United States Patent

Dreibelbis et al.

[15] **3,642,176**

[45] **Feb. 15, 1972**

[54] MEANS FOR STORING AND DISPENSING HEATED LIQUID AND SYSTEM THEREFOR

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[22] Filed: **Apr. 13, 1970**

[21] Appl. No.: **27,759**

[52] **U.S. Cl.**.....**222/146 HE,** 222/318, 219/312

[51] **Int. Cl.**.....**B67d 5/62**

[58] **Field of Search**.....222/566, 567, 569, 570, 108, 222/146, 318; 285/332, DIG. 12; 251/251, 263; 219/312

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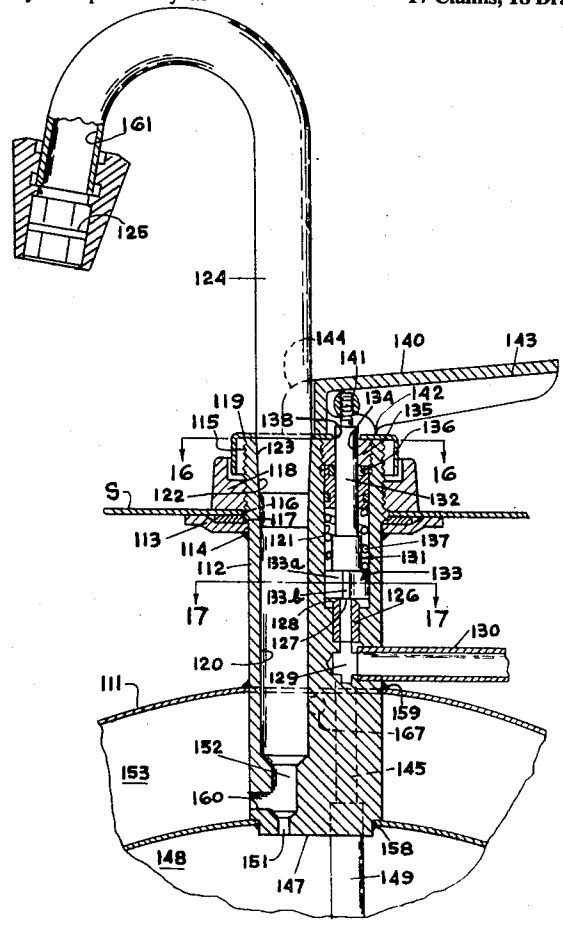
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[57] **ABSTRACT**

A system for dispensing a supply of instant hot fluid more particularly water wherein a hot fluid storage tank having an expansion and accumulation chamber may be operatively associated with either an adjacent or a remotely disposed dispensing and control mechanism. The dispensing and control mechanism has a first connection to a source of fluid to be heated and dispensed normally maintained at pressures above that of atmospheric pressure, a second connection with valve means therein to direct and regulate the flow of source water to the hot water storage tank for displacement of heated water therefrom, a third connection between the outlet for the hot fluid storage tank and a spout means on the dispensing and control mechanism to permit heated fluid displaced from said hot fluid storage tank outlet to be passed to and discharged from the spout means, the third connection has port means therein disposed so that the expansion and accumulation chamber will collect backflow water from the spout and the third connection when dispensing is terminated or expanded hot fluid from the hot fluid storage tank when the system is at static conditions of operation, and a fourth connection between the upper end of the expansion and accumulation chamber and the spout means but isolated from said third connection to vent the expansion and accumulation chamber and act to maintain the entire system at atmospheric pressure.

Additionally, the system includes in the dispensing means a valve means normally biased closed to block flow of water from the source into the system and cammed to move axially against the bias to an open position by an axial-acting actuator. The valve means disposed to be removably mounted through the upper face of the dispensing means. The spout is mounted by a tapered wring fit connection to allow for easy removal along the longitudinal line of the connection whereby access to the valve means for service, repair and replacement is facilitated.

17 Claims, 18 Drawing Figures



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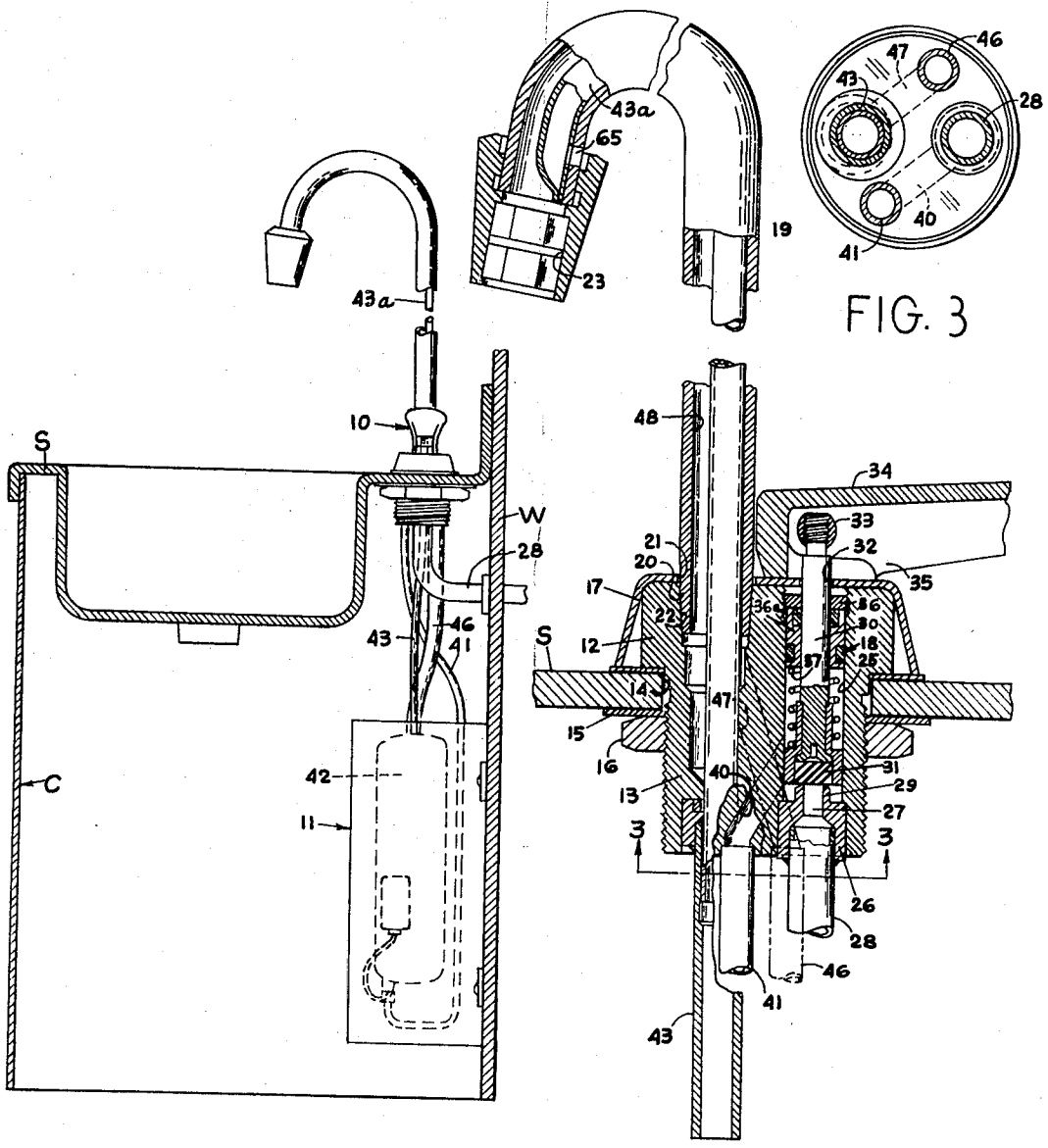


