United States Patent

Branton et al.

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[54] LIQUID DISPENSING SYSTEM

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[21] Appl. No.: **34,372**

[52] **U.S. Cl.**.....**137/318,** 137/565

[51] **Int. Cl.**.....**B23b 41/08,** F16e 41/04

[58] **Field of Search**.....137/317, 318, 319, 320, 321, 137/565, 568; 222/82, 83, 83.5, 145, 181, 333, 377, 383; 285/3

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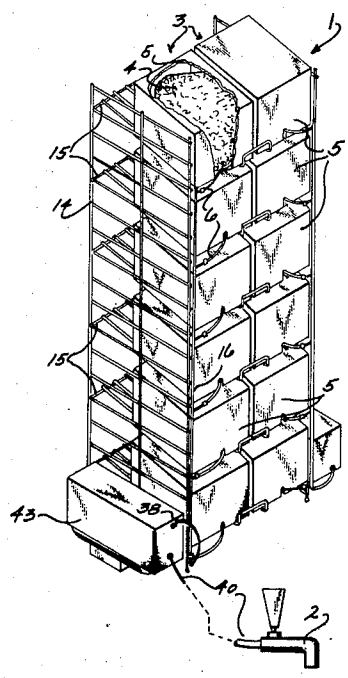
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[57] **ABSTRACT**

The disclosed liquid dispensing system contemplates a liquid source comprising a plurality of containers arranged in a vertical column. Each of the containers is provided with an outlet means adjacent to the bottom thereof and which may be coupled to a vertically extending manifold tube. The liquid in the containers flows by gravity from the containers to a pump connected to the manifold tube. The pump is operated as required to force the liquid into a pressure accumulator tank from which the liquid is drawn at the point of use.

