June 27, 1950 R. F. QUAM 2,512,966

VESSEL FILLING VALVE

Filed Jan. 17, 1949

Fig. 1.

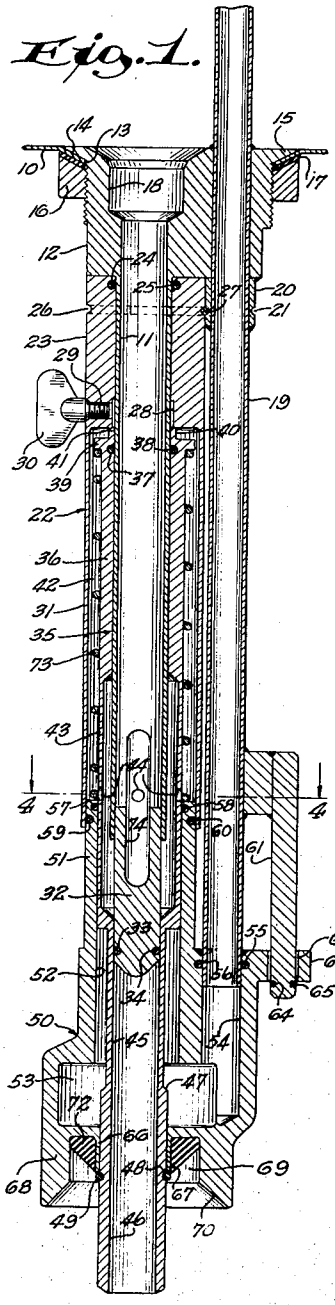


Fig. 2.

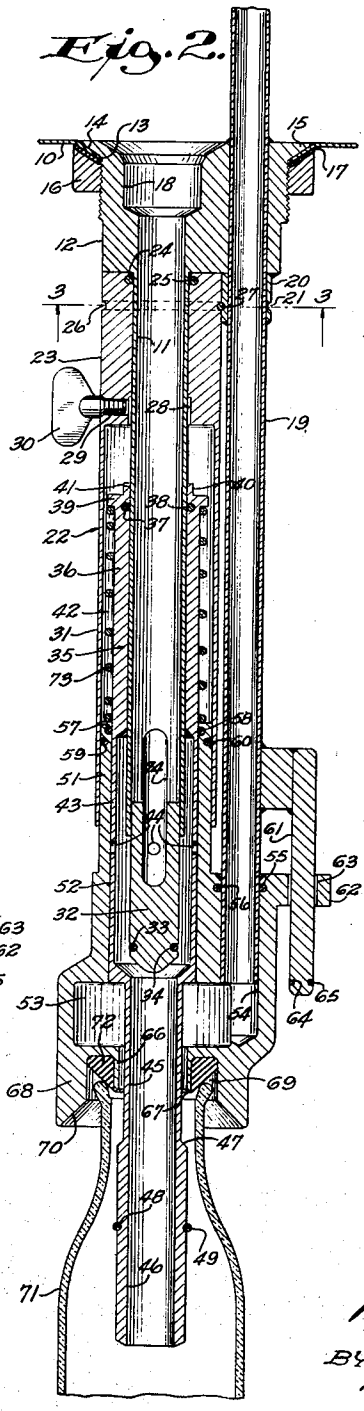


Fig. 3.

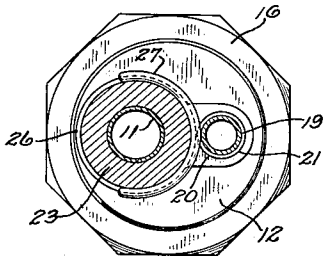
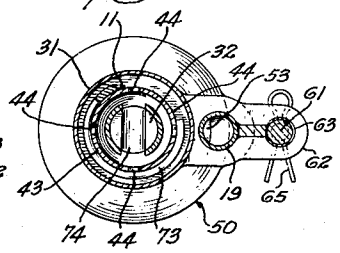


Fig. 4.