FIG. 1

FIG. 3

FIG. 2

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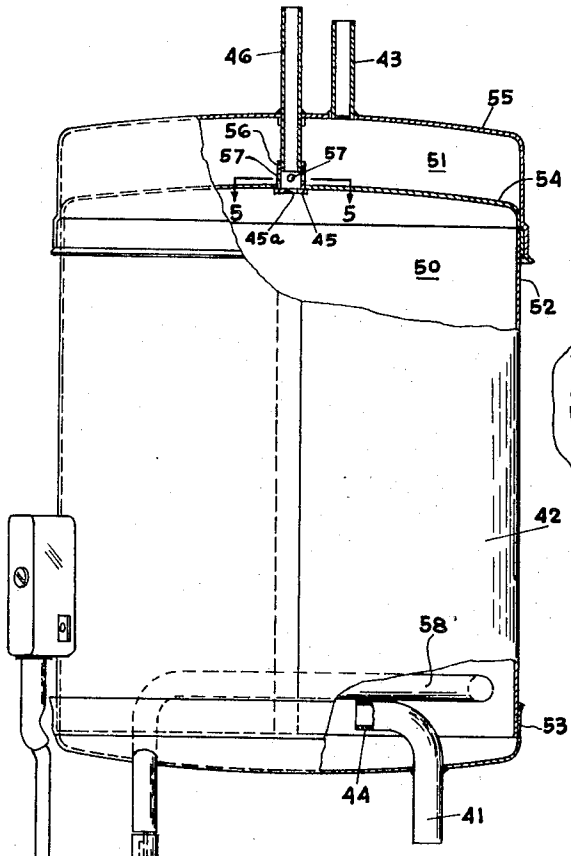


FIG. 4

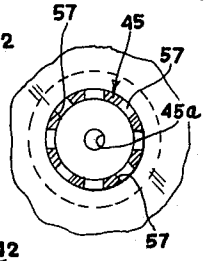


FIG. 5

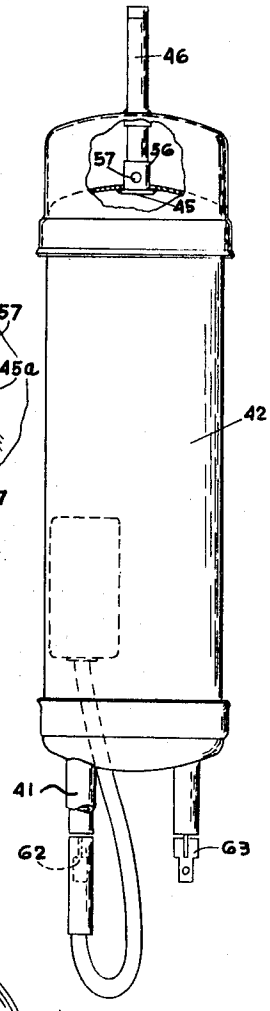


FIG. 6

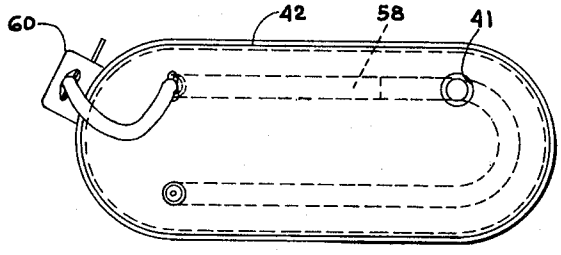


FIG. 7

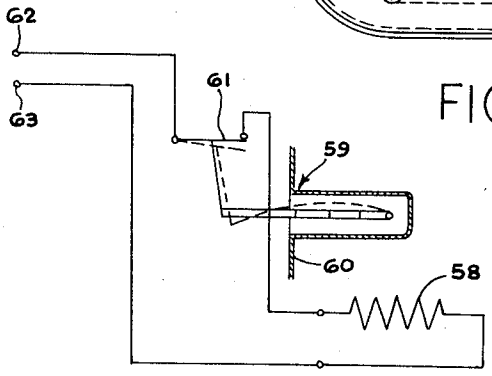


FIG. 8

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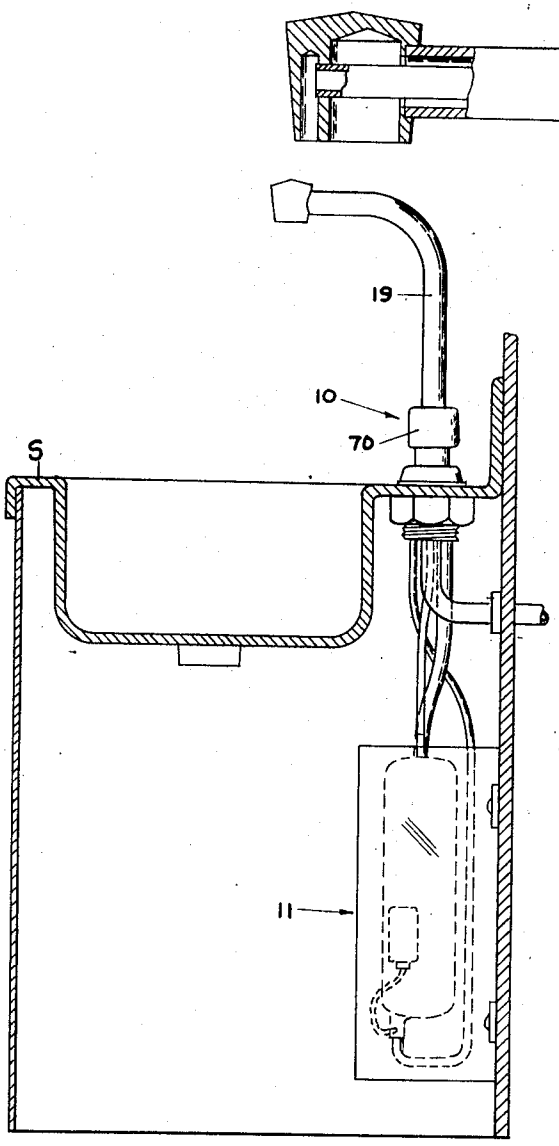