19 Claims, 12 Drawing Figures



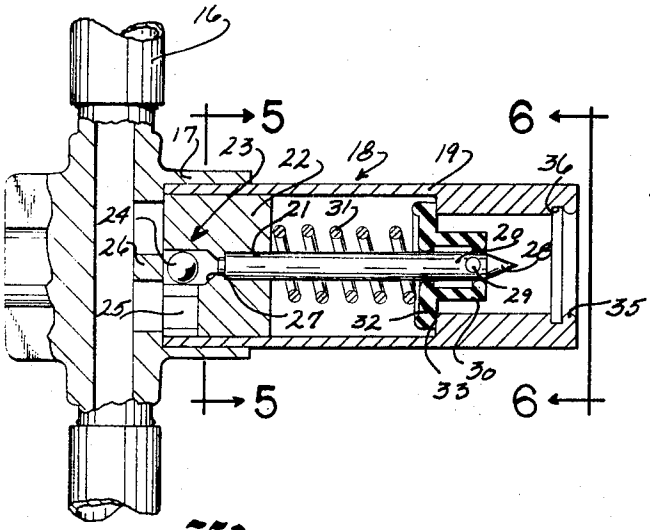


Fig. 4

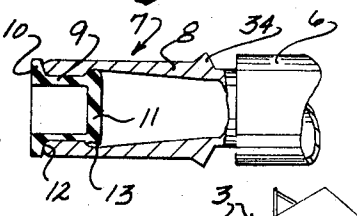


Fig. 3

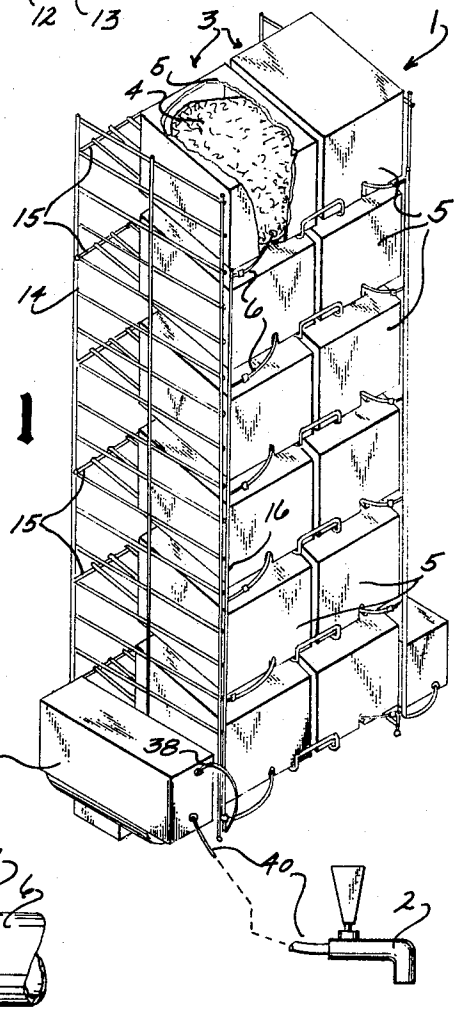


Fig. 1

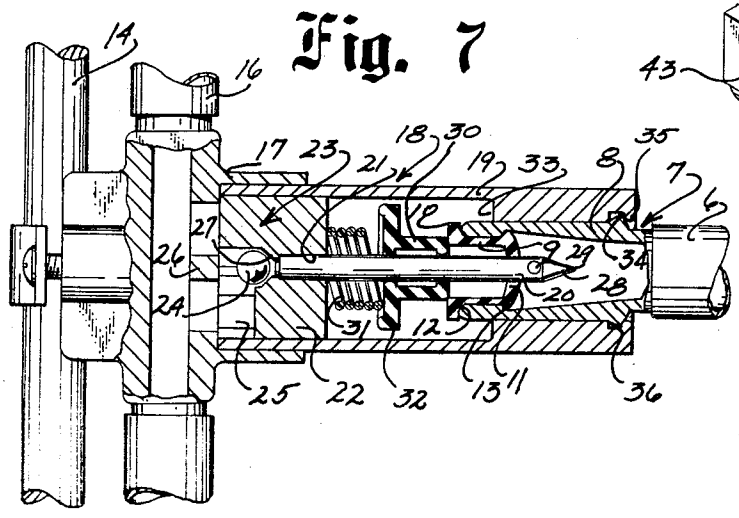


Fig. 7

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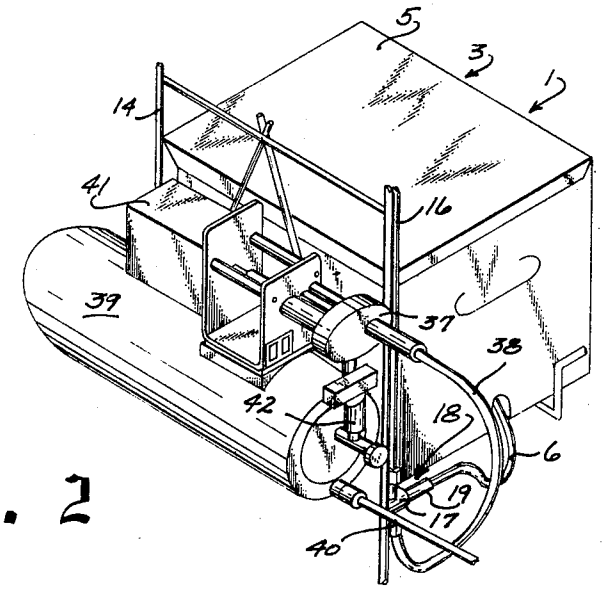


Fig. 2

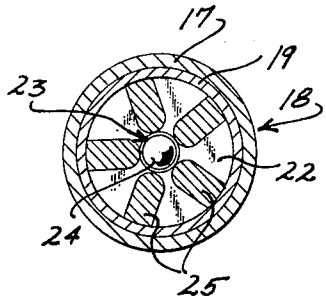
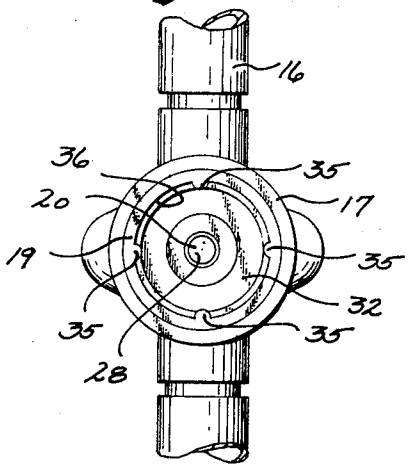


