Aug. 10, 1965 E. C. DIVES ETAL 3,199,746

LIQUID TRANSFER MECHANISMS

Filed Sept. 10, 1962 2 Sheets-Sheet 1

FIG. 1

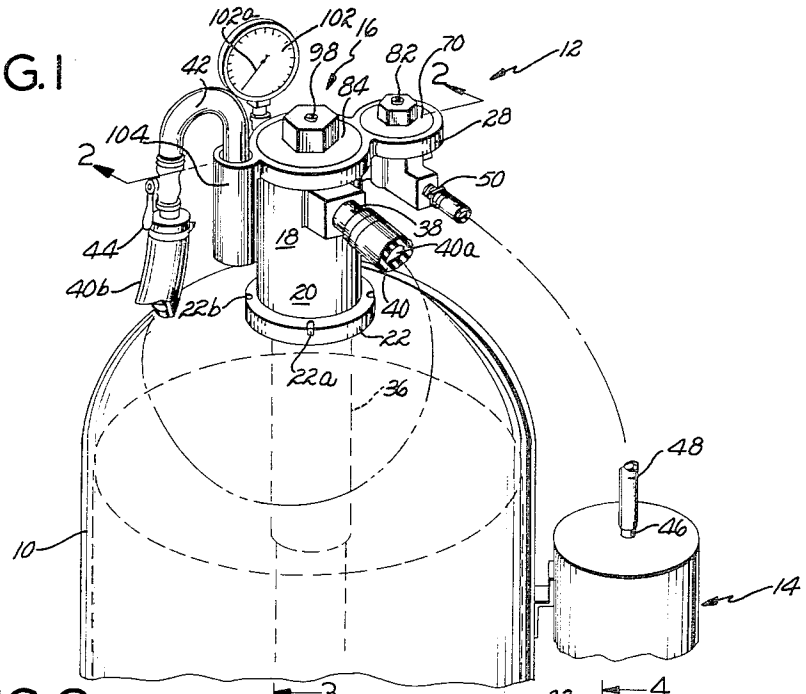
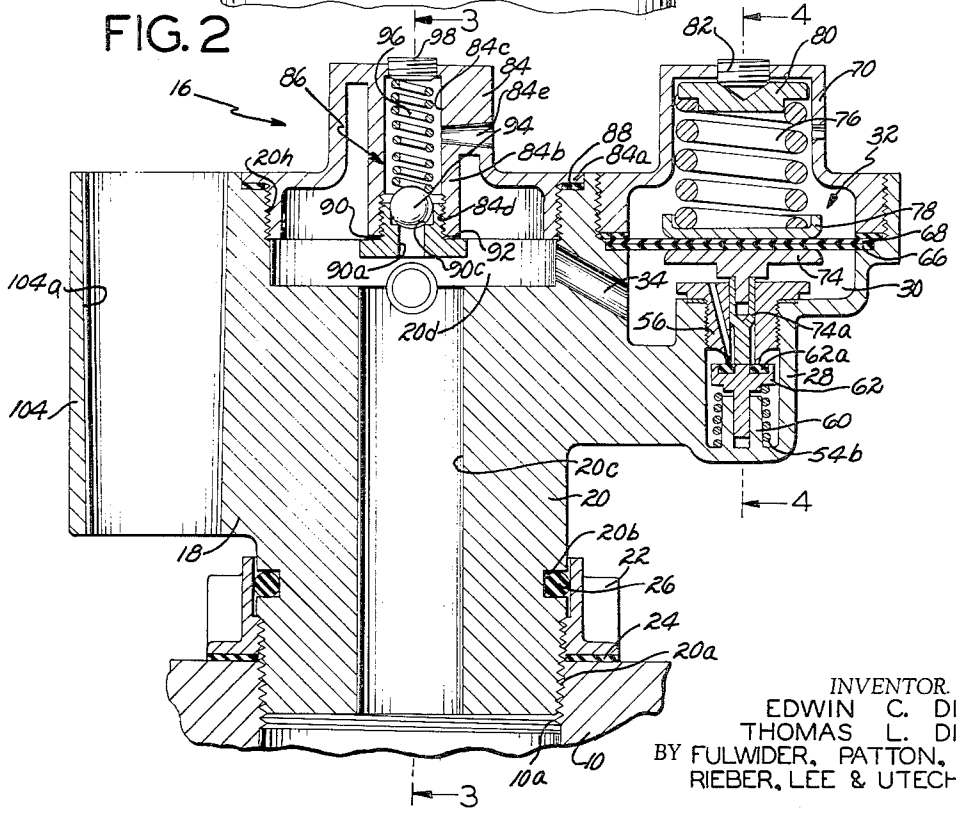