FIG. 9

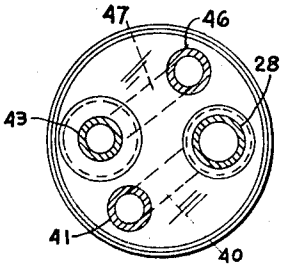


FIG. 12

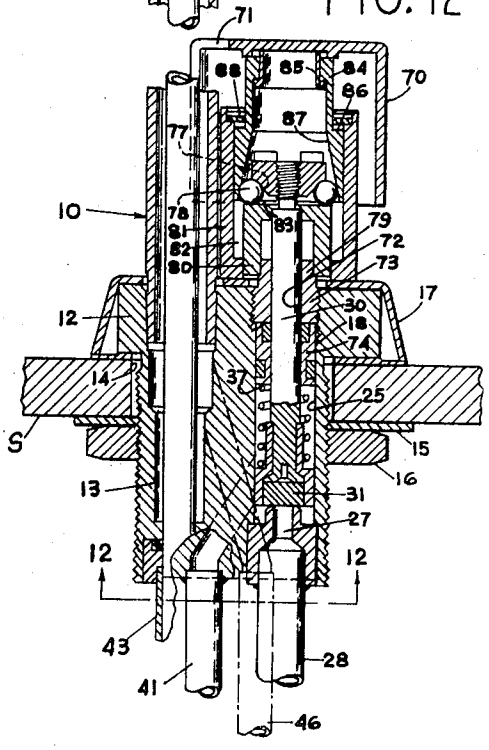


FIG. 10

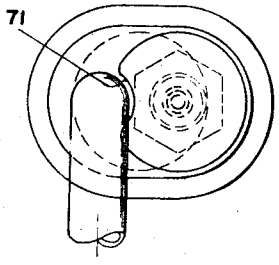


FIG. 11

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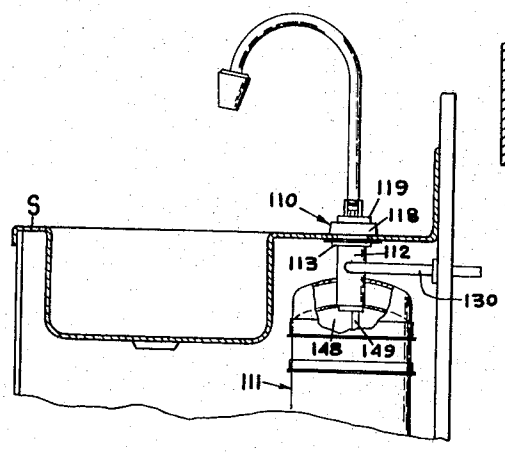


FIG. 13

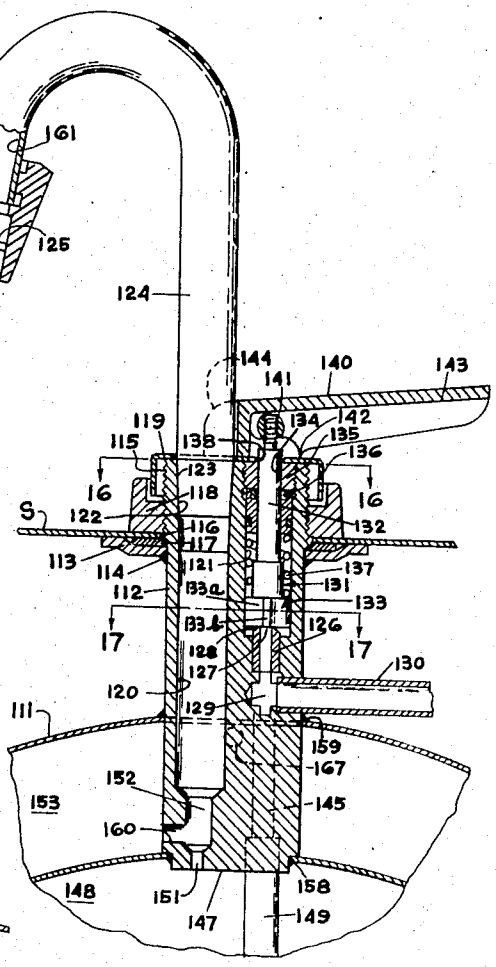


FIG. 14

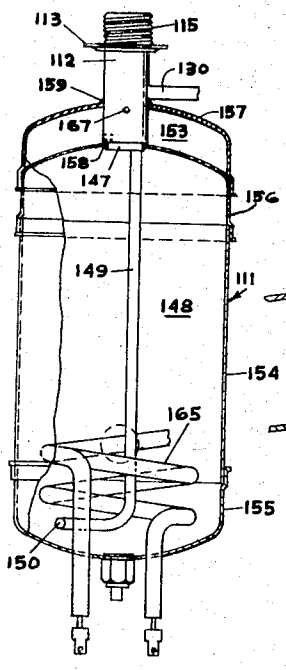


FIG. 18

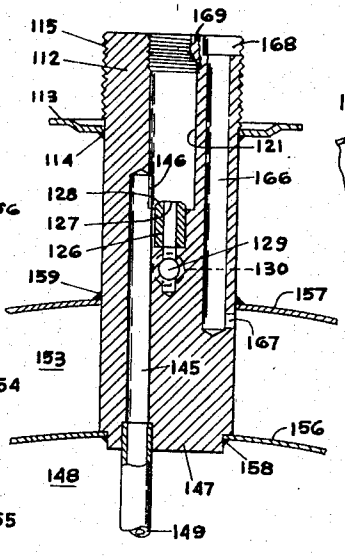


FIG. 15

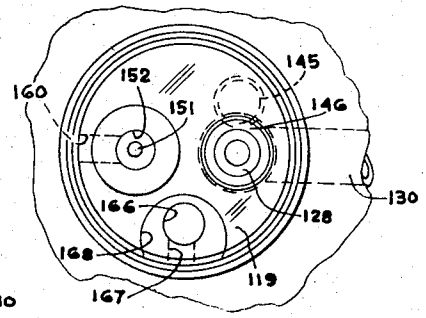


FIG. 16

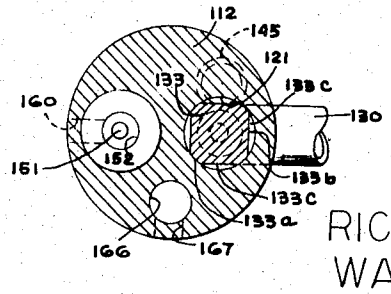


FIG. 17

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MEANS FOR STORING AND DISPENSING HEATED LIQUID AND SYSTEM THEREFOR

BACKGROUND OF INVENTION

Pat. No. 3,202,321 relates to a hot-water-heating and dispensing apparatus operating at atmospheric pressure in which the dispensing head is disposed remotely from the hot water storage tank. The dispensing head of the system shown in this patent acts as means for regulating the discharge of the heated water as needed and permits the dispensing head to serve in the capacity of an overflow control device and venting means all of which is accomplished solely through the dispensing means for the heated fluid. In this last-mentioned capacity the dispensing head has a relatively small built-in chamber calibrated to operate at a predetermined volumetric capacity dependent largely on the temperature of cold water introduced into the system. Therefor, if the volumetric capacity of the system increases or additional expansion of heated water occurs, the excess water must pass from the system by way of the normal dispensing passage or spout.

In systems where the temperature of the water source varies over wide ranges from very cold in the winter to moderately warm in the summer it is clear that a calibrated expansion chamber in the dispensing head will from time to time produce inconvenient dripping of overflow water and consequently waste water in the system.

Other hot water dispensing systems operating at atmospheric pressure are shown in U.S. Pat. Nos. 2,903,551 and 3,089,941.

The present invention contemplates a hot-water-dispensing system to overcome this problem and to provide an improved system operated at atmospheric pressure in which a hot water storage tank having an associated expansion and accumulation chamber is connected to either a remote or an adjacent dispensing head and control mechanism so as to provide for regulation and control of the dispensing of heated water, to permit expansion of heated water or accumulation of backflow water in said expansion and accumulation chamber, and the expansion and accumulation chamber is operatively connected to an independent and isolated venting arrangement which also serves to maintain the system at all times at the desired atmospheric pressure operating conditions.

