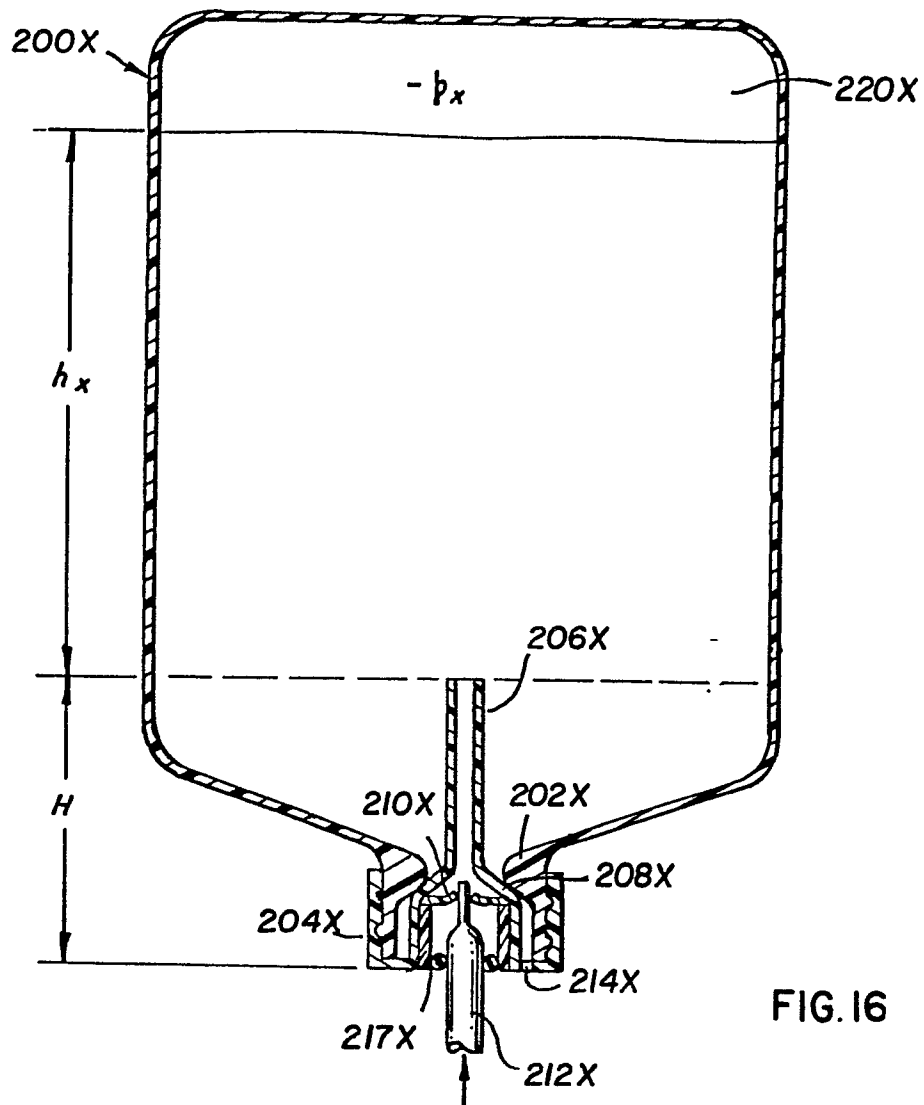


FIG. 16

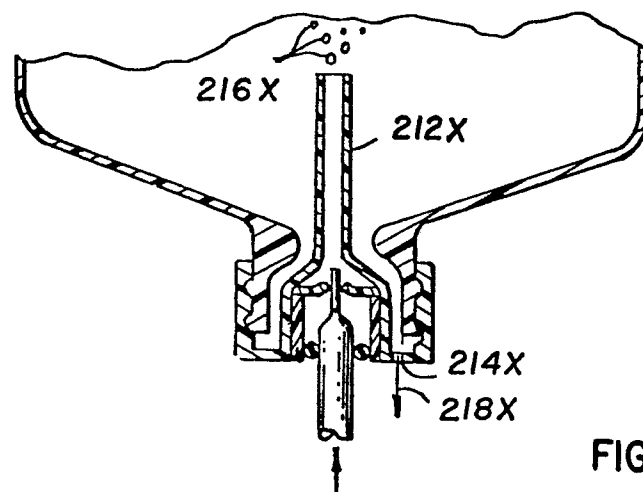


FIG. 17

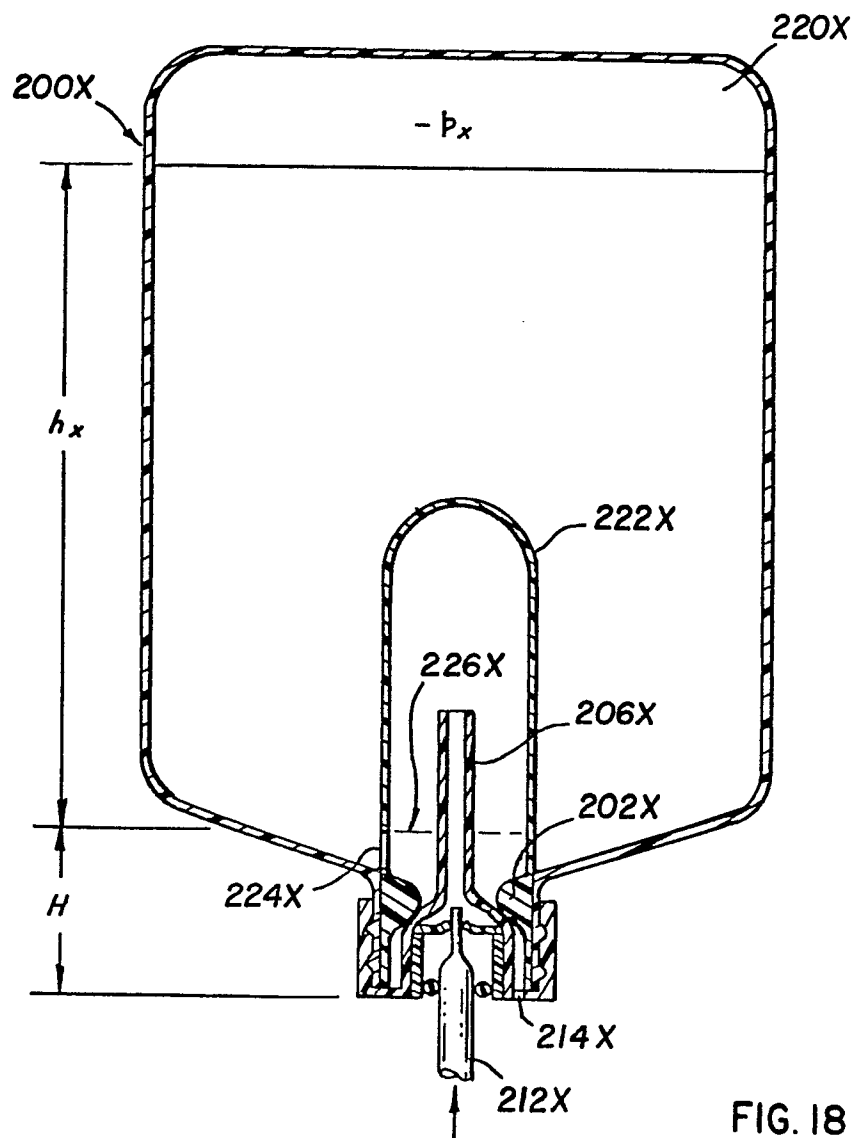


FIG. 18

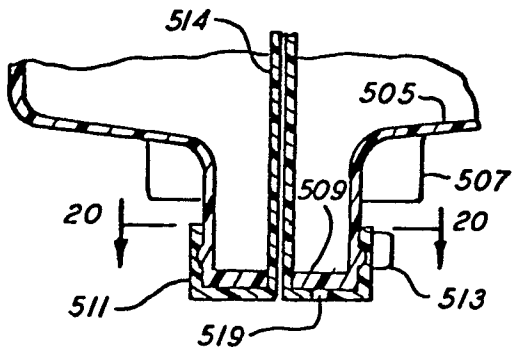