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VESSEL FILLING VALVE

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14 Claims. (Cl. 226—124)

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This invention relates to improvements in vessel filling valves, and more particularly to valves adapted for use on pedestal type vessel filling machines.

In filling bottles or the like with liquids such as milk, the tendency of said liquids to foam seriously interferes with the filling operation when conventional filling valves are used. This foaming necessitates the slowing down of the filling operation to a rate at which a minimum amount of foam is produced, and necessarily results in low efficiency.

My copending application Serial No. 41,995, filed August 2, 1948, discloses a vessel filling valve of the same general type as the present invention but which operates by being lowered into sealing engagement with the upper end of the vessel to be filled, rather than by having the vessel raised into operative relationship therewith. My copending application Serial No. 70,920, filed January 14, 1949, discloses one type of vessel filling valve which is adapted for use on a pedestal type vessel filling machine wherein the vessel to be filled is raised into operative relationship with the vessel filling valve.

It is a general object of the present invention to provide a valve embodying hydraulic operation for expediting the filling of vessels with a liquid, the filling operation, when said valve is used, being substantially unaffected by the formation of foam from said liquid.

A further object of the invention is to provide a vessel filling valve of the type described and which is operated hydraulically by having the vessel to be filled raised into operative relationship therewith to create pressure on the hydraulic fluid, the structure being such that the fluid being handled also serves as the hydraulic medium.

A further object of the invention is to provide a valve of the class described which may be quickly and easily disassembled and cleaned and which is well adapted for use in the food industries.

A further object of the invention is to provide a valve of the class described which is strong and durable, which is fast and positive in its operation, and which is easy to manufacture and repair.

With the above and other objects in view, the invention consists of the improved vessel filling valve, and all of its parts and combinations, as set forth in the claims, and all equivalents thereof.

In the drawing accompanying and forming a

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part of this specification, wherein is shown one complete embodiment of the preferred form of the invention, and wherein the same reference characters indicate the same parts in all of the views:

Fig. 1 is a vertical sectional view of the improved valve showing it in closed position;

Fig. 2 is a view similar to Fig. 1 showing the improved valve in open position with a bottle in operative relationship therewith;

Fig. 3 is a transverse sectional view taken along the line 3—3 of Fig. 1; and

Fig. 4 is a transverse sectional view taken along the line 4—4 of Fig. 1.

Referring more particularly to the drawing, the numeral 10 indicates the bottom of a tank which is adapted to supply the liquid for the vessels to be filled. The improved valve preferably comprises a vertically extending fluid inlet conduit 11 which is formed at its upper end with an enlarged, externally threaded, cylindrical portion 12. The tank 10 is preferably formed with an aperture 13 in the bottom thereof, through which the portion 12 extends. Around the margin of the aperture 13, the tank bottom is formed with a downwardly sloping annular portion 14. The enlarged portion 12 is formed with an annular outwardly and upwardly projecting flange 15, the underside of which rests on the upper surface of said annular sloping portion 14. An annular collar or nut 16 is threaded on the portion 12, and an annular gasket 17, of rubber or other suitable material, is interposed between the collar or nut 16 and the underside of the portion 14. The collar 16 is sufficiently tightened to prevent leakage past the gasket 17.

The inlet conduit 11 may have a portion of increased internal diameter 18 within the enlarged portion 12. Fixed to and extending through the enlarged portion 12 and spaced from and substantially parallel with the conduit 11, is a conduit 19. The conduit 19 preferably extends upwardly to a point above the level of the liquid in the tank 10, and said conduit also extends downwardly as shown. Fixed, as by welding, to the underside of the enlarged portion 12 and fixed to and surrounding the conduit 19, is a collar 20. The collar 20 is formed with an external annular groove 21 having a semi-circular cross-sectional shape.