SUMMARY OF THE INVENTION

Thus, the present invention contemplates a fluid-dispensing system operating at atmospheric pressure for dispensing quantities of hot water or other fluids at temperatures between given hot and cold temperature limits which system includes, a fluid reservoir or storage tank having means thereon for maintaining the fluid stored therein at a predetermined temperature, a dispensing head adjacent to or remotely disposed from said fluid reservoir or storage tank having an inlet connected to a source of fluid to be heated, a valve member and an outlet connected to deliver said fluid from said inlet to the lower portion of said fluid reservoir whereby controlled dispensing of fluid from said fluid reservoir will occur by positive displacement when said valve passed fluid thereto, a spout means connected to one end of a discharge conduit having its inlet connected to the outlet for said storage tank near the upper end thereof, a means connected to said tank, about the point where said outlet is connected to said discharge conduit, forming an expansion and accumulation chamber and coacting with said discharge conduit to receive expansion fluid from said fluid reservoir or backflow fluid from said spout means and to maintain the collected fluid at substantially the same temperature as the fluid in said storage tank, and a vent means connected between said means forming said expansion and accumulation chamber and said spout means which vent means acts to maintain said system at atmospheric pressure.

Additionally, the present invention contemplates a fluid reservoir or storage tank assembly for maintaining the fluid stored therein at a predetermined temperature which is adapted more particularly for use in an atmospheric-type fluid-dispensing system. The storage tank assembly includes a storage section having an inlet for fluid to be heated and an outlet at the upper end thereof connected to a discharge conduit, an expansion and accumulation means having at least one wall common to the storage section or tank and operatively associated with the outlet and said discharge conduit, means for maintaining fluid stored in said storage chamber at a predetermined temperature, means connected between said outlet for the storage tank and said discharge conduit to permit expansion fluid from said storage section or tank and backflow fluid from said discharge conduit to accumulate and collect in said expansion and accumulation means, and a vent means at the upper end of said expansion and accumulation section to maintain the operation of said fluid reservoir or storage tank assembly at atmospheric pressure.

Additionally, the present invention contemplates a fluid reservoir or storage tank assembly for maintaining fluid stored therein at a predetermined temperature as above described in which the common wall between the expansion and accumulation chamber and the storage section for heated water is constructed to provide means for trapping foreign matter collected in the accumulation chamber.

OBJECTS AND ADVANTAGES

Accordingly, an object of the present invention is to provide a hot water dispensing system having a hot water storage tank with an associated expansion and accumulation chamber, the tank and chamber also being associated with either an adjacent or a remote dispensing head operable to control the flow of water into and from the tank; said system being normally maintained at atmospheric pressure by suitable venting means associated with the expansion and accumulation chamber and the dispensing means.

It is another object of the present invention to provide a hot water storage tank with an improved expansion accumulation chamber which is adapted to be maintained at substantially the same temperature as the fluid in the storage tank and provides a trap for foreign matter therein.

Another object of the present invention is to provide a hot water dispensing system in which the dispensing means has a spot providing a flow path for fluid to be dispensed which is conducted to the discharge connection or conduit from the hot water storage tank in the hot water dispensing system and the system is provided with an improved venting means for maintaining the system at atmospheric pressure in the form of a vent connection between the expansion and accumulation chamber means for the hot water storage tank and the spout which is isolated from the fluid flow path between the hot water storage tank and the spout.

Still another object of the present invention is to provide a hot water dispensing system in which the dispensing means includes an improved normally closed flow control means manually operated to an open position for dispensing fluid in the hot water dispensing system.

And another object of the present invention is to provide in a hot water dispensing system a flow control means in which manual-operating means moves axially in a direction opposite from the means for controlling the flow and cam means is disposed between the respective elements so that response to the movement of one will cause movement of the other.

It is still a further object of the present invention to provide an improved hot water storage tank having an associated expansion and accumulation chamber in which the accumulation chamber is operatively disposed to receive expansion water from the storage tank and is vented to atmosphere so as to maintain the hot water storage tank operation at atmospheric pressure.

Further objects and advantages of the invention will become apparent from a study of the following specification taken in connection with the accompanying drawings wherein:

FIG. 1 is a view and side elevation of a hot water fluid-dispensing system in accordance with the present invention in-

stalled in a commode with portions of the sink and cabinet thereof broken away to show installation details.

FIG. 2 is an enlarged view of the dispensing head for the form of hot water dispensing system shown in FIG. 1 of the drawings.

FIG. 3 is a cross section taken on line 3—3 of FIG. 2.

FIG. 4 is a front elevational view of the heating and storage tank assembly in accordance with the present invention with portions thereof broken away.

FIG. 5 is an enlarged fragmentary cross-sectional view taken on line 5—5 of FIG. 4.

FIGS. 6 and 7 are side elevational views and bottom plan views respectively of the heating and storage tank assembly in accordance with the present invention with portions thereof broken away.

FIG. 8 is a diagrammatic illustration of the fluid heater circuit for the fluid reservoir or storage tank shown in FIGS. 4, 5 and 6.

FIG. 9 is a view and side elevation of another form of hot water dispensing system in accordance with the present invention as installed in a commode with portions of the sink and the cabinet thereof broken away to more fully show installation details.

FIG. 10 is an enlarged side elevational view of the pushbutton-type dispensing means of the hot water dispensing system of FIG. 9.

FIG. 11 is a top plan view of the dispensing means as shown in FIG. 9, showing a fragment of the spout means.

FIG. 12 is a bottom plan view taken on line 12—12 of the body of the dispensing means of the form of the invention shown in FIGS. 9 and 10 of these drawings to illustrate the various fluid connections in the system.

FIG. 13 is a view and side elevation of still another form of hot water dispensing system in accordance with the present invention as installed in a commode with portions of the sink in cross section and portions of the heating and storage means broken away.

FIG. 14 is an enlarged view partly in vertical section of the dispensing means and the upper portion of the heating and storage means for the form of the invention shown in FIG. 13.

FIG. 15 is a vertical section of the body member of the dispensing head with the valve elements and spout removed to show the passages and ports therein more clearly.

FIG. 16 is a cross-sectional view taken on line 16—16 of FIG. 14.

FIG. 17 is a cross-sectional view taken on line 17—17 of FIG. 14.

FIG. 18 is a side elevational with portions broken away and exposed in vertical section of the valve body and the heating and storage means.

SYSTEM WITH LEVER-OPERATED DISPENSING MEANS

Referring now to the drawings and particularly to FIG. 1 an atmospheric-type fluid-dispensing system in accordance with the present invention is shown as installed in a commode generally designated C. The system consists of two major assemblies: One is the dispensing means generally designated **10** mounted adjacent the sink S and the other being a storage means for fluid generally designated **11** with heating means thereon more fully described hereinafter, the storage means being mounted on a vertical wall W of the commode.

The dispensing means and the storage and heating means are connected to each other by suitable conduits so that a fluid to be dispensed from the system may be taken at ambient temperature from any suitable source (not shown) heated in the storage means and moved therefrom by positive displacement to the dispensing means by a suitable control valve for passing ambient fluid to the storage tank to be heated.

In FIGS. 2 to 5, the dispensing means **10** is shown as including a body **12** having a reduced threaded portion **13** which extends through an opening as at **14** in the upper surface of the sink S and permits the body to be locked and sealed in place by a suitable seal means **15** and a retaining nut **16**. The top portion of the body **12** is enclosed within a finishing cover **17** generally made of stainless steel or other metal adapted for this purpose.