FIG. 2



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FIG. 3

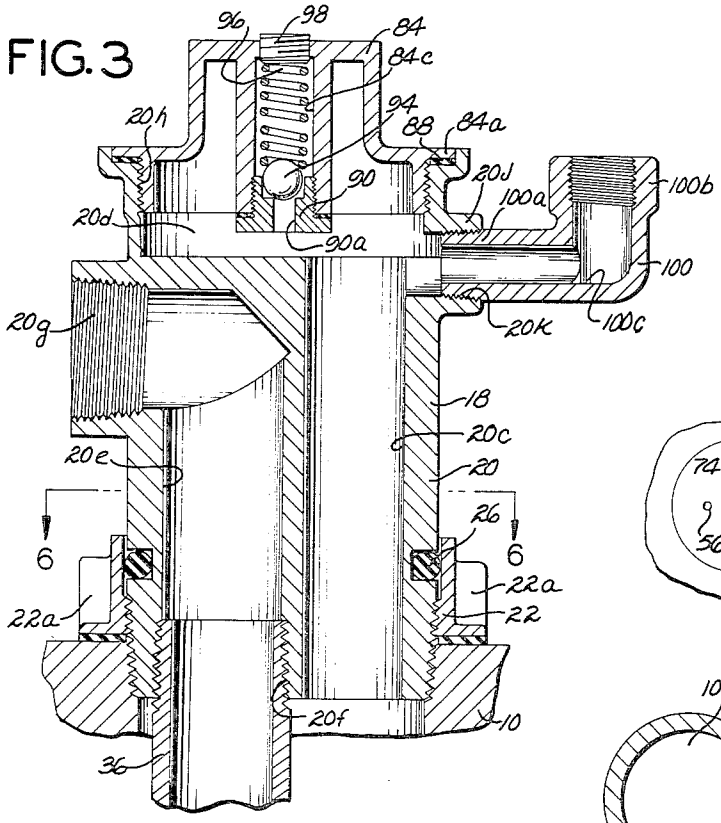


FIG. 5

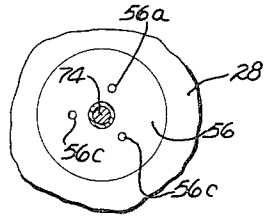


FIG. 4

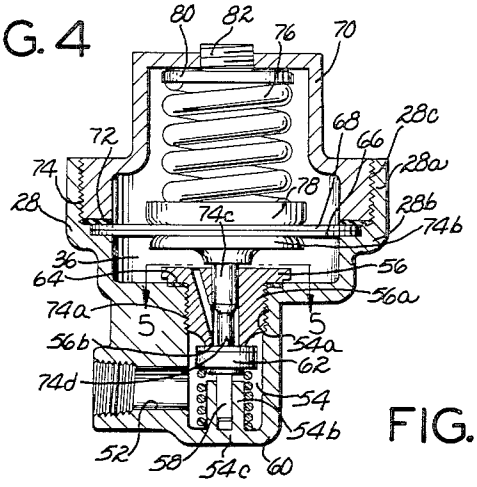
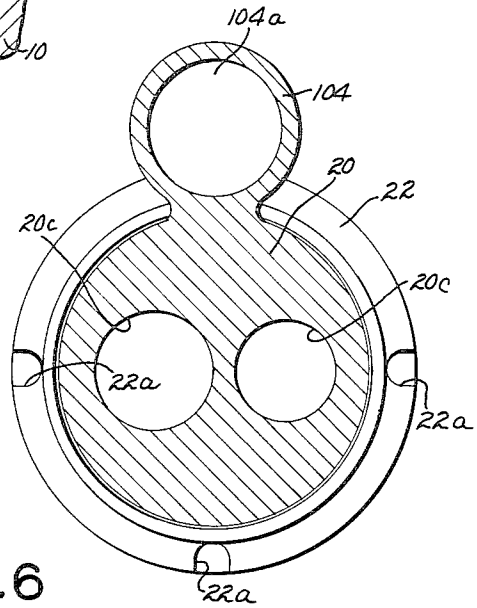