Fig. 5

Fig. 6



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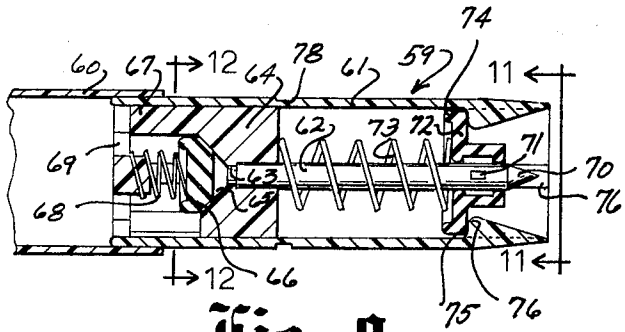


Fig. 9

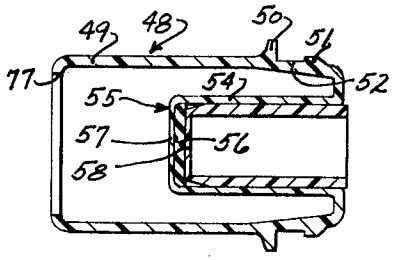


Fig. 10

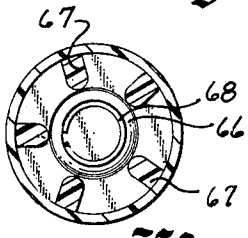


Fig. 12

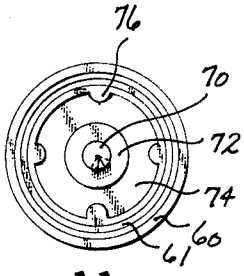
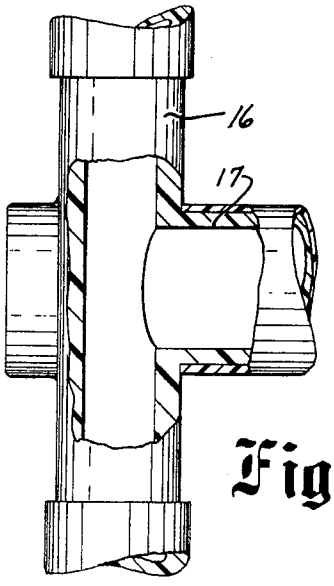


Fig. 11



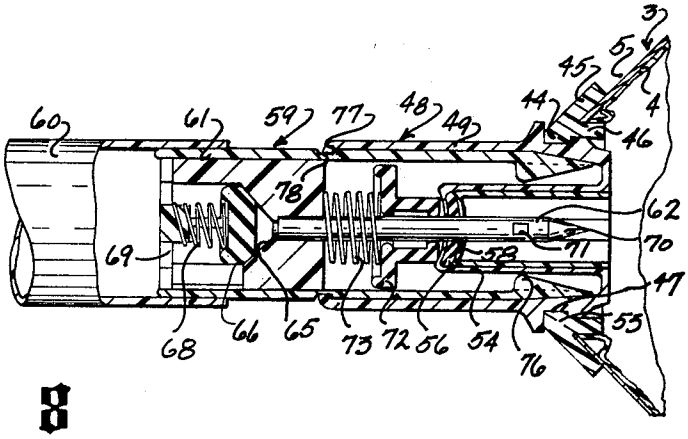


Fig. 8

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LIQUID DISPENSING SYSTEM

BACKGROUND OF THE INVENTION

The invention relates to a liquid dispensing system such as may be employed for the dispensing of a soft drink syrup.

It has been the practice to supply soft drink syrups to retail establishments in stainless steel containers from which the syrup is dispensed by pressurizing with a carbon dioxide gas. The stainless steel containers remain the property of the syrup manufacturer and when empty are returned, washed and refilled. The handling, storage and shipping of empty containers adds substantially to the cost of the product. And because the stainless steel containers could not be shipped interstate, a wide distribution required many generally local cleaning and refilling facilities involving a substantial investment. It is generally an object of this invention to provide a dispensing system which may be employed to dispense liquid from non-refillable, non-returnable containers which can be thrown away after being emptied.

SUMMARY OF THE INVENTION

Generally the liquid dispensing system of this invention contemplates a liquid source comprising a plurality of containers arranged in a vertical column. Each of the containers is provided with an outlet means adjacent to the bottom thereof and which may be coupled to a vertically extending manifold tube. The liquid in the containers flows by gravity from the containers to a pump connected to the manifold tube. The pump is operated as required to force the liquid into a pressure accumulator tank from which the liquid is drawn at the point of use.

DRAWING DESCRIPTIONS

The drawings furnished herewith illustrate the best mode presently contemplated for carrying out the invention and described hereinafter.