The body **12** of the dispensing means **10** is provided with a control valve generally designated **18** and spout **19** having a generally inverted J-shaped construction with the long leg of the J-shaped spout tapered at the end **20** to permit the spout to extend through an opening **21** in the finishing cover **17** and into a mating tapered bore **22** in the body so that the spout will have a wring fit connection and be adapted to be fixed at any angular position to permit the discharge end remote therefrom provided with the discharge outlet **23** for the dispensing system to be fixed with respect to the sink S when the hot water dispensing system is in assembled position. Further, this construction and the wring fit connection permits the spout to be removed on its longitudinal axis with minimal angular rotation and this facilitates easy service, repair and replacement of the control valve **18** or elements therefor now to be described, from the top or upper face of the control body **12**.

The body **12** is provided with a bore **25** which extends through the longitudinal line of the body **12** spaced form and substantially parallel to bore **22**. The bore **25** is closed at one end by a fitting **26** having an inlet passage **27** therein which connects at one end to the supply conduit **28** in turn connected at the end remote therefrom to any suitable source of water or fluid at some given source temperature. The inlet passage **27** extends through a projection **29** at the end of the fitting **26** remote from the end connected to the supply conduit **28** so that valve stem **30** having a valve head **31** slidably mounted in the bore **25** will on movement as hereinafter described cause the valve head **31** to engage and disengage the projection **29** to open and close the end of the inlet passage **27**.

Valve stem **30** extends through the bore **25** in the body **12** and an opening **32** in the finishing cover **17** and is connected by a suitable means **33** to a lever arm **34** which is pivoted as at **35** on the upper face of the finishing cover **17**. The lever arm **34** can be manually actuated to move the valve stem **30**.

A backup nut **36** mounted at the end of the bore **25** remote from the inlet passage **27** retains backup member **36*a*** so that spring member **37** mounted about the valve stem **30** will engage the valve head **31** and normally maintain the control valve **18** closed. That is, it will normally maintain the valve head **31** in engagement with the end of projection **29** so as to close the inlet passage **27**.

When the lever arm **34** is manually operated it will pivot about the point **35** to move the end thereof connected to the valve stem so as to compress the spring **37** and thus lift the valve head **31** off of the projection **29**. When this occurs fluid from the source will pass freely into the bore **25** and this will continue as long as the lever **34** is maintained in the depressed condition.

When the lever **34** is released the spring **37** expands and moves the valve head **31** into engagement with the projection **29** and thus inlet passage **27** will once again be maintained closed until the lever arm **34** is again depressed.

FIG. 2 further shows that the body **12** of the dispensing head has a first crossover passage **40** which communicates at one end with the bore **25** and at the end remote therefrom with a conduit **41** connected to the body member **12** by any suitable means such as welding. The opposite of the conduit **41** is in turn connected to the bottom of a storage tank **42** forming part of the heating and storage means **11**. The heating and storage means more fully described hereinafter is maintained atmospheric pressure by a suitable independent and isolated venting means or conduit **43** as is more fully described hereinafter.

The conduit **41** opens adjacent the bottom of the storage tank **42** as at **44**, so that when water from the source enters the bore **25** the same can be passed freely through the first crossover passage **40** and conduit **41** to the lower portion of the

storage tank 42 all of which is clearly shown by FIGS. 1, 2 and 4 of the drawings.

Centrally in the end of the storage tank a fitting 45 is provided with a restricted outlet orifice 45a. The fitting or connector 45 is connected to a discharge conduit 46 which is connected at the end remote from the fitting 45 to the body member 12 so as to communicate with a second crossover passage 47 in the body member 12.

The crossover passage 47 extends through the body 12 into communication with the lower end of the tapered bore 22 and the tapered bore 22 communicates with the discharge passage 48 through the spout 19. The discharge passage 48 is provided with discharge outlet 23 which is disposed over he sink S all of which is shown in FIG. 2 of the drawings.

Thus when the lever arm 34 is depressed, fluid will pass into the bore 25, more particular water from any suitable source, at source temperature and at a pressure higher than atmospheric pressure, and as above described will flow freely into the bottom of the storage tank 42. Since the system is maintained at atmospheric pressure the incoming fluid will displace the heated fluid in storage tank 42 and force heated fluid from the storage tank 42 through outlet orifice 45a, discharge conduit 46 and crossover passage 47 to the discharge passage 48 in the spout for discharge through discharge outlet 23 to any use as may be desired.

When the lever arm 34 is released the valve head 31 closes the inlet passage 27 as above described and no further fluid is dispensed from the system.

However, by reference the drawings, it is clear in this form of the invention that the storage tank 42 is remote from the spout 19. Therefor, when the lever arm 34 is released to close control valve 18, a quantity of fluid will be left in the discharge conduit 46, crossover passage 47 and the discharge passage 48 in the spout 19.

If this quantity of fluid remains standing in the conduit and passages then expansion of the fluid due to heating thereof by the heating and storage means will cause the water to drip from the discharge outlet 23.

To meet this problem the heating and storage means 11 is provided with a suitable expansion and accumulation means now to be described.

HEATING AND STORAGE TANK ASSEMBLY FOR REMOTE DISPENSING MEANS

Thus, referring to FIGS. 4 to 8 of the drawings, the Heating and Storage Tank Assembly 11 consists of a storage chamber section generally designated 50 formed by the storage tank 42 and an expansion and accumulation chamber or section generally designated 51. The storage tank 42 is defined by a hollow cylindrical shell or member 52 closed at each respective end by a lower cover 53 and an upper cover 54 which members are domed or cup-shaped identical to each other during the initial stages to facilitate manufacture of the heating and storage tank assembly 11 in various sizes and for reasons which will appear clear from the description below.

A second domed upper end cover 55 deeper along its longitudinal line then the other end covers connected in fluidtight engagement about the periphery of the first upper end cover 54 will define the expansion and accumulation chamber 51. However, in this arrangement the first upper end cover 54 forms one wall of the expansion and accumulation chamber and thus is common to both the storage tank 50 and the expansion and accumulation chamber 51. It is however domed in shape as is shown in FIGS. 4 and 5 and since it forms a flow or bottom in assembled position which is lowest at the peripheral edge, a trap for foreign matter which may enter or accumulate in the expansion and accumulation chamber 51 will be provided.

The conduit 41 passing fluid to the heating and storage tank assembly is connected in fluid tight engagement in the lower cover 53 and extends in a curved manner only a short distance into tank 50 so that the outlet 44 for conduit 41 is adjacent the lowermost portion of the tank 50, so that fluid from the source will be discharged into the lower section of the tank and heated fluid displaced therefrom through outlet orifice 45a.

FIGS. 4 and 5 show that the first upper cover 54 at the highest point of the domed configuration is provided with the fitting or connector 45 and the restricted outlet orifice 45a in the fitting or connector 45 provides communicating and passage means from the storage chamber or tank 50 to permit fluid to pass through the fitting 45 to conduit 46 which is formed with an annular collar 56 connected at the end remote from the outlet orifice 45a to the discharge conduit 46. The discharge conduit 46 extends through the second upper end cover 55 by means of any suitable type of fluidtight connection and connects into the body member 12 of the dispensing head 10 to deliver heated fluid thereto as has been above described.