FIG. 19

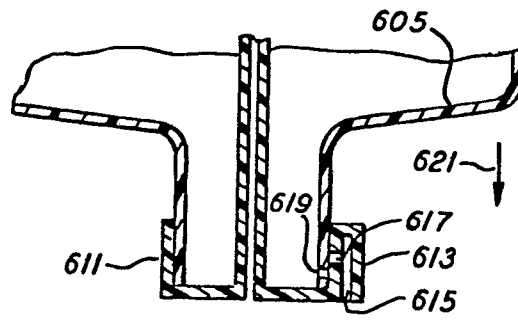


FIG. 21

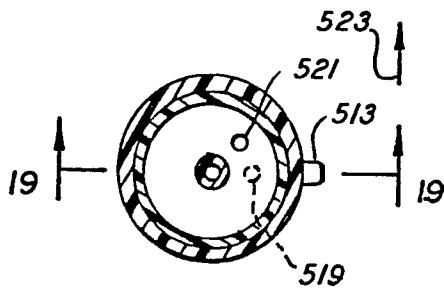


FIG. 20

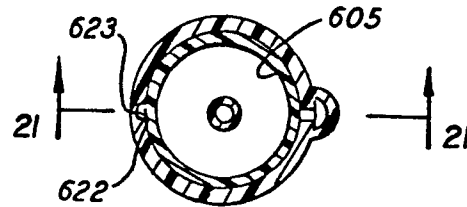


FIG. 22

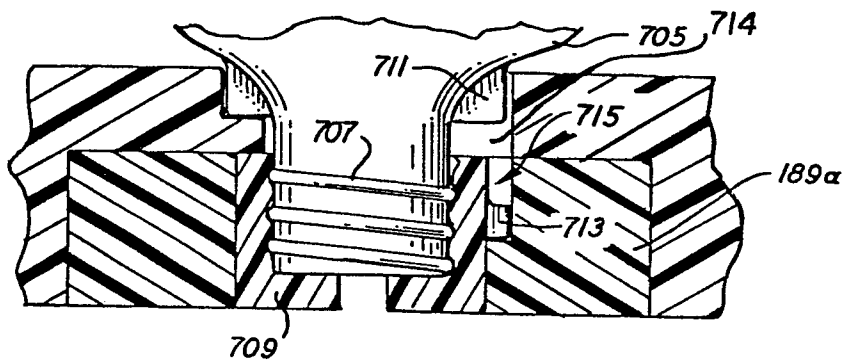