In the drawings:

FIG. 1 is a perspective view showing the components of the liquid dispensing system of this invention;

FIG. 2 is an enlarged partial perspective view and shows the assembly including the motor, pump and accumulator tank of the system with the casing removed from the assembly;

FIG. 3 is a detail view partially in section, of the male coupling member for the system;

FIG. 4 is a sectional detail view showing the female coupling unit as connected to the manifold of the dispensing system;

FIG. 5 is a sectional view taken generally on line 5—5 of FIG. 4;

FIG. 6 is an end view of the female coupling unit taken generally on line 6—6 of FIG. 4;

FIG. 7 is a sectional view showing the male coupling element and female coupling unit coupled together as in service;

FIG. 8 is a sectional view showing a further embodiment of a coupling assembly for the invention;

FIG. 9 is a detail section of the male coupling unit shown in FIG. 8;

FIG. 10 is a detail section of the female coupling unit shown in FIG. 8;

FIG. 11 is an end elevational view taken generally on line 11—11 of FIG. 9; and

FIG. 12 is a sectional view taken generally on line 12—12 of FIG. 9.

DESCRIPTION OF THE INVENTION

Referring to the drawings, the liquid dispensing system of this invention is particularly adapted for soft drink syrups and permits the source or supply 1 to be remote from the point of use where the liquid is dispensed from one or more nozzles or taps 2.

The liquid to be dispensed may be provided in non-refillable, non-returnable disposable packages 3 of convenient size for easy handling. Each package 3 comprises a collapsible bag

or container 4 made of suitable plastic material and encased within a generally rigid protective case 5 which can be of cardboard or the like. A length of flexible tubing 6 is connected to the bag 4 adjacent to the bottom thereof and projects outwardly from the corresponding portion of each package 3 to serve as an outlet for the liquid contents. A male coupling unit 7 is provided on the free end of tubing 6 and comprises a tubular element 8 closed by a resilient cup-like stopper member 9 having an annular flanged rim 10 and a generally flat diaphragm bottom 11. The stopper member 9 is forced into the end of the tubular element 8 with the rim 10 seated against the terminus 12 of element 8 and the outwardly projecting annular periphery of diaphragm 11 seated against the oppositely facing annular internal shoulder 13 to form a closure and seal for the bag 4 and its tubing 6.

At the source 1, the packages 3 of the liquid to be dispensed are disposed on a suitable rack 14 in columnar relation. The several levels 15 of rack 14 slant downwardly toward the front and receive the packages 3 with the tubing 6 disposed forwardly in a manner to place the tubing connections to the respective bags 4 in a lowermost position relative to its package.

A vertically disposed manifold tube 16 is supported by the rack 14 adjacent to a corresponding column of packages 3. In FIG. 1, the rack 14 supports two columns of packages 3 each of which is provided with a corresponding manifold tube 16.

The manifold tube 16 is provided with a plurality of vertically spaced inlet fittings 17 corresponding to the number of levels 15 on rack 14 for supporting the packages 3. The respective fittings 17 project generally perpendicularly from the manifold tube 16 with each fitting being located somewhat beneath the corresponding level 15. A female coupling unit 18 is secured in each fitting 17 and projects therefrom for receipt of the male coupling unit 7 on the tubing 6 to place the respective bags 4 of the packages 3 in communication with the manifold 16.

The female coupling unit 18 comprises a tubular element 19 and includes a hollow probe element 20 which extends longitudinally within the element 19. The probe element 20 is secured in the bore 21 provided generally centrally in the base portion 22 adjacent to the manifold inlet fitting 17. A check valve 23 is provided at the manifold end of bore 21 and includes the floating ball 24 which is confined radially by a plurality of circumferentially spaced internal radial projections 25 connected to the base portion 22 and axially by the stop 26. When the pressure in the manifold 16 exceeds the pressure in the corresponding bag 4 the floating ball 24 engages and seats against the tapered valve seat 27 at the end of bore 21 to preclude liquid flow into the manifold.

The outer end of the probe element 20 is provided with a tapered penetrating head 28 adapted to puncture the diaphragm 11 of the male coupling unit 7 when coupling is effected. Adjacent to the penetrating head 28, the probe element 20 is provided with a cross through bore to provide opposed inlets 29 to the hollow interior of the probe element. The inlets 29 are normally closed by the annular resilient valve member 30 slidably disposed on the probe element 20. The helical spring 31 surrounding probe element 20 and disposed between valve member 30 and the base portion 22 serves to bias the valve member into the position where the radial flange 32 on the valve member abuts the internal annular shoulder 33 of the tubular coupling element 19 to close the inlets 29.