FIG. 6



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LIQUID TRANSFER MECHANISMS

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3 Claims. (Cl. 222—396)

The present invention relates generally to liquid transfer mechanisms, and more specifically to fluid pressure operated apparatuses for removing liquids from containers.

Liquids of various chemical properties are stored in containers of various shapes and designs. Frequently, it becomes necessary to use considerable quantities of liquids at relatively remote locations. Under these circumstances, difficulty has heretofore been encountered in removing such liquids from the containers in a simple and efficient manner. That is, where relatively large quantities of liquids are required, the problem of removing the liquid from the container is complicated due to the large containers employed. The usual means whereby the liquid is poured from the container, or is removed therefrom by means of a suitable spigot or like valve means is generally unsatisfactory.

In view of the foregoing, the present invention was conceived to provide an automatic liquid transfer mechanism which can be quickly and easily attached to and removed from containers, and which is operable to effectively remove the liquids therefrom. This invention consists of means whereby fluid pressure is applied to the surface of the liquid within the container to force such liquid out of the container through suitable conduit means provided for that purpose.

It is an object of the present invention to provide a liquid transfer mechanism for quickly and easily removing liquid from a container.

Another object of the present invention is to provide a liquid transfer mechanism which is readily transportable from one location to another.

Another object is to provide a liquid transfer mechanism which can be attached to and removed from a container without the need for complicated or cumbersome tools.

Another object of the present invention is to provide a liquid transfer mechanism as characterized above which utilizes portable fluid pressure to force the liquid from within the container.

Another object of the present invention is to provide a liquid transfer mechanism as characterized above which includes pressure regulator means for insuring that the pressure within the container is always within predetermined safe limits.

A further object of the present invention is to provide a transfer mechanism as characterized above having pressure operated means for exhausting the interior of the container to the atmosphere whenever the pressure therewithin exceeds a predetermined safe limit.

Another object of the present invention is to provide a liquid transfer mechanism as characterized above having fluid pressure indicating means for, at all times, indicating the pressure within the container.

Another object of the present invention is to provide a liquid transfer mechanism as characterized above which is simple and inexpensive to manufacture and which is rugged and dependable in operation.

The novel features which we consider characteristic of our invention are set forth with particularity in the appended claims. The device itself, however, both as to its organization and mode of operation, together with additional objects and advantages thereof, will best be understood from the following description of specific embodiments when read in connection with the accompanying drawings in which:

FIGURE 1 is a fragmentary perspective view showing the liquid transfer mechanism mounted on a fluid container;

FIGURE 2 is a fragmentary sectional view through the liquid transfer mechanism, taken substantially along line 2—2 of FIGURE 1;

FIGURE 3 is a fragmentary sectional view taken substantially along line 3—3 of FIGURE 2;

FIGURE 4 is a sectional view taken substantially along line 4—4 of FIGURE 2;

FIGURE 5 is a fragmentary sectional view of the pressure regulator portion of the subject mechanism, taken substantially along line 5—5 of FIGURE 4; and

FIGURE 6 is a sectional view taken substantially along line 6—6 of FIGURE 3 of the drawings.

Like reference characters indicate corresponding parts throughout the several views of the drawings.

Referring to FIGURE 1 of the drawings, there is shown therein a tank or liquid container 10 whereon is operatively positioned a fluid transfer mechanism 12 according to the present invention. Mechanism 12 comprises a source of fluid pressure 14 and a control device 16.