However, by reference to FIGS. 4 and 5 it will be noted that fitting 45a is provided with a plurality of ports 57 which provide communication between the expansion and accumulation chamber 51 and the passage formed by the discharge conduit 6. Thus when flow through the outlet orifice 45a discharge conduit 46 begins due to displacement of heated fluid, any fluid in the expansion and accumulation chamber 51 will be aspirated and mixed with the heated fluid passing to the spout 19 for discharge from the system. However, because the first upper cover member 54 forms a common wall for both the storage chamber 50 and the expansion and accumulation chamber 51 the accumulated fluid will be at substantially the same temperature as the heated fluid being discharged from the system. Conversely when the flow of fluid into the storage tank 50 is stopped as has been described the standing fluid in the discharge conduit 46 and the spout 19 can backflow through the ports 57 and collect in the expansion and accumulation chamber 51 where by direct conduction of heat through the common wall 54 the temperature of this fluid will be maintained.

In order to heat fluid delivered to the heating and storage tank assembly 11, a U-shaped resistance heating element 58 is also disposed in the lower section of the storage chamber or tank 50. The resistance heating element is connected in fluidtight engagement to and extends through the lower cover 53, as is shown in FIGS. 4, 5 and 6 of the drawings and forms part of an electrical circuit which as is diagrammatically illustrated at FIG. 8 of the drawings includes a thermostat assembly generally designated 59 having a sensing element 60 connected to the side of the tank 50 so to extend into the medial portion of fluid stored in said tank. The sensing element 60 can be of the bimetal or other type and is operably connected to a switch means 61. The switch means 61 is connected in series with the resistance heater 58, a pair of terminals 62 and 63 and a suitable source of electrical power. The dotted lines of FIG. 8 shows the switch means in the open position and the solid lines show the switch means in closed position. When the switch means 61 is closed, the electrical power to circuit will flow to the resistance heater 58.

The switch means 61 includes a calibrating mechanism (not shown) for adjusting the switch setting to maintain the fluid in the tank at a predetermined temperature.

This above-described system is substantially identical with that shown and described in U.S. Pat. No. 3,202,321 hence it is not more fully described herein as it is considered one known expedient for the automatic heating of fluid in the storage tank of a fluid-dispensing system. It will be understood that other and different means for the automatic heating of fluid in such storage tank are also known and could be incorporated in the present system without departing from the scope of the present invention.

The system in order to operate properly and to prevent any pressure from building up at any point in the system is vented to atmosphere by means of the venting conduit 43 which is connected in fluidtight engagement one end to the second upper end cover 55 and at the end remote therefrom to the body member 12 where it extends upwardly therethrough by

means of vent conduit extension 43*a* which in turn passes into and through the tapered bore 22 and the discharge passage 48 in the spout 19 to a point short of the discharge outlet 23. The end of the vent conduit extension 43*a* terminates at the vent outlet 65 so as to vent the expansion and accumulation chamber 51 and the remaining portions of the system connected thereto and thus maintain the system at atmospheric pressure at both static and dynamic conditions of operation.

SYSTEM WITH PUSHBUTTON-OPERATED DISPENSING MEANS

FIGS. 9 to 12 show a system substantially identical with that above-described. It differs in that the dispensing means has an improved pushbutton operated means for the control valve.

Since all the parts and elements of this form of the invention are otherwise identical they will not be described except as they may relate to the pushbutton actuator and such parts will be given the same numbers as is shown in FIGS. 1 to 8 of the drawings.

Thus referring to FIGS. 9 to 12, the dispensing means 10 is provided with a body 12 having a reduced threaded portion 13 which extends through an opening as at 14 in the upper surface of the sink S. The body 12 is locked ans sealed to the sink by seal means 15 and a retaining nut 16.

In assembled position the body 12 is enclosed with a finishing cover 17 generally made of stainless steel or a coated plastic or other material adapted for this purpose.

As in the form of the invention shown in FIG. 1 the dispensing head 10 is provided with the control valve generally designated 18 and a spout 19 which elements are identical and fit into the body 12 in the same manner above described, for the body 12 shown in FIGS. 11 and 12.

A knob or cap means 70 having a peripheral recess 71, as shown in FIG. 10 and 11 of the drawings is provided for manually operating the control valve 18. Note that the spout 19 fits into the recess 71 and rotation of the cap or knob means is prevented in both the nonoperating position or when the cap or knob means 70 is depressed to operate the control valve 18 as is hereinafter described.

The valve stem 30 extends through the bore 25 in body 12, a bore 72 in a backup unit 73 which is threadably mounted in and coacting with a gland 74 to seal and close the bore 25 in the body member 12 and connects a spaced distance beyond the upper surface of body 12 to a nut member 75 which is tapered as at 76 on its inner face and provided with a plurality of spaced upper races 77 for ball bearing members 78 which act to move the nut member 75 and the valve stem 30 connected hereto as will be described.

The backup member 73 has a projection 79 thereon which extends beyond the upper face of the body member 12 and receives thereon an annular inner member 80 and an annular outer member 81. The inner member 80 and outer member 81 are spaced from each other to form an annular recess or space 82.

The inner member 80 extends longitudinally upward parallel to the valve stem 30. At the upper end it provides the needed plurality of lower races 83 for the ball bearing member 78 to permit the ball bearing member 78 to move freely in and out when force is exerted and released by means assembled and connected to the pushbutton knob or cap means 70.

Thus the pushbutton knob or cap means 70 has tubular actuating sleeve or annular actuating member 84 fixedly connected thereto as at 85. The actuating member 84 is stepped as at 86 on its outer wall and tapered as at 87 on the inner wall adjacent the open end. The annular actuating member 84 is sized to be slidably mounted for guided movement along the inner wall of the outer annular member 81 and the outer annular member 81 is provided with a stop means as at 88 so that in assembled position the stop means 88 will engage the stepped portion 86 of the actuating member 84 and thus limit the upward movement of the pushbutton knob or cap member 70 as well as the downward movement as it will also engage the inner face of the knob or cap member 70 all of which is shown in FIG. 10 of the drawings.

FIG. 10 further shows that in assembled position when the control valve is not depressed the outermost end of the tapered portion 87 just rests on the ball bearing member 78. Ball bearing member 78 are forced radially outward in the upper and lower races 77 and 83 by the action of the spring means 37 of the control valve 18 which normally moves the valve stem 30 and valve head 31 to maintain the inlet passage 27 in normally closed position.

When it is desired to operate the system the pushbutton knob or cap means 70 is depressed. The taper surface 87 exerts force radially inward on the ball bearing members 78 and the ball bearing members sliding in the upper and lower races 77 and 83 move the nut member 75 longitudinally upward. Since the nut member 75 is connected to the valve stem 30 and valve head 31 the inlet passage 27 will be opened and fluid to be heated from the source to which the inlet conduit 28 is connected will enter the bore 25 in the body member 12.

Fluid introduced in bore 25 will then pass to the heating and storage tank assembly means 11 to displace assembly fluid from the system in the identical manner as has been described above for the form of the system shown in FIGS. 1 to 8 of the drawings.

COMPOSITE DISPENSING MEANS AND HEATING AND STORAGE TANK ASSEMBLY

In the respective forms of the invention described above, the dispensing means and the heating and storage tank assembly are disposed remote from each other and conduits are provided to connect those portions of the system and to vent the system to atmosphere.