FIG. 23

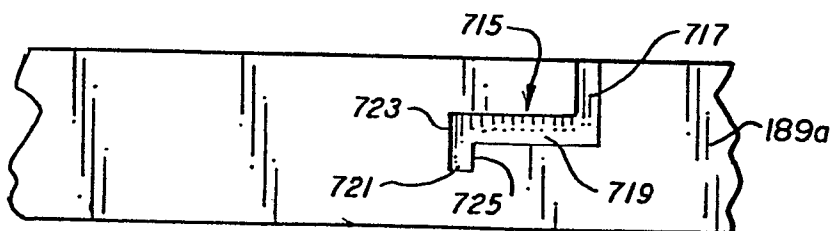


FIG. 24

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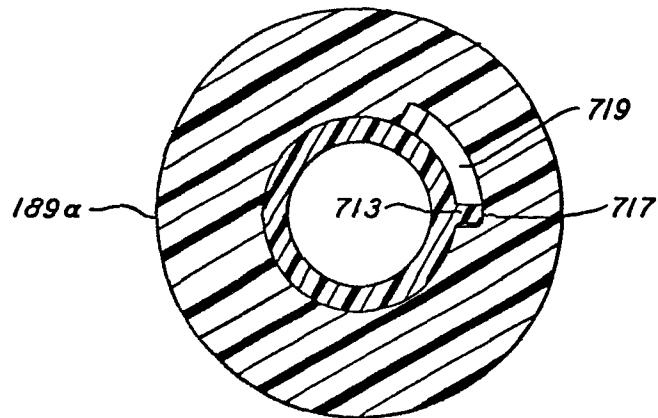
*INSERTED & VENTING*