Positioned around the inlet conduit 11 is a sleeve member 22 having its upper end in juxtaposition with the underside of the portion 12. The sleeve 22 has a thick walled upper portion 23 having an inner diameter substantially equal to

the outer diameter of the inlet conduit 11, and having an outer diameter substantially equal to that of the enlarged portion 12. The sleeve 20 has an outer diameter of such size that the said sleeve is tangent to the upper portion 23 of the sleeve 22. Adjacent the upper end of the portion 23 the sleeve 22 is formed with an internal annular groove 24 in which is seated an annular sealing ring 25, of rubber or other suitable material. The exterior of the portion 23 of the sleeve 22 is formed with an annular groove 26 which extends in the same horizontal plane as the groove 21 and which has the same semi-circular cross-sectional shape. A snap ring 27 is adapted to be seated in the groove 26, and when in the position shown, it locks the sleeve 22 to the sleeve 20 through the groove 21 in the latter sleeve.

The lower end of the bore of the portion 23 is formed with a part of slightly increased diameter 28 with which a threaded hole 29 for a removable plug 30 communicates. Below the portion 23, sleeve 22 is formed with a part 31 which preferably extends for a major portion of the length of said sleeve and which has a bore of increased diameter.

A substantially cylindrical stem 32, having an outside diameter equal to the inside diameter of the inlet conduit 11, has one end thereof fixedly inserted into the lower end of said conduit. The lower end of the conduit 11 and the upper portion of the stem 32 are formed with an elongated slot 14 which extends diametrically therethrough, as shown in Figs. 1, 2 and 4. At its lower end the stem 32 is formed with an external annular groove 33 in which is seated a suitable annular sealing ring 34.

Axially slidable on the conduit 11 is a sleeve 35. Adjacent its upper end the sleeve 35 has a portion 36 with a bore diameter substantially equal to the outer diameter of the conduit 11. The portion 36 is formed at its upper end with an internal annular groove 37 in which is seated an annular sealing ring 38. Said end is also formed with an outwardly projecting annular flange 39. A tubular extension 40 projects upwardly from the sleeve 35 above the flange 39 and is formed with a cut away portion 41 to provide communication between the annular chamber 42 (between the portion 31 of the sleeve 22 and the sleeve 35) and the chamber 28 when the sleeve 35 abuts the lower end of the portion 23 of the sleeve 22.

Below the portion 36 the sleeve 35 is formed with a portion 43 which has a bore diameter substantially larger than the bore of the portion 36. Intermediate the length of the portion 43 the sleeve 35 is preferably formed with a plurality of radially extending apertures 44. Below the portion 43 the sleeve 35 is formed with a portion 45 having a bore diameter substantially equal to the diameter of the stem 32 and having an outside diameter approximately equal to that of the conduit 11. The lower end of the portion 45 communicates with a portion 46 having an increased wall thickness which forms a shoulder 47 at the upper end thereof. The portion 46 is formed with an external annular groove 48 in which is seated an annular sealing ring 49.

A sleeve 50 is slidable on the portion 43 of the sleeve 35 and has an upper portion 51 slidable between the sleeve 35 and the portion 31 of the sleeve 22. The sleeve 50 has a bore portion 52 which is substantially the same diameter as the outer diameter of the portion 43 of the sleeve 35. The lower end of the bore 52 communicates

with a chamber 53 of enlarged diameter. The sleeve 50 is formed with a bore 54 to slidably receive the lower end of the conduit 19, said bore communicating with the chamber 53 at its lower end. The upper end portion of the bore 54 is formed with an annular groove 55 in which is seated an annular sealing ring 56. The upper end of the portion 51 of the sleeve 50 is formed with an internal annular groove 57 in which is seated an annular sealing ring 58, and with an external annular groove 59 in which is seated an annular sealing ring 60.

Fixedly connected, as by welding, on the lower end portion of the conduit 19 in spaced relation and parallel therewith is a rod 61. The rod 61 preferably extends slightly below the lower end of the conduit 19. The sleeve 50 is preferably formed with a horizontally extending boss 62 which is vertically apertured as at 63 to slidably embrace the rod 61. The lower end of the rod 61 is preferably formed with an annular groove 64 to removably receive a key or clip 65. The key 65 limits the downward movement of the sleeve 50, and when the valve is in shut-off position, said key supports the weight of the sleeves 35 and 50. While a key is shown for this purpose, any suitable means may be used, such as a nut or the like.