When coupling is effected between the male unit 7 and the female unit 18, the penetrating head 28 on the probe element 20 of the female unit pierces and moves through the diaphragm portion 11 of the stopper member 9 in the male unit. Simultaneously, the stopper member flanged rim 10 projecting over the end 12 of the male unit 7 engages the end of the slidable valve member 30 on probe element 20 and unseats the valve member from its closure position over inlets 29 against the biasing pressure of spring 31. Coupling engagement between male unit 7 and female unit 18 is complete after

the circumferential ridge 34 on the outside of the male coupling element 8 is forced past the plurality of circumferentially spaced radial prongs 35 projecting inwardly from the annular stepped recess 36 provided at the entrance to the female unit. With the ridge 34 seated in the recess 36 behind the prongs 35 as generally shown in FIG. 5, coupling between male unit 7 and female unit 18 is maintained against the pressure of spring 31 and the probe element 20 will then have penetrated the diaphragm 11 axially to an extent to place the probe inlets 29 inwardly of the stopper member 9. With the inlets 29 of the probe element 20 disposed inwardly from the resilient stopper member 9 closing the male coupling unit 7, the interior of the hollow probe element is placed in communication with the collapsible bag 4 through the tubing 6 and flow from the bag to the manifold tube 16 is controlled by the check valve 23.

To effect an uncoupling between male unit 7 and the female unit 18, the male unit is pulled axially forcing the annular ridge 34 to disengage from behind the prongs 35. Thereafter, removal of the male unit is completed with the help of spring 31 which reseats the valve member 30 in closure position over inlets 29 with the radial flange 32 on the valve member abutting the annular shoulder 33. As the probe element 20 is withdrawn from its penetration of the stopper member 9 during uncoupling, the resilience of the material effects a reclosure and generally seals the diaphragm 11 to minimize possible leakage from the bag 4 of any liquid remaining therein.

From the manifold tube 16 the liquid is conducted to pump means including a positive displacement pump 37, preferably a gear pump, through the tubing 38 connecting the lower end of the manifold tube to the pump inlet. The outlet of pump 37 is connected to the pressure accumulator tank 39 from which the liquid is drawn by the tap 2 through the conduit 40 connecting the tap and accumulator tank. The electric motor 41 driving the pump 37 is controlled by the pressure switch 42 mounted on the accumulator tank 39 and in pressure communication therewith. The switch 42 is adapted to start the motor 41 to run the pump 37 when the accumulator tank 39 has generally reached a given minimum pressure and to shut off the motor to stop the pump when the accumulator tank has generally reached a given maximum pressure. The pump means comprising the motor 41, pump 37, and accumulator tank 39 is disposed to the side of the lowermost level 15 of rack 14 and may be enclosed within a suitable casing 43.

To place the liquid dispensing system of this invention in service, the packages 3 are disposed on the several levels 15 of rack 14 and the respective outlet tubings 6 are coupled to the manifold tube 16 at the corresponding inlet fittings 17. From the packages 3 making up the source or supply 1, flow through the manifold tube 16 to the pump 37 is by gravity. Because of the pressure head in the manifold tube 16, the check valves 23 will be closed for all packages 3 beneath the uppermost package 3 still containing liquid. As a package 3 empties and the pressure head falls in the manifold tube 16 beneath the liquid level in the next lower package, its corresponding check valve 23 opens in response to the falling pressure head to maintain the flow of liquid into the manifold tube. As a consequence, the packages 3 will empty consecutively from top to bottom as liquid is withdrawn from the system.

Since the plastic bags or containers 4 in the packages 3 are not vented, a vacuum is drawing therein as liquid is being withdrawn. As a consequence, the bags 4 collapse under atmospheric pressure to provide an assist in emptying the bag.

In the embodiment shown in the drawings wherein the pump means comprising the motor 41, pump 37 and accumulator tank 39 are disposed alongside the lowermost level 15 of the rack 14 and with the pump mounted above the accumulator tank, flow by gravity cannot be relied upon to fully empty the package 3 disposed at the lowermost level. Thus, the source or supply 1 by all appearances will be empty when the lowermost package 3 still contains liquid to a level generally corresponding to the level of the inlet of pump 37.