In the form of the invention shown in FIGS. 13 to 18, the dispensing means generally designated 110 is connected directly and integrally with the heating and storage tank assembly means generally designed 111 to form a composite or combined single unit which is compact and can be directly mounted under the sink in the same manner as the unit shown and described in U.S. Pat. No. 2,903,551. Further, as in the earlier forms of the invention described this form of the invention is also maintained and operated at atmospheric pressure in the manner to be desired.

Thus referring to FIGS. 13, 14 and 15 the dispensing means 110 in accordance with this form of the invention includes an elongated body member 112 which is connected directly and in fluidtight engagement with the heating and storage tank assembly 111 as will be described.

The elongated body member 112 has a transverse flange 113 connected thereto by any suitable means such as a weldment 114 a spaced distance inwardly from the end thereof and the said end is threaded as at 115 so that the elongated body may be extended through an opening 116 in the upper surface of a sink or other device and sealed and connected to said sink S as by the gasket 117 and locking nut 118 to provide a simple and easy mounting for the entire composite unit.

A finishing cover made of stainless steel or other material is disposed and connected to the upper end of the elongated body member 112.

The body member 112 has two substantially parallel bores thereon as at 120 and 121. Bore 120 is tapered as at 122 at its upper end to receive the mating tapered end 123 of an inverted J-shaped spout member 124. The tapered connection permits the spout 124 to be securely mounted in any of a variety of radial-dispensing positions and this permits the discharge end remote from the connected end with the discharge outlet 125 therein for the dispensing system to be fixed in any given position with respect to the sink S when the dispensing system of the present form of the member is in assembled position.

The bore 121 is countersunk to receive an insert 126 which has an inlet port 127 and a valve seat 128 about said inlet port. The inlet port 127 communicates with an inlet opening 129 in

turn connected to an inlet conduit **130** in communication with a source (not shown) of fluid to be heated which fluid is maintained at pressures above atmospheric pressure. Inlet conduit **130** is connected to the body member **112** so as to communicate with the inlet opening **129** and to deliver the fluid to be heated to the inlet opening for discharge through the inlet port **127** into the bore **121** whenever the same is opened.

The inlet port or passage **127** is normally closed by a control valve generally designated **131** which is slidably mounted in the bore **121**. The control valve **131** includes a valve stem **132** having valve head **133** connected to the end thereof which valve head is normally disposed to meet and engage the valve seat **128** on the insert **126** and to open and close the inlet port or passage **127**.

The valve stem **131** extends through the bore **121** in body member **112** and a bore **134** in a backup member **135** to the exterior of the body member **112**. The backup member **135** closes the bore **121** and coacts with an "O"-ring member **136** to provide a fluidtight seal for the bore **121** to prevent escape of fluid therefrom. The spring member **137** about the valve stem **132** acts to urge the valve head **133** into engagement with the inlet port **127** so as to normally maintain the inlet port **127** closed.

Valve head **133** is milled, chamfered or formed as shown in FIG. **17** so that the sides **133***a* thereof are flat. Thus in assembled position only the corners **133***b* are in sliding contact with the inner wall of bore **121** and forms spaces **133***c* therewith. When the valve head **133** is lifted off of the valve seat **128** fluid from the inlet port or passage **128** can flow freely and substantially noiselessly into the bore **121**, through the spaces **133**c.

The end of the valve stem **132** remote from the valve head **133** also extends through an opening **138** in the finishing cover **117** and is connected at the exterior of the body member **112** to a lever arm **140** by any suitable pivoted connecting means such as is shown at **141**. The lever arm **140** is an L-shaped member which can be pivoted about the point **142**.

When the end **143** of the lever arm **140** remote from the pivoted connecting member **141** is depressed the lever arm pivots about the point **142** and moves the end of the valve stem **132** to which it is connected longitudinally upward. This compresses the spring member **137**, lifts the valve head **133** off the valve seat **128** and opens the inlet port or passage **127** so that fluid may flow from the source about the valve head **133** into the bore **121** in the body member **112**. On release of the lever arm **140**, the spring member **137** expands and forces the valve stem **132** and valve head **133** longitudinally downward thus bringing the valve head **133** back into engagement with the valve seat **128** and thus the control valve is returned to the normally closed position for the inlet port or passage **127**.

It will be noted that the lever arm **140** is provided with a recess at **144** which fits loosely about the spout means **124**. This recess acts to prevent rotating of the lever arm **140** after it is in assembled position as was described above with respect to the recess **71** in pushbutton member **70**.

Once the fluid enters bore **121** it will pass to the heating and storage tank assembly **111** through a longitudinal-disposed connecting passage **145** which communicates therewith at one end through an opening **146** in the lower side wall of bore **121** and at the end remote from the opening opens on the inner face **147** of the elongated body member **112** in the storage chamber or section **148** of the heating and storage tank assembly **111**, where it is connected to an elongated inlet conduit **149** which extends downward so as to deliver incoming water or other fluid through the outlet **150** of the inlet conduit **149** adjacent to the bottom of the storage chamber or section **148** of the heating and storage tank assembly **111**.

When water or other fluid is delivered to the storage chamber or section **148** it will displace heated water through an outlet orifice **151** also in the inner face **147** of the body member **112**. Outlet orifice **151** communicates through aspirating chamber **152** with the bore **120** in the body member **112**.

HEATING AND STORAGE TANK ASSEMBLY FOR ADJACENT DISPENSING MEANS

The heating and storage tank assembly **111** of this form of the invention is substantially similar to that of the form of the invention having a remote dispensing head.

Thus, referring to FIGS. **13** and **18**, the heating and storage tank assembly **111** is shown as consisting of the storage chamber or tank section **148** and an expansion and accumulation chamber or section generally designated **153**. The storage tank **148** is defined by a hollow cylinder shell or member **154** closed at each of its respective ends by a lower cover **155** and an upper cover **156**. The members **155** and **156** are domed for the same reasons above-described with respect to the storage tank **42** of the remote dispensing means form of the present invention.

A second domed upper end closure **157** which is also deeper along the longitudinal line than the other end closures **155** and **156** when connected in fluidtight engagement with the periphery of the upper end closure **156** will define the expansion and accumulation chamber **153**. This arrangement also provides the single common wall between the means defining the storage chamber **148** and the expansion and accumulating chamber **153** and once again this construction not only permits collected fluids in the expansion and accumulation chamber **153** to be maintained at substantially system temperature but further because the upper end closure **156** is domed and serves as the bottom or floor for the expansion and accumulation chamber **153** it will act trap any foreign matter which may enter with or be formed in the collected water or other fluid in the expansion and accumulation chamber.

FIGS. **13**, **14**, **15** and **18** further shows that the elongated body member **112** is connected by any suitable means such as weldments **158** and **159** to the respective first upper end cover **156** and second upper end cover **157**.

This arrangement disposes at least the lower portion of the bore **120** so that it lies within the expansion and accumulation chamber **153**. The aspirating chamber **152** which communicates between bore **120** and the outlet orifice **151** for the storage chamber **148** is disposed adjacent to the highest point of the domed portion of the first upper end cover **155** and is brought into communication with the expansion and accumulation chamber **153** by means of an aspirating and return port or passage **160** in the body member **112**, all of which is clearly shown in FIGS. **14** and **17** of the drawings.