Below the chamber 53, the sleeve 50 is formed with a portion 66 having a bore diameter substantially equal to the outer diameter of the portion 46 of the sleeve 35. The lower end of the portion 66 terminates in an internally bevelled surface 67. The sleeve 50 is also formed with a downwardly extending annular flange 68 below the chamber 53 and spaced outwardly from the portion 66 to provide an annular recess 69 therebetween. The flange 68 has an internally bevelled lower end portion 70 and preferably has an inner diameter substantially larger than the outer diameter of the mouth of the vessel 71 to be filled. An annular sealing ring 72, preferably having a substantially triangular cross-sectional shape, is seated in the recess 69 as shown in Figs. 1 and 2. Positioned around the sleeve 35 between the flange 39 thereof and the upper end of the sleeve 50 is a helical compression spring 73. The spring 73 urges the sleeve 35 upwardly and urges the sleeve 50 downwardly.

When the improved valve is in the shut-off position, the parts thereof are disposed as shown in Fig. 1. When the parts are so arranged, the compression spring 73 holds the sleeve 35 in raised position so that the stem 32 with its sealing ring 34 is positioned in the bore of the portion 45 of said sleeve. This prevents any liquid from passing down through the inlet conduit 11 and out through the lower end of the sleeve 35. Meanwhile the compression spring 73 holds the sealing ring 49, which is on the lower end of the sleeve 35, and the annular bevelled surface 67, which is on the lower end of the sleeve 50, in sealing engagement, thereby sealing off the lower end of the sleeve 50. The annular sealing ring 49 is of such size that it will not compress sufficiently to pass into the bore of the portion 66 of the sleeve 50.

Prior to using the improved valve for a vessel filling operation the plug 30 is removed temporarily to allow air trapped in the annular chamber 42 to escape, and to permit flow of fluid from the conduit 11, through slot 14 and apertures 44 into the chamber 42 to fill said chamber. The plug 30 is replaced in the passage 29 when the chamber 42 is completely filled.

The valve is operated by raising the vessel to be filled (such as the bottle 71) under the sleeve 50 to bring the mouth of the vessel into sealing engagement with the sealing ring 72. Further lifting of the vessel 71 causes the sleeve 50 to rise against the pressure of the spring 73 until the sealing ring 58 has passed the apertures 44 in the sleeve 35. At this point the chamber 42 has become a closed hydraulic cylinder. Further raising of the sleeve 50 by the bottle 71 causes the sleeve 35 to be forced downwardly against the pressure of the spring 73, since a constant volume of fluid is sealed into the chamber 42 by the seals 25, 38, 58 and 60. Downward movement of the sleeve 35 moves said sleeve away from the stem 32, permitting fluid to flow down through the conduit 11, slot 74, and bore of the portions 43 and 46 of the sleeve 35 into the bottle 71. The fluid will be directed to the bottom of the bottle 71 in a solid fast moving stream.

As the fluid enters the bottle 71, the air and foam in said bottle pass upwardly around the portion 46 of the sleeve 35, through the bore of the portion 66 at the lower end of the sleeve 50, through the chamber 53 and conduit 19 to the receptacle 10 above the level of the liquid therein. After the vessel has been filled, it is lowered and the valve parts return to the shut-off position of Fig. 1 as the spring 73 expands to its normal length.

The vertical position of the apertures 44 in the sleeve 35 is such that the sleeve 50 is capable of a predetermined upward movement before it closes off said apertures and causes downward movement of the sleeve 35 to permit the flow of fluid through said sleeve. This movement of the sleeve 50 sufficiently breaks the sealing engagement between the sealing ring 49 and the bevelled surface 67 before the downward movement of the sleeve 35 takes place to permit any liquid in the chamber 53 to drain into the bottle 71 before any fluid is allowed to flow downwardly into the bottle through the sleeve 35.