Control device 16, as shown most clearly in FIGURES 2 and 3 of the drawings, comprises a housing 18 having a central unit 20 the lower end portion of which is provided with external fastening threads 20*a* for cooperation with internal threads 10*a* formed in container 10. Such threads preferably should be tapered, on the order of pipe threads, to provide a more effective seal between the housing 18 and container 10.

To further assist in hermetically sealing the housing 18 within the container 10, there is provided a locking nut 22 on central housing unit 20, said nut being provided with internal fastening threads for cooperation with the aforementioned threads 20*a*. An annular sealing member 24 is interposed between nut 22 and the upper surface of container 10 to provide a hermetic seal therebetween. The lower end portion of housing unit 20 is further formed with an annular cutout or groove 20*b* wherein is positioned an O-ring 26 formed of rubber or similar sealing material for sealing engagement with the internal surface of locking nut 22.

As shown most clearly in FIGURE 1 of the drawings, nut 22 is formed with a plurality of radially disposed notches 22*a* for receiving a suitably formed wrench whereby the nut 22 can be firmly fastened against the annular sealing member 24.

Central housing unit 20, as shown in FIGURES 2 and 3, is formed with a fluid passageway 20*c* and the lower portion of which opens into the interior of container 10. The upper end portion of passageway 20*c* terminates in a cavity 20*d* formed in housing unit 20.

Housing 18 is also provided with a housing unit 28 formed with a chamber 30 wherein is positioned a pressure regulator identified generally with the numeral 32. A passageway 34 in housing 18 interconnects chamber 30 and cavity 20*d* for purposes which will hereinafter be explained in detail.

Unit 20 of housing 18 is further formed with an L-shaped through opening 20*e* the lower end portion of which is formed with internal fastening threads as at 20*f*, and the upper end portion of which is provided with fastening threads 20*g*.

As shown most clearly in FIGURE 1 of the drawings, an elongated pipe or tubular member 36 is threadedly fastened to the threaded lower end portion of L-shaped through opening 20*e* to be positioned substantially entirely within the container 10. Although it is not mandatory for successful practice of the present invention, it has been found desirable to employ a pipe or tubular member 36 which is retractable and expansible to accommodate containers of differing sizes and shapes. The

tubular member 36 shown in FIGURE 1 comprises a plurality of telescoping pipe sections arranged in contiguous fashion through which, as will hereinafter appear, liquid is permitted to flow. For this purpose, any suitable inlet means can be provided near the lower end of the tubular member 36 to permit the liquid within tank 10 to enter such tubular member.

Mounted within the upper end portion of L-shaped through opening 20*e*, as by internal fastening threads 20*g* therein, is a pipe section 38 whereon is mounted one end 40*a* of a flexible conduit 40. The other end 40*b* of conduit 40 carries a U-shaped filling pipe 42. A flow control device 44 is also interposed in conduit 40 and is manually operable, as desired, to permit and prevent fluid flow through conduit 40 as will hereinafter become more apparent.

The force for moving the liquid out of container 10 is in the form of fluid pressure, such as compressed air, stored within tank 14. As shown most clearly in FIGURE 1 of the drawings, tank 14 may be provided with suitable mounting means for attachment to the liquid container 10. However, such mounting means is not essential for successful practice of the present invention, since the tank 14 can be positioned as desired.

Tank 14 comprises suitable coupling means, as shown at 46 in FIGURE 1, for receiving one end of a flexible conduit 48. The other end of conduit 48 is connected to suitable coupling means 50 threadedly mounted within an opening 52 formed in housing unit 28. Opening 52 communicates with a valve chamber 54 formed in unit 28. The upper end of valve chamber 54 is threaded as at 54*a* for receiving a valve seat member 56 having a through opening 56*a*.

The lower end portion of valve chamber 54 is provided with cylindrically shaped bearing means 54*b* having a centrally located opening 54*c* for slidably receiving a valve stem 58. A compression spring 60 slidably fits about bearing portion 54*b* between the lower end wall of housing 28 and a valve member 62 carried by stem 58.