FIG. 25a

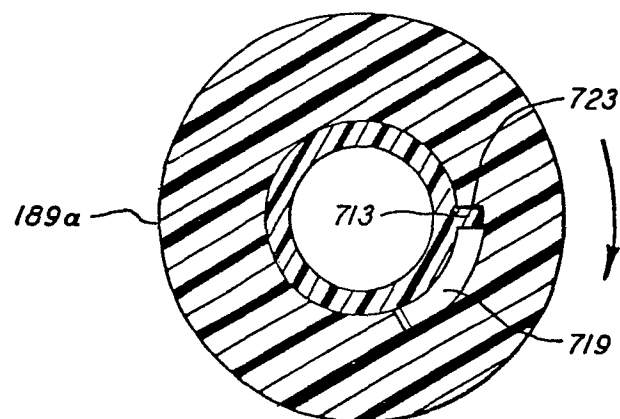
*PRESSURIZED*

FIG. 25b

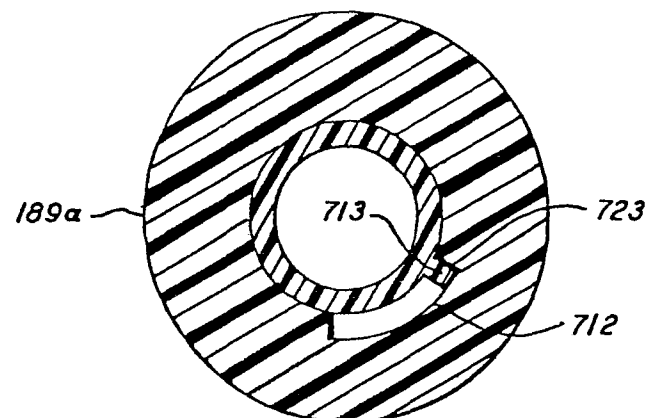