When the source or supply 1 by all appearances is empty and requires to be replenished, all the empty packages 3 above the lowermost package are uncoupled from the manifold tube 16, removed from the rack 14 and disposed of. The lowermost package 3 is then uncoupled and moved to the highest level 15 to which the rack 14 is to be reloaded. Fresh packages 3 are loaded onto the rack 14 at all levels 15 beneath the partially empty package at the top of the column. After the packages 3 are again coupled to the manifold tube 16 and the system again placed in service, the uppermost partially empty package will be the first package on the reloaded rack 14 to be fully emptied. With the partially empty package 3 from the lowermost level 15 of rack 14 being moved to the highest level upon reloading, prompt usage of the liquid therein is assured to prevent possible deterioration. When the rack 14 is to be reloaded before all of the packages 3 in the column are empty, any partially empty package should be placed in the uppermost position in the column and any remaining full packages should be moved up to the next adjacent levels 15 beneath the partially empty package and any fresh packages required to complete the column should assume the lowest levels. Such movement of the packages 3 is conveniently possible because upon uncoupling of a package from the manifold tube 16, the resilience of the diaphragm portion 11 of the stopper member 9 can be relied upon to reclose and generally seal the opening caused by the penetration of probe element 20 upon initial coupling between the male coupling unit 7 and female coupling unit 18.

The embodiment of FIGS. 8–12 shows another form of coupling arrangement as may be employed in the dispensing system of this invention. According to the latter embodiment each disposable package 3 is provided with a receptacle fitting 44 having forwardly disposed radially extending circumferential flanges 45 secured to the generally rigid outer case 5 and a rearwardly extending tubular portion 46 secured to the collapsible inner bag 4. The receptacle fitting 44 provides a generally circular opening 47 to the bag 4 which is closed by the plastic female coupling plug 48.

The coupling plug 48 comprises an annular tubular outer shell 49 having longitudinally circumferential projections 50 and 51 forming a peripheral groove 52 for the receipt of the annular inward projection 53 of fitting 44 to secure the coupling plug to the package 3. The coupling plug 48 further includes a forwardly extending cup-like projection 54 disposed interiorly of outer shell 49 and spaced concentrically therefrom. The bottom 55 of the cup-like projection 54 is spaced rearwardly from the forward end of outer shell 49 and comprises a resilient diaphragm 56 sandwiched between the inner and outer layers 57 and 58 of the cup-like projection.

The female coupling plug 48 is engageable with a male coupling unit 59 carried on the end of a length of flexible tubing 60 connected to the manifold tube 16 at the corresponding manifold inlet fitting 17 to place the bag 4 of package 3 in communication with the manifold.

The male coupling unit 59 bears certain similarities to the female coupling unit 18 of FIG. 4 and comprises an annular tubular outer shell 61 having a hollow longitudinally extending probe element 62 therein. The probe element 62 is secured in the bore 63 provided generally centrally in the base portion 64 intermediate the length of shell 61 and extends forwardly from the base portion.

Oppositely from probe element 62 the bore 63 terminates with a flared valve seat 65 engageable by the movable valve seal member 66. The seal member 66 is confined radially by a plurality of circumferentially spaced internal radial projections 67 connected to the base portion 64. A relatively light coil spring 68 is disposed between the rearwardly disposed stop 69 and the seal member 66 to bias the member toward the valve seat 65. Generally the biasing pressure of spring 68 is overcome to provide for flow through the bore 63 toward the manifold 16 when the pressure head in the manifold drops somewhat beneath the head in the corresponding package 3.

The forward end of the hollow probe element **62** is provided with a tapered head **70** which is adapted to penetrate the several layers **57** and **58** and intermediate diaphragm **56** of the female coupling plug projection **54** when coupling is effected. Adjacent to the penetrating head **70**, the probe element **62** is provided with a diametral through bore providing inlets **71** to the hollow interior of the element. The inlets **71** are closed by the annular resilient valve member **72** slidably disposed on the probe element **62**. A helical spring **73** disposed between the valve member **72** and the base portion **64** biases the valve member forwardly on the probe element **62** and closure of inlets **71** is effected when the radial flange **74** on the valve member engages with the shoulders **75** formed by the circumferentially spaced internal projections **76** adjacent to the forward end of tubular shell **61**.