As shown most clearly in FIGURE 2 of the drawings, valve member 62 is provided with an annular flow control insert 62*a* which cooperates with a valve seat 56*b* formed on the lower end portion of valve seat member 56. As will hereinafter be explained in greater detail, the cooperation between valve member 62 and valve seat member 56 controls the flow of fluid pressure from valve chamber 54 in housing unit 28 to the central opening 56*a* of valve seat member 56.

Valve seat member 56 is further provided with three radially disposed angular flow control ports 56*c*. Thus the fluid pressure afforded to central opening 56*a* of member 56 is permitted to flow through ports 56*c* to pressure chamber 30 within housing unit 28. An annular sealing member or gasket 64 is interposed between the annular shoulder afforded by the enlarged upper end portion of valve seat member 56 and the housing unit 28 when the valve seat member 56 is threadedly positioned therein as shown in the drawing. Thus there is provided an hermetic seal between member 56 and the housing to insure that fluid flow to chamber 30 is solely dependent upon operation of valve member 62.

The upper end portion of housing unit 28 is cup-shaped as at 28*a*. Also, housing unit 28 is provided with an annular shoulder 28*b* for receiving one or more flexible diaphragms as shown at 66 and 68. The cup-shaped upper end portion 28*a* is formed with internal fastening threads 28*c* for receiving a cup-shaped housing member 70. An annular sealing member or gasket 72 is interposed between shoulder 28*b* of housing unit 28 and housing member 70 to afford an hermetic seal around the marginal edges of the diaphragm members 66 and 68.

Attached to the underside of or positioned in abutting relation to diaphragm member 66 is a generally T-shaped actuating member 74 which comprises a stem 74*a* and a generally flat circular abutting portion 74*b*. Stem 74*a* is formed with a guide portion 74*c* which slidably fits within the central through opening 56*a* of valve seat member 56. Such stem is also formed with a lower end portion 74*d* of reduced diameter to enable stem 74 to control the movement of valve member 62, as will hereinafter appear, without interfering with communication between opening 56*a* and the three radially disposed ports 56*c*.

Disposed within cup-shaped housing member 70 is a compression spring 76 the lower end portion of which fits within a generally cup-shaped retainer 78, the latter of which is connected to diaphragm member 68. The upper end portion of compression spring 76 fits a retainer 80. An adjustment screw 82 is threadedly positioned within the housing member 70 for adjusting the position of retainer 80 and hence the compressive force of spring 76 on diaphragms 66 and 68 as will hereinafter become more apparent.

Referring to FIGURES 2 and 3 of the drawings, it is seen that the upper end portion of central housing unit 20 is provided with fastening threads 20*h* adjacent the cavity 20*d*. A housing member 84 carrying a relief valve assembly 86 is threadedly positioned within the upper end portion of central housing unit 20. That is, housing member 84 is formed with external fastening threads for cooperation with threads 20*h* in housing unit 20 as shown in FIGURES 2 and 3. Housing unit 84 is further formed with an annular flange 84*a* providing a shoulder for sealing engagement with an annular gasket 88 positioned within a suitable annular recess formed in housing unit 20.

Member 84 is formed with a depending central portion 84*b* having a central opening 84*c*. The lower end portion of opening 84*c* is formed with fastening threads, as at 84*d*, for threadedly receiving a valve seat member 90. A sealing member or gasket 92 is interposed between valve seat member 90 and the housing member 84.

Valve seat member 90 is formed with a through opening 90*a* which is enlarged at its upper end as shown at 90*b*. Such arrangement provides an annular edge 90*c* which constitutes a valve seat for a spherically shaped valve member 94. Valve member 94 should be of such size as to slidably fit within the enlarged upper end of opening 90*a* in valve seat member 90. As such, there is provided an effective guide for the movement of valve member 94 between flow preventing and flow permitting position with respect to the valve seat afforded by annular edge 90c. The spherical valve member 94 should be selected in accordance with the diameter of the lower end portion of opening 90*a*. That is, for maximum flow preventing cooperation between valve member 94 and valve seat 90*c*, the diameter of the annular edge 90*c* should be slightly less than the diameter of spherical flow control member 94.