*DISPENSING*

FIG. 25c

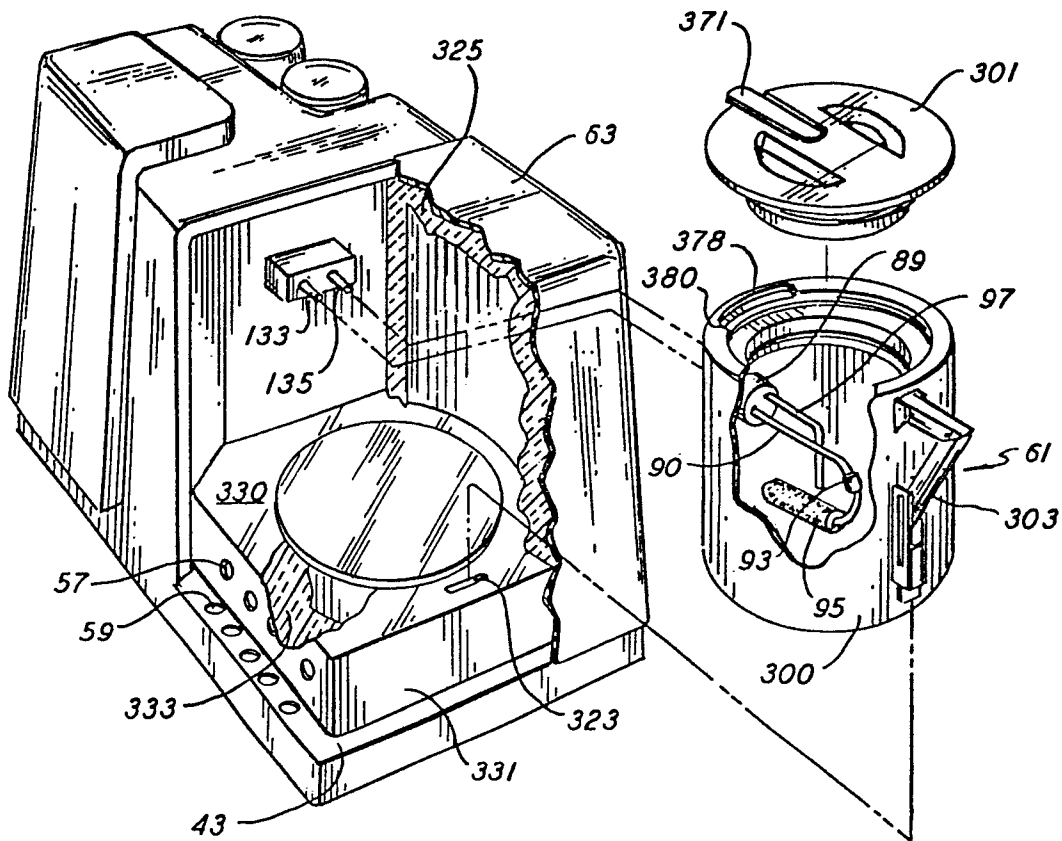


FIG. 26

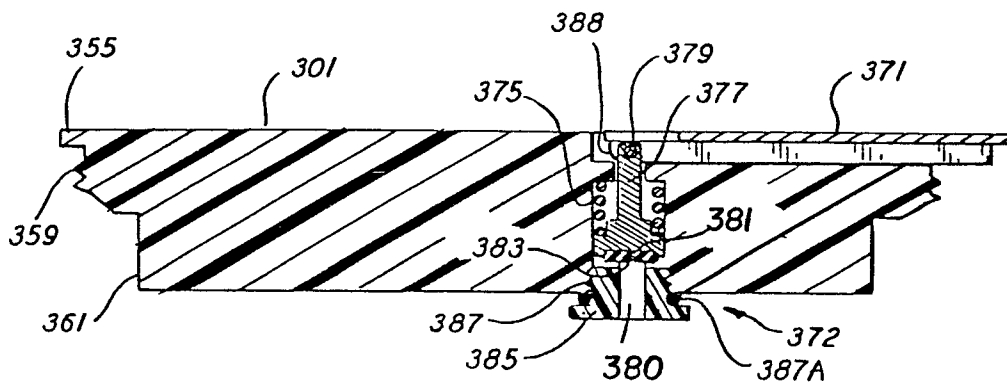