When water or other fluid is displaced from the storage chamber section **148** of the heating and storage tank assembly **111**, collected water or fluid in the expansion and accumulation chamber **153** will be aspirated and mixed with the heated fluid passing through the outlet orifice, the aspirating chamber and bore **120** to the discharge passage **161** formed through the spout **124**. Conversely when the displacement of heated fluid from the storage chamber **148** terminates the standing water or other fluid remaining in the bore **120** and discharge passage **161** will flow backwards through the aspirating and return port **160** to collect again in the expansion and accumulation chamber **153** where the temperature of the fluid will be maintained until the fluid is aspirated again on further operation of the system.

The heating of the fluid stored in the storage chamber **148** is accomplished by resistance heater **165** which is connected in an electrical circuit identical with that above described for the form of the invention shown in FIGS. **1** to **8** and **9** to **12**. Hence it is not deemed necessary to describe the structure and operation again for the heating means illustrated for this form of the invention.

As in the other forms of the system it is necessary to maintain the composite dispensing means and heating and storage tank assembly at atmospheric pressure and for this purpose a passage or bore **166** is provided in the body members **112**, one end of which communicates through an opening **167** with the upper end of the expansion and accumulation chamber **153** and the other end through a port **168** opening on the external face **169** of the body member **112** so that atmospheric pres-

sure will be acting there through at all times. This venting arrangement is clearly shown in FIGS. **15**, **16** and **17** of the drawings.

From the foregoing an improved convenient system to provide an instant supply of hot water or other heated fluid for a commercial, industrial or a domestic installation has been described which is characterized by the fact that the system operates at atmospheric pressure, is adapted to handle the heating of water or other fluids over a wide temperature range without exceeding the volumetric capacity for the system and provides means to exceed the volumetric capacity of known prior art heating and dispensing systems for providing instant hot water or other heated fluids.

While the foregoing description illustrates various preferred embodiments of apparatus and systems in accordance with the present invention, it will be appreciated that certain changes and modifications may be made in the structure of these disclosed arrangements without departing from the spirit and scope of the invention and that the same is defined by the claims as hereinafter set forth.

What is claimed is:

1. In a fluid-dispensing system to be operated at atmospheric pressure:

a. a dispensing means including a normally closed control valve means having an inlet connected to a source of fluid to be dispensed and an outlet spaced from said inlet, and a spout means forming a discharge passage for fluid to be dispensed from said system,

b. storage means for fluid to be dispensed including, a storage chamber having an outlet, and an expansion and accumulation chamber operatively associated with said storage chamber,

c. means for heating and maintaining fluid in said storage chamber within a predetermined temperature range,

d. first passage means connected between the outlet of said control valve means and the storage means to deliver fluid to be dispensed to the lower portion of said storage chamber,

e. second passage means connected between the outlet for the storage chamber and said discharge passage in the spout means and disposed to extend through said expansion and accumulation chamber for a portion of its length,

f. port means in said second passage means to permit continuous and direct flow communication between the expansion and accumulation chamber and the outlet for said storage chamber whereby fluid from said storage chamber and from said second passage means can pass freely to and from said expansion and accumulation chamber when said control valve means is opened and closed,

g. and vent means connected at one end of the expansion and accumulation chamber and open to atmosphere at the end remote therefrom for maintaining the operation of said fluid-dispensing system at atmospheric pressure.

2. In a fluid-dispensing system as claimed in claim **1** wherein said storage means has means providing a common wall between said expansion and accumulation chamber and said storage chamber to permit fluid in said expansion and accumulation chamber to be maintained at substantially the same temperatures fluid in said storage chamber.

3. In a fluid-dispensing system as claimed in claim **2** wherein,

a. tank means defines said storage chamber,

b. said tank means including, a cylindrical member, and end closure means at each end of said cylindrical member, one of said end closure means of said tank means constitutes the common wall,

c. said common wall end closure means domed,

d. cup-shaped end closure means sealingly connected to the periphery of said common wall to define said expansion and accumulation chamber,

e. said common wall end closure means forming the bottom wall for expansion and accumulation chamber lowest at its periphery to provide a trap for foreign materials,

f. and the outlet for the storage chamber at the highest point on the domed common wall.

4. In a fluid-dispensing system as claimed in claim **1** wherein the vent means comprises, conduit means, and said conduit means extends through said spout means to provide a vent flow path within and isolated from the fluid being discharged through said spout means from the storage means.

5. In a fluid-dispensing system as claimed in claim **1** wherein the dispensing means includes:

a. body member having at least two spaced bores therein,

b. one of said bores having the inlet communicating with the source of fluid to be dispensed, and the outlet for delivering fluid to said storage means,

c. said control valve means axially mounted in said last-mentioned bore and axially movable in said bore to control flow of fluid to be dispensed from the inlet to the outlet associated with said bore,

d. at least one other bore having a tapered seat at the upper end thereof,

e. and said spout means having a tapered portion at the inlet end thereof adapted to be seated in any given circumferential position in said tapered bore to facilitate dispensing of fluid from said system.

6. In a fluid-dispensing system in accordance with claim **5** wherein:

a. cam means is connected to said body member at the end of said bore remote from the inlet,

b. said control valve means having a valve stem extending through the cam means and a valve head on said valve stem,

c. spring means normally biasing said valve head to maintain the inlet closed,

d. cam member means on said valve stem disposed to engage said cam means,

e. and means mounted on said body member operatively connected for axial movement relative the longitudinal line of the valve stem to operate said cam means whereby the valve stem will be moved against the bias of the spring to provide a progressively increasing fluid flow path between said inlet and outlet for the bore in which the control valve is located.

7. In a fluid dispensing system as claimed in claim **3** wherein said dispensing means includes:

a. a control valve body member,

b. said control valve body member connected to said tank means and disposed to extend for at least a portion of its length through said expansion and accumulation chamber.

8. In a fluid-dispensing system as claimed in claim **7** wherein said vent means comprises a passage means in said control valve body member.

9. In a fluid-dispensing system operated at atmospheric pressure:

a. closed storage means for fluid to be dispensed having means thereon for heating and maintaining said fluid within a predetermined temperature range,

b. means forming a closed expansion and accumulation chamber connected in heat exchange relation with said storage means,

c. a dispensing means including a normally closed control valve means to regulate flow of fluid in said system, and a spout means having a discharge passage for dispensing fluid from said system,

d. said control valve means including, a body member having an inlet connected to a source of fluid to be dispensed and an outlet for said fluid,

e. said body member connected to the upper end of said closed storage chamber means and the upper end of said means forming said expansion and accumulation chamber so that portion of the body member lies in the expansion and accumulation chamber,

f. means for delivering fluid to be dispensed from the outlet in said body member to the lower portion of the storage chamber means,

g. said body member having restricted outlet means for said storage chamber means, and a connecting passage in the body member communicating at one end with the restricted outlet means and at the other end with the discharge passage in said spout for passing heated fluid from said system,

h. port means in the body member to provide communication between the lower portion of said expansion and accumulation chamber means and said discharge passage to coact with the restricted outlet means to permit expansion fluid from said storage chamber and backflow fluid from said discharge passage in the spout to collect in and to pass from the expansion and accumulation chamber means when the control valve means is opened and closed,

i. and vent means in said body member communicating with the expansion and accumulation chamber at one end and open to atmosphere at the end remote therefrom maintaining the operation of the fluid-dispensing system at atmospheric pressure

10. In fluid-dispensing system as claimed in claim **9** wherein:

a. said closed storage means is defined by tank means having a cylindrical member, and end closure means for each respective end of said cylindrical member,