The improved valve is fast and positive in its action and may be quickly disassembled for cleaning purposes. All of the parts can be removed by removing the sealing ring 49, key 65 and snap ring 27. The construction of the improved valve makes it particularly well adapted for use in the food industries.

It is within the concept of the invention to provide any suitable means other than the conduit 19 for returning air and foam to the tank 10, such as a horizontal tube, a manifold, and a vacuum device. The method shown and described herein is only illustrative of one method for accomplishing this purpose.

It will be noted that the improved valve delivers a large volume of liquid in a centrally located stream to the bottom of the vessel being filled, and that the liquid then rises in the bottle around the entering stream, driving the air and foam out of the top to be carried away as previously described. Due to the fact that the entering liquid is in the form of a solid stream flowing at high velocity, the tendency of the liquid to foam is reduced, and large bubbles are produced which are easily eliminated.

Various changes and modifications may be made without departing from the spirit of the invention, and all of such changes are contemplated as may come within the scope of the claims.

What I claim is:

1. In a vessel filling valve having a liquid inlet conduit; a first sleeve telescopically associated with said conduit, said sleeve having a lower end portion adapted to be positioned in a vessel to be filled; a second sleeve telescopically associated with said first sleeve, said second sleeve having a vessel mouth sealing portion and also having a vent; a third sleeve surrounding portions of said first and second sleeves and forming a fluid chamber between said first and third sleeves for causing telescopic movement of said first sleeve in response to telescopic movement of said second sleeve, there being communication between said inlet conduit and said chamber through said first sleeve when the sleeves are in one position; and means normally preventing the flow of fluid through the lower end of said first sleeve and responsive to telescopic movement of said first sleeve in one direction for permitting said flow.

2. In a vessel filling valve having a liquid inlet conduit; a first sleeve telescopically associated with said conduit, said sleeve having an end portion adapted to be positioned in a vessel to be filled; a second sleeve telescopically associated with said first sleeve, said second sleeve having a vessel mouth sealing portion and also having a vent; a third sleeve surrounding portions of said first and second sleeves and forming a fluid chamber between said first and third sleeves for causing telescopic movement of said first sleeve in response to telescopic movement of said second sleeve in the opposite direction, there being communication between said inlet conduit and said chamber through said first sleeve when the sleeves are in one position; and means normally preventing the flow of fluid through the lower end of said first sleeve and responsive to telescopic movement of said first sleeve in one direction for permitting said flow.

3. In a vessel filling valve having a liquid inlet conduit; a first sleeve telescopically associated with said conduit, said sleeve having an end portion adapted to be positioned in a vessel to be filled; a second sleeve telescopically associated with said first sleeve, said second sleeve having a vessel mouth sealing portion and also having a vent; a third sleeve surrounding portions of said first and second sleeves and forming a fluid chamber between said first and third sleeves for causing telescopic movement of said first sleeve in response to telescopic movement of said second sleeve in the opposite direction, there being communication between said inlet conduit and said chamber through said first sleeve when the sleeves are in one position; and means on said inlet conduit normally preventing the flow of fluid through the lower end of said first sleeve and responsive to telescopic movement of said first sleeve in one direction for permitting said flow.

4. In a vessel filling valve having a liquid inlet conduit; a first sleeve telescopically associated with said conduit, said sleeve having an end portion adapted to be positioned in a vessel to be filled; a second sleeve telescopically associated with said first sleeve, said second sleeve having a vessel mouth sealing portion and also having a vent; a third sleeve surrounding portions of said first and second sleeves and forming a fluid chamber between said first and third sleeves for causing telescopic movement of said first sleeve in response to telescopic movement of said second sleeve, there being communication between said inlet conduit and said chamber through said first sleeve when the sleeves are in one posi-

tion; a stem normally preventing the flow of fluid through the lower end of said first sleeve and responsive to telescopic movement of said first sleeve in one direction for permitting said flow; and means on said first sleeve normally sealing the vent in said second sleeve and responsive to telescopic movement of said first and second sleeves to permit the flow of fluid through said vent.