FIG. 30

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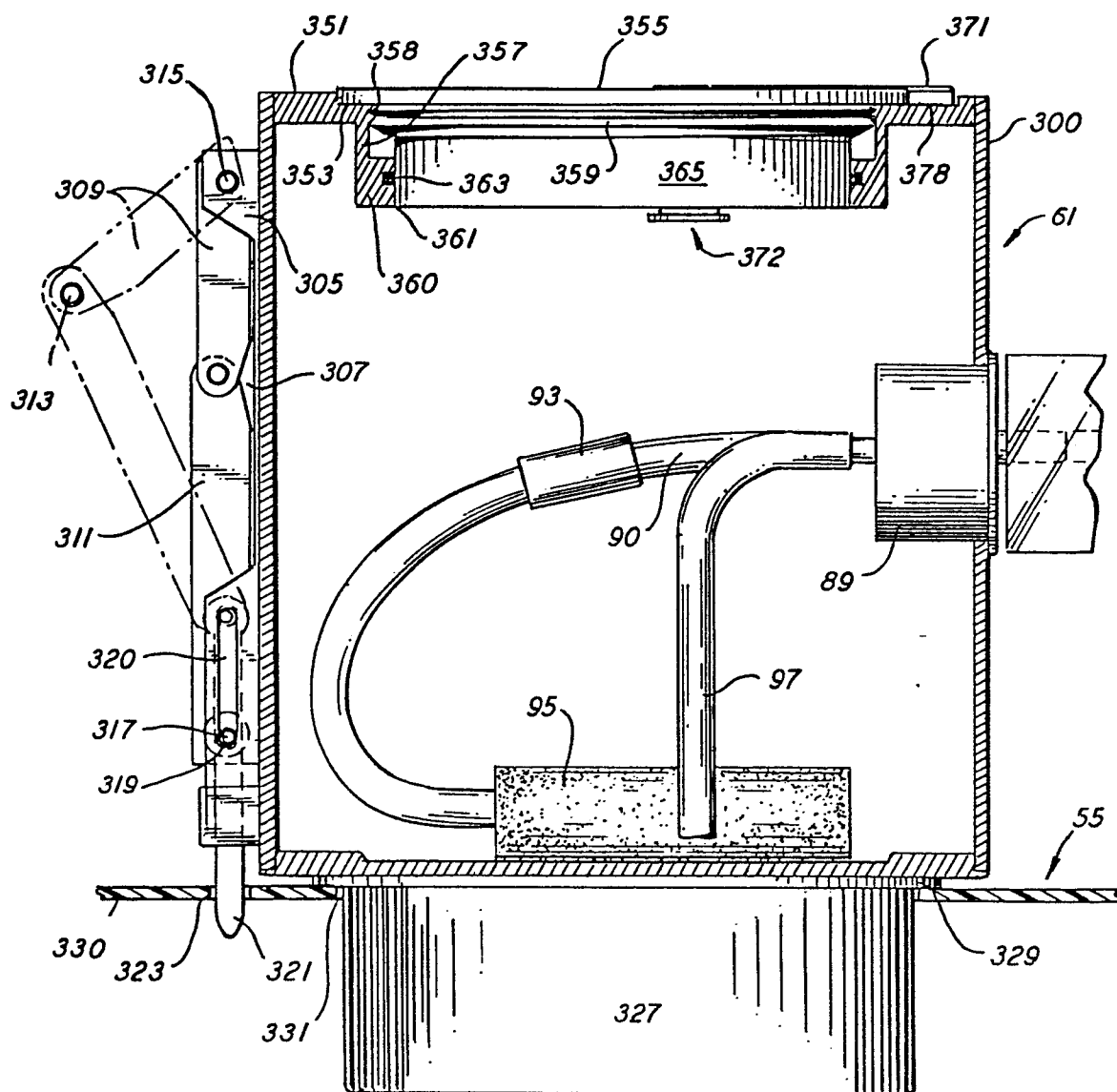