Also positioned within opening 84*c* of housing member 84 is a compression spring 96 the lower end portion of which abuts against the valve member 94. Threadedly positioned within the upper end protion of housing member 84 is an adjustment screw 98 which rests against the upper end portion of compression spring 96. As such, and as will hereinafter be explained in greater detail, adjustment of screw 98 within housing member 84 alters the compressive force of spring 96 as applied to valve member 94.

Housing member 84 is further formed with an opening 84*e* which exhausts opening 84*c* to the atmosphere.

As shown most clearly in FIGURE 3 of the drawings, the rear of the central housing unit 20 is provided with a boss 20*j* wherein there is provided a threaded through opening 20*k* which communicates with cavity 20*d*. Within opening 20*k* is an L-shaped fitting 100 having an externally threaded end portion 100*a* mounted in opening 20*k*, and an internally threaded end portion 100*b*. Such internal threads are part of an L-shaped through opening 100*c* formed in fitting 100.

As shown most clearly in FIGURE 1 of the drawings,

a pressure indicator **102** is threadedly connected to end portion **100***b* of fitting **100**, said indicator having a pointer **102***a* which is responsive to fluid pressure within the cavity **20***d* of central housing unit **20**.

Formed integrally with housing units **20** and **28**, is a holder **104** having a through opening **104***a* wherein the filling pipe **42** can be positioned when not in use.

The device shown in the drawings and hereinbefore described in detail, operates generally as follows.

With the threads **20***a* of central housing unit **20** firmly engaging the opening **10***a* in container **10**, the lock nut **22** is brought to bear against the washer **24**. Such arrangement, of course, hermetically seals the control unit **16** on the container **10**.

The source of fluid pressure **14** is mounted on the side of tank **10** and the flexible conduit **48** is connected to the fitting **46** on tank **14** and to the fitting **50** on housing unit **28**. Flexible conduit **40**, in like manner, is connected between fitting **38**, attached to central housing unit **20**, and to the flow control device **44** connected to filling pipe **22**.

As long as flow control device **44** remains closed, the fluid pressure from source **14** flows through flexible conduit **48** and opening **52** into valve chamber **54** of housing unit **28**. In the event the pressure within chamber **30** of housing unit **28** is less than a predetermined minimum value, the compression spring **78** will cause diaphragm members **66** and **68** to bend downwardly thereby causing stem **74***a* of member **74** to move valve member **62** to flow permitting position with respect to valve seat **56***b* against the force of compression spring **60**. When this happens, the fluid under pressure within valve chamber **54** is permitted to flow into chamber **30** through opening **56***a* formed in valve seat member **56**.

Such fluid pressure within chamber **30** is caused to flow into container **10** through passageway **34**, cavity **20***d* and vertical opening **20***c* in the central housing unit **20**. Such fluid pressure, which as above explained can be air under pressure, is thereby applied to the surface of the liquid within container **10**.

When the pressure within chamber **30** and hence within container **10** reaches a predetermined maximum value as determined by the setting of regulator **32**, the valve member **62** is caused to close against valve seat **56***b*. This results from the increase in pressure within chamber **30** forcing the diaphragm members **66** and **68** upwardly against the force of compression spring **76**. As a result, the actuator member **74** is also moved upwardly until a point is reached where compression spring **60** is permitted to move valve member **62** to its flow preventing position. When this occurs, the pressure within container **10** reaches a steady state.

In the event it is desired to increase or decrease the steady state of pressure within container **10**, it is merely necessary to increase or decrease the force of compression spring **76** on diaphragm members **66** and **68** by means of adjustment screw **82**. To increase the pressure within container **10** to the screw **82** is turned inwardly to cause spring **76** to exert a greater force on the diaphragms. Under these conditions a greater force is required within pressure chamber **30** to return diaphragm members **66** and **68** to a position to permit valve member **62** to close. To decrease such pressure within container **10**, it is merely necessary to retract adjustment screw **82** so as to partially relieve diaghragm **66** and **68** of some of the pressure of compression spring **76**.