5. In a vessel filling valve having a liquid inlet conduit; a first sleeve telescopically associated with said conduit, said sleeve having an end portion adapted to be positioned in a vessel to be filled; a second sleeve telescopically associated with said first sleeve, said second sleeve having a vessel mouth sealing portion and also having a vent; a third sleeve surrounding portions of said first and second sleeves and forming a fluid chamber between said first and third sleeves for causing telescopic movement of said first sleeve in response to telescopic movement of said second sleeve in the opposite direction, there being communication between said inlet conduit and said chamber through said first sleeve when the sleeves are in one position; a stem on said inlet conduit normally preventing the flow of fluid through the lower end of said first sleeve and responsive to telescopic movement of said first sleeve in one direction for permitting the flow of fluid through said first sleeve; and yieldable means for urging said first and second sleeves in opposite axial directions.

6. In a vessel filling valve having a liquid inlet conduit; a first sleeve telescopically associated with said conduit, said sleeve having an end portion adapted to be positioned in a vessel to be filled; a second sleeve telescopically associated with said first sleeve, said second sleeve having a vessel mouth sealing portion and also having a vent; a third sleeve surrounding portions of said first and second sleeves and forming a fluid chamber between said first and third sleeves for causing telescopic movement of said first sleeve in response to telescopic movement of said second sleeve in the opposite direction, there being communication between said inlet conduit and said chamber through said first sleeve when the sleeves are in one position; a stem on said inlet conduit normally preventing the flow of fluid through the lower end of said first sleeve and responsive to telescopic movement of said first sleeve in one direction for permitting the flow of fluid through said first sleeve; and a helical spring surrounding said first sleeve and in engagement with said second sleeve for urging said first and second sleeves in opposite axial directions.

7. In a vessel filling valve having a liquid inlet conduit; a sleeve slidable on said conduit and having a fluid outlet; means normally preventing the flow of fluid through said fluid outlet and responsive to sliding movement of said sleeve in one direction to permit fluid to flow through said fluid outlet; means forming a fluid chamber adjacent a portion of said sleeve end of said conduit, there being a normally open communication between said inlet conduit and said chamber to permit fluid from said inlet conduit to fill said chamber; means providing for the closing off of said communication; and means for exerting compressive pressures on the fluid in said chamber to cause sliding movement of said sleeve in a direction to permit fluid flow through the outlet thereof.

8. In a vessel filling valve having a liquid inlet conduit; a sleeve slidable on said conduit and having a fluid outlet; means normally preventing the flow of fluid through said fluid outlet and responsive to sliding movement of said sleeve in one direction to permit fluid to flow through said fluid outlet; means forming a fluid chamber surrounding a portion of said sleeve and of said conduit, there being a normally open communication between said inlet conduit and said chamber to permit fluid from said inlet conduit to fill said chamber; means providing for the closing off of said communication; and means for exerting compressive pressures on the fluid in said chamber to cause sliding movement of said sleeve in a direction to permit fluid flow through the outlet thereof.

9. In a vessel filling valve having a liquid inlet conduit; a sleeve slidable on said conduit and having a fluid outlet; means normally preventing the flow of fluid through said fluid outlet and responsive to sliding movement of said sleeve in one direction to permit fluid to flow through said fluid outlet; means forming a fluid chamber surrounding a portion of said sleeve and of said conduit, there being at least one aperture in said sleeve normally providing communication between said inlet conduit and said chamber to permit fluid from said inlet conduit to fill said chamber; means providing for the closing off of said aperture and means for exerting compressive pressures on the fluid in said chamber to cause sliding movement of said sleeve in a direction to permit fluid flow through the outlet thereof.