FIG. 27

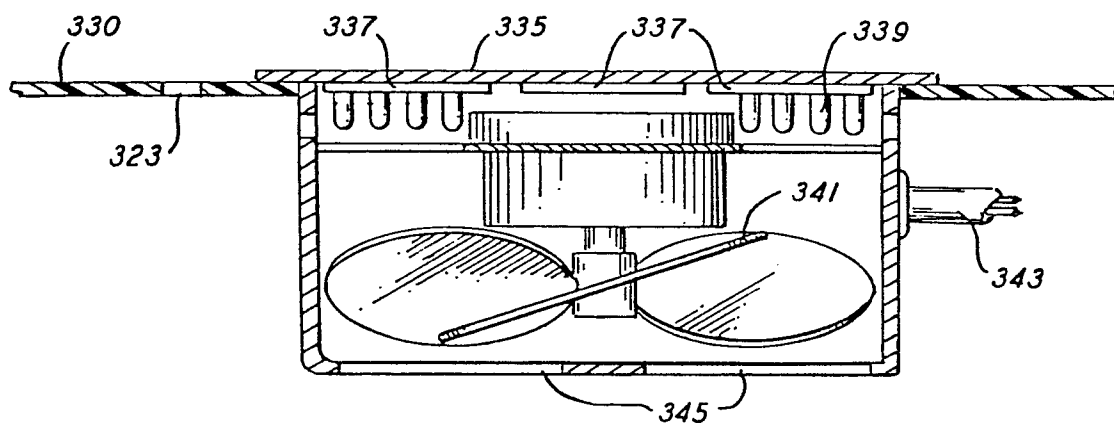
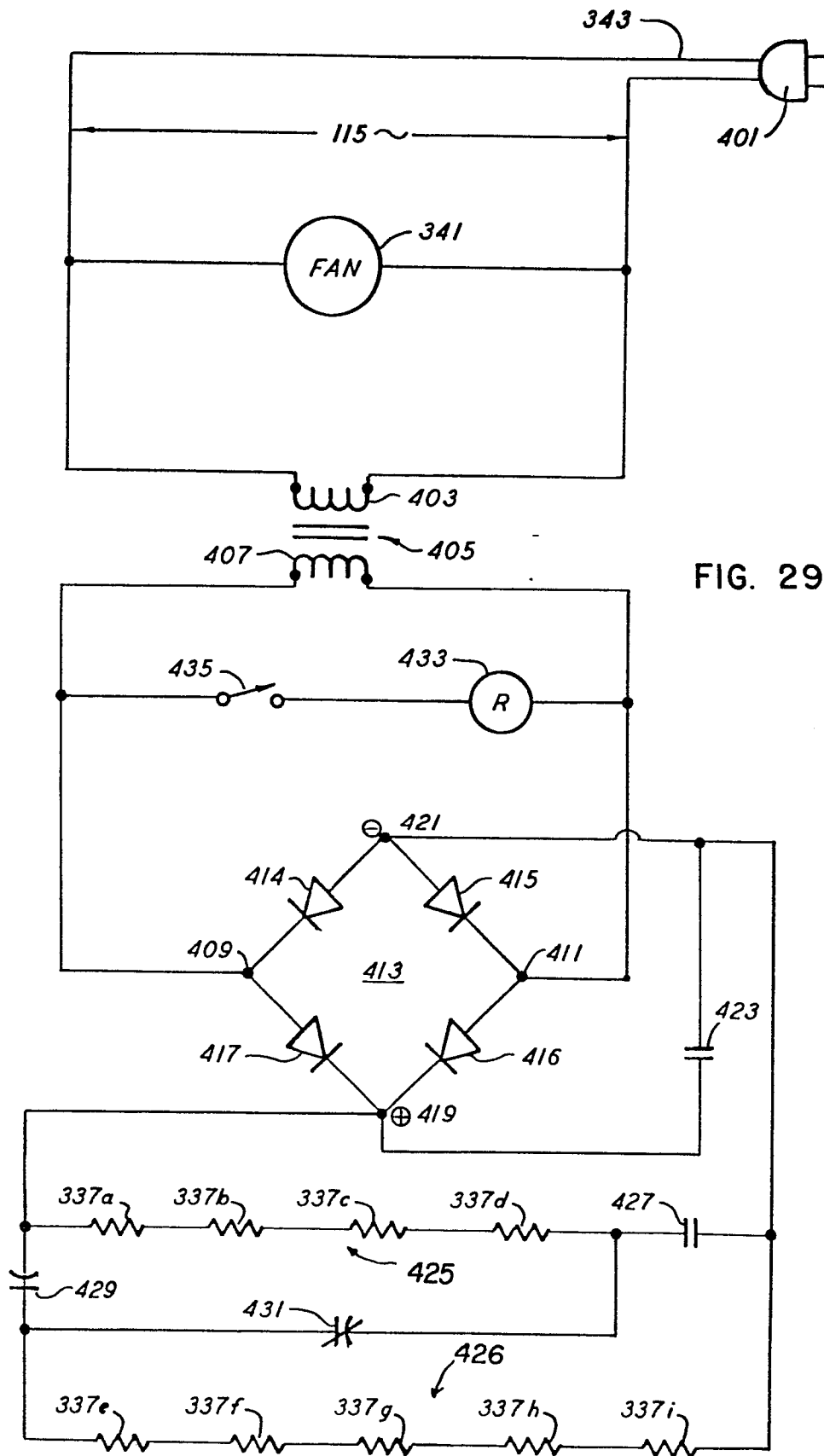