The pressure within cavity **20***d* and hence the pressure within container **10** is continually indicated by the indicator **102**. The pressure within cavity **20***d* is applied to indicatod **102** through the L-shaped fitting **100**.

If for reasons such as falfunction of certain components of the subject apparatus the pressure within container **10** should exceed a maximum safe limit, the cavity **20***d* and hence the interior of container **10** will be exhausted to the atmosphere through relief valve **86**. The maximum safe limit, of course, is determined by the compressive force of spring **96** on check valve **94**. When such predetermined maximum safe limit is exceeded, the unusually high pressure within the cavity **20***d* moves valve member **94** from flow preventing engagement with valve seat **90***c*. When this happens the fluid pressure within said cavity is exhausted through openings **90***a*, **84***c* and **84***e* to the atmosphere.

The unsafe fluid pressure within container **10** is thereby relieved, and the valve member **94** is permittd to return to flow preventing position in engagement with valve seat **90***c* whenever the pressure within cavity **20***d* returns to a safe value.

To transfer the liquid from container **10**, it is merely necessary to remove the filling pipe **42** from holder **104**, and to position the same in the container or tank to be filled. Thereafter, the flow control device **44** can be manually opened so that the aforementioned fluid pressure on the liquid within container **10** forces such liquid up the tubular member or pipe **36**. Such liquid is then forced through the L-shaped opening **20***e* in central housing unit **20**, and through flexible conduit **40**, flow control device **44** and filling pipe **42** to the container to be filled.

After the desired amount of liquid has been transferred from container **10**, it is merely necessary to manually actuate flow control device **44** to its flow preventing position. Thereupon, further flow of liquid from container **10** is prevented and the filling pipe **42** can be returned to holder **104** as shown in FIGURE 1.

It is thus seen that the present invention provides a liquid transfer mechanism which is easy to mount on and remove from a container without the need of elaborate and cumbersome tools. Due to these and other reasons, such transfer mechanism is ideally suited for use in the field.

Also, the subject liquid transfer mechanism is easy and safe to operate due to the continuous indication of the fluid pressure within the container and due to the aforedescribed operation of the relief valve. Optimum operation, of course, is obtained by virtue of the operation of the pressure regulator whereby the fluid pressure within container **10** is always maintained within predetermined safe limits.

Although we have shown and described certain specific embodiments of our invention we are fully aware that many modifications thereof are possible. Our invention, therefore, is not to be restricted except insofar as is necessitated by the prior art by thes pirit of the appended claims.

We claim:

1. A quickly demountable liquid transfer mechanism adapted for use with a container having a threaded opening comprising:

(a) a housing having male threads thereon for connection with the threaded opening in the container;

(b) a vertically disposed cavity in said housing;

(c) a first vertically disposed passageway in said housing for connecting said cavity with the interior of the container;

(d) a vertically disposed chamber in said housing,

(e) a second passageway in said housing, a portion of said second passageway being parallel to said first passageway;

(f) a third passageway in said housing connecting said cavity and said chamber;

(g) a fluid pressure limiting means operatively positioned within said cavity to exhaust said first passageway when the fluid pressure therein exceeds a predetermined safe maximum limit;

(h) fluid pressure means including a pressure regulator operatively positioned within said chamber to provide a predetermined fluid pressure within said container;

(i) a first conduit portion connected to said second passageway and telescopingly extending into said container; and

(j) a second conduit portion connected to said second passageway, extending exterior to said housing and container and including flow control means having a flow preventing position and a flow permitting position allowing fluid pressure within said container to force the liquid therein through said conduit portions.

2. A quickly demountable liquid transfer mechanism as defined in claim 1 wherein said second conduit is flexible.

3. A quickly demountable liquid transfer mechanism as defined in claim 1 including a pressure indicator mounted on said housing and communicating with said cavity.

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