To effect coupling between the female coupling plug **48** and the male coupling unit **59**, the male unit is brought into general alignment with the female coupling plug such that the tubular shell **61** will enter the shell **49** of the plug. With some pressure the penetrating head **70** of the male unit **59** will pierce and move through the bottom **55** of the cup-like projection **54** to place the probe element inlets **71** in communication with the liquid content of the bag **4**. Simultaneously the bottom **55** of projection **54** engages with the slidable valve member **72** and moves it rearwardly on the probe element **62** against the biasing pressure of spring **73**. Coupling engagement is complete when the relatively small annular internal ridge **77** at the forward end of the coupling plug shell **49** enters the peripheral groove **78** provided on the outside of the male coupling shell **61** to maintain the coupling engagement.

When an uncoupling is effected, the annular ridge **77** is forceably disengaged from the groove **78** and as the probe element **62** is withdrawn, the spring **73** biases the valve member **72** forwardly toward the position covering the inlets **71**. As the probe element **62** is withdrawn from its penetration of the projection bottom **55**, the resilience of the diaphragm **56** tends to effect a reclosure and sealing to minimize possible leakage from the bag **4** if any liquid content remains.

Various modes of carrying out the invention are contemplated as being within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

We claim:

1. In a liquid dispensing system, pump means for delivering the liquid to the point of use and having an inlet, a manifold tube having at least some vertical extent and connected to the inlet of said pump means, at least one container containing a supply of the liquid to be dispensed with the level of the liquid in the container exceeding the height vertically of the inlet to the pump means, said container having an outlet adjacent to the bottom thereof, said manifold tube having inlet means corresponding to said container and disposed at a level beneath that of the container outlet, and means for coupling the container outlet to the inlet means on the manifold tube to provide for gravity flow of the liquid from the container to the pump means, said coupling means including corresponding coupling units in flow communication with the container outlet and the manifold tube inlet means respectively, said coupling unit in communication with the container outlet including sealing closure means for the container and the coupling unit in communication with the manifold tube inlet means including means for breaking the closure means to place the container in flow communication with the manifold tube.

2. The invention as set forth in claim **1** wherein the coupling unit in flow communication with the container outlet is a male coupling unit and is received within a female coupling unit in flow communication with the manifold tube inlet means.

3. The invention as set forth in claim **2** wherein the male coupling unit includes closure means for the container and the female coupling unit includes means for penetrating the closure means to place the container in flow communication with the manifold tube.

4. The invention as set forth in claim **1** wherein the coupling unit in flow communication with the container outlet comprises a female coupling closure plug on the container and which is adapted to receive a male coupling unit in flow communication with the manifold tube inlet means.

5. The invention as set forth in claim **4** wherein the male coupling unit includes means for penetrating the closure plug to place the container in flow communication with the manifold tube.

6. In a liquid dispensing system, a pressure accumulator for delivering the liquid to the point of use, a motor-driven positive displacement pump having an inlet and an outlet with the latter communication with said accumulator, a plurality of containers containing the liquid for dispensation and having outlet means adjacent to the bottom thereof, a rack having a plurality of levels with each level adapted to support a container to place the containers in a vertical column, a vertically extending manifold having the lower end thereof communicating with the pump inlet, a plurality of vertically spaced inlets on said manifold, said manifold inlets corresponding to the respective levels of said rack and the respective inlets being disposed beneath the corresponding levels of said rack, a first coupling unit connected to each of the manifold inlets, and a second coupling unit connected to the respective container outlet means, said first coupling units being adapted for coupling to the corresponding second coupling units to connect the respective containers to the manifold and provide for gravity flow of liquid from the containers to the pump.

7. The invention as set forth in claim **6** wherein check valve means are disposed between the manifold and each of the respective containers, said valve means being adapted to preclude flow from the containers to the manifold when the pressure head in the manifold exceeds that in the corresponding container and thereby provide for consecutive emptying of the vertical column of containers from top to bottom.

8. The invention as set forth in claim **7** wherein the check valve means comprises a spring biased rubber sealing member.

9. The invention as set forth in claim **6** wherein the second coupling unit serves as a sealing closure for the corresponding container.

10. The invention as set forth in claim **9** wherein the second coupling unit comprises a tubular coupling element the free end of which is closed by a resilient diaphragm.

11. The invention as set forth in claim **10** wherein the first coupling unit includes means for piercing the resilient diaphragm of the second coupling unit and thereby place the corresponding container in flow communication with the manifold.