FIG. 28



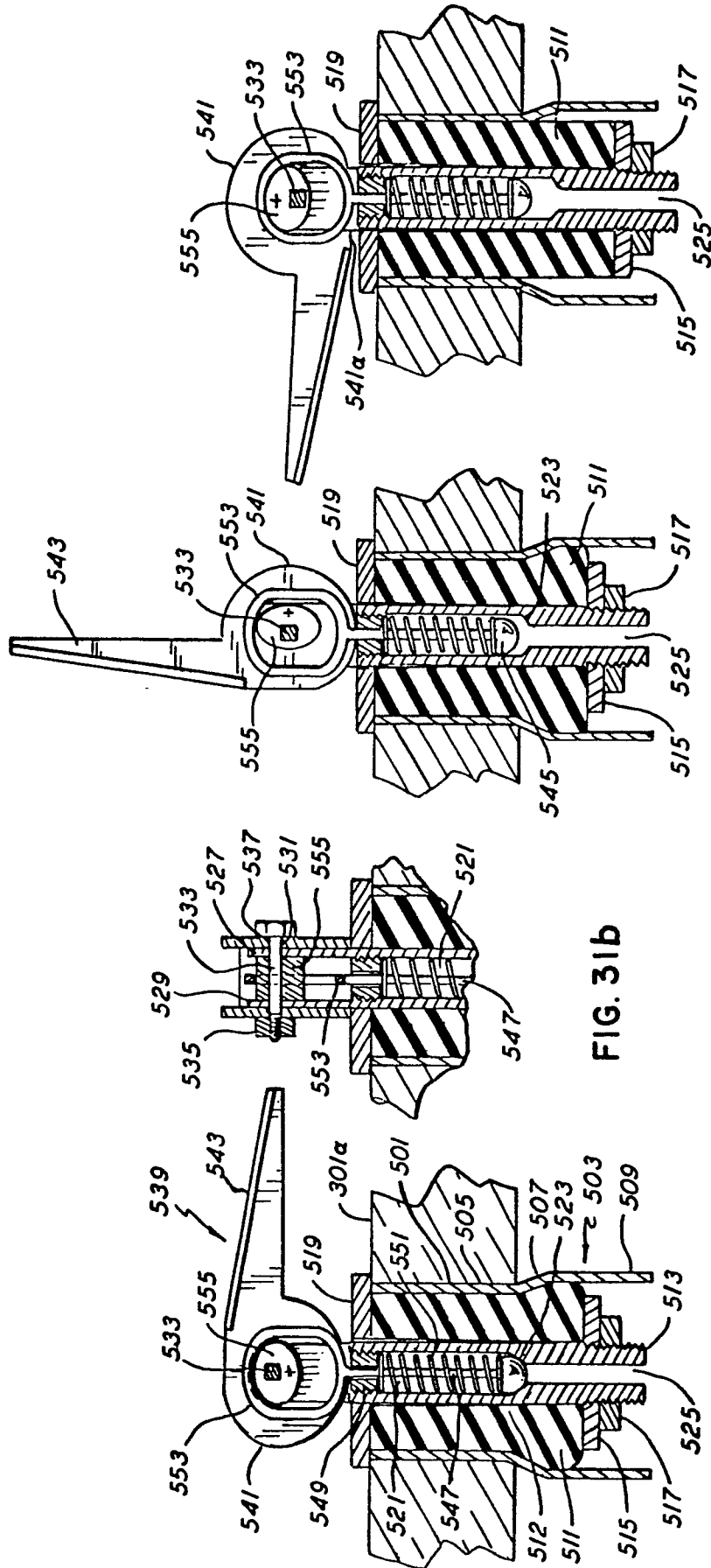


FIG. 31d

FIG. 31c

FIG. 31b

FIG. 31a