10. In a vessel filling valve having a liquid inlet conduit; a sleeve slidable on said conduit and having a fluid outlet; means normally preventing the flow of fluid through said fluid outlet and responsive to sliding movement of said sleeve in one direction to permit fluid to flow through said fluid outlet; means forming a fluid chamber surrounding a portion of said sleeve and of said conduit, there being a normally open communication between said inlet conduit and said chamber to permit fluid from said inlet conduit to fill said chamber; and a second sleeve having a portion projecting into said fluid chamber for closing off said communication and for exerting compressive pressures on the fluid in said chamber to cause sliding movement of said first-mentioned sleeve in a direction to permit fluid flow through the outlet thereof.

11. In a vessel filling valve having a liquid inlet conduit; a sleeve slidable on said conduit and having a fluid outlet; means normally preventing the flow of fluid through said fluid outlet and responsive to sliding movement of said sleeve in one direction to permit fluid to flow through said fluid outlet; means forming a fluid chamber surrounding a portion of said sleeve and of said conduit, there being at least one aperture in said sleeve normally providing communication between said inlet conduit and said chamber to permit fluid from said inlet conduit to fill said chamber; and a second sleeve slidable on said first mentioned sleeve and having a portion projecting into said chamber, said second sleeve being responsive to sliding movement in one direction to close off said aperture and to exert compressive pressures on the fluid in said chamber sufficient to cause sliding movement of said first-mentioned sleeve in a direction to permit fluid flow through the outlet thereof.

12. In a vessel filling valve having a liquid inlet conduit; a sleeve slidable on said conduit and

having a fluid outlet; means normally preventing the flow of fluid through said fluid outlet and responsive to sliding movement of said sleeve in one direction to permit fluid to flow through said fluid outlet; means forming a fluid chamber surrounding a portion of said sleeve and of said conduit, there being at least one aperture in said sleeve normally providing communication between said inlet conduit and said chamber to permit fluid from said inlet conduit to fill said chamber; and a second sleeve slidable on said first mentioned sleeve and having a portion projecting into said chamber, said second sleeve being responsive to sliding movement in one direction to close off said aperture and to exert compressive pressures on the fluid in said chamber sufficient to cause sliding movement of said first-mentioned sleeve in a direction to permit fluid flow through the outlet thereof, said second sleeve being formed with a vessel mouth sealing portion and having a vent.

13. In a vessel filling valve having a liquid inlet conduit; a sleeve slidable on said conduit and having a fluid outlet; means normally preventing the flow of fluid through said fluid outlet and responsive to siding movement of said sleeve in one direction to permit fluid to flow through said fluid outlet; means forming a fluid chamber surrounding a portion of said sleeve and of said conduit, there being at least one aperture in said sleeve normally providing communication between said inlet conduit and said chamber to permit fluid from said inlet conduit to fill said chamber; a second sleeve slidable on said first-mentioned sleeve and having a portion projecting into said chamber, said second sleeve

being responsive to sliding movement in one direction to close off said aperture and to exert compressive pressures on the fluid in said chamber sufficient to cause sliding movement of said first-mentioned sleeve in a direction to permit fluid flow through the outlet thereof; and means for urging said first and said second sleeves in opposite directions.

14. In a vessel filling valve having a liquid inlet conduit; a sleeve slidable on said conduit and having a fluid outlet; means normally preventing the flow of fluid outlet; means normally preventing the flow of fluid through said fluid outlet and responsive to sliding movement of said sleeve in one direction to permit fluid to flow through said fluid outlet; means forming a fluid chamber surrounding a portion of said sleeve and of said conduit, there being at least one aperture in said sleeve normally providing communication between said inlet conduit and said chamber to permit fluid from said inlet conduit to fill said chamber; a second sleeve slidable on said first-mentioned sleeve and having a portion projecting into said chamber, said second sleeve being responsive to sliding movement in one direction to close off said aperture and to exert compressive pressures on the fluid in said chamber sufficient to cause sliding movement of said first-mentioned sleeve in a direction to permit fluid flow through the outlet thereof; and a helical spring in said chamber in engagement with said first and second sleeves for urging said sleeves in opposite axial directions.

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No references cited.