12. The invention as set forth in claim **10** wherein said first coupling unit comprises a tubular coupling element, a probe element extending longitudinally within the tubular element and having a penetrating head adjacent to the free end of the coupling unit, said probe element being hollow with the interior thereof communicating with the manifold and having inlet means adjacent to the penetrating head, a valve member slidably disposed on said probe element, spring means biasing the valve member to a position of closure over the probe element inlet means, said penetrating head of the probe element being adapted to pierce the resilient diaphragm of the second coupling unit during the coupling operation with the second coupling unit engaging the valve member and pushing same from the closure position over the probe element inlet means against the biasing pressure of said spring means to place the probe element inlet means and therefore the manifold inflow communication with the container, and interlocking means on the respective tubular elements of the coupling units to maintain said units in coupling relation against the pressure of the spring means biasing the valve member.

13. The invention as set forth in claim **12** wherein check valve means are disposed between the probe element and manifold, said check valve means being adapted to preclude flow from the corresponding container until the pressure head in said container exceeds the pressure head in the manifold.

14. The invention as set forth in claim 12 wherein the interlocking means for maintaining the coupling relation comprises external ridge means on the tubular element of the second coupling unit, said ridge means being engageable behind internal radial inwardly projecting means on the first coupling unit.

15. The invention as set forth in claim 12 wherein the first coupling unit is a male coupling unit having an external peripheral groove intermediate the length thereof and the second coupling unit is a female unit having an internal annular ridge at the forward end thereof, said ridge being engageable within said groove during the coupling operation to maintain the coupled relation between the coupling units.

16. The invention as set forth in claim 6 wherein the second coupling unit is a plastic closure plug and includes a resilient diaphragm sandwiched between layers of plastic material and said first coupling unit includes means for piercing the diaphragm and plastic layers to place the corresponding container in flow communication with the manifold.

17. A coupling arrangement for connecting a liquid supply container into a dispensing system for the liquid, comprising first and second coupling units adapted to be coupled together, said first coupling unit connected to the container and comprising a tubular element having a free end closed by a resilient diaphragm member to provide a sealing closure for the container, said second coupling unit connected to the balance of the dispensing system and comprising a tubular element having an internal longitudinally extending probe element adapted to penetrate through the diaphragm member during the coupling operation, said probe element being hollow with the interior thereof communicating with the balance of the dispensing system and having inlet means placing the interior thereof in communication with the container.

18. A coupling arrangement for connecting a liquid supply container into a dispensing system for the liquid, comprising male and female coupling units, said male coupling unit being connected to the container and comprising a tubular element having the free end thereof closed by a resilient diaphragm member to provide a sealing closure for the container, said female coupling unit being connected to the balance of the dispensing system and comprising a tubular element adapted to receive the male coupling unit, a probe element extending longitudinally within the tubular element of the female unit and adapted to penetrate through the diaphragm member of the male unit during the coupling operation, said probe element being hollow with the interior thereof communicating with the balance of the dispensing system and having inlet means, a valve member slidably disposed on said probe element, spring means to bias the valve member to a position of closure over the probe element inlet means, said valve member being engaged and pushed from the probe element inlet means closure position by the male coupling unit during the coupling operation to place the probe element inlet means in flow communication with the container and hence place the container into the dispensing system, and interlocking means on the respective tubular elements of the coupling units to maintain said units in coupling relation against the pressure of the spring means biasing the valve member.

19. A coupling arrangement for connecting a liquid supply container into a dispensing system for the liquid, comprising male and female coupling units, said female coupling unit being connected to the container and comprising a closure plug therefor having a tubular element and a resilient diaphragm member, said male coupling unit being connected to the balance of the dispensing system and comprising a tubular element adapted to enter the female coupling unit, a probe element extending longitudinally within the tubular element of a male unit and adapted to penetrate through the diaphragm member of the female unit during the coupling operation, said probe element being hollow with the interior thereof communicating with the balance of the dispensing system and having inlet means, a valve member slidably disposed on said probe element, spring means to bias the valve member to a position of closure over the probe element inlet means, said valve member being engaged and pushed from the probe element inlet means closure position by the female coupling unit during the coupling operation to place the probe element inlet means in flow communication with the container and hence place the container into the dispensing system, and interlocking means on the respective tubular elements of the coupling units to maintain said units in coupling relation against the pressure of the spring means biasing the valve member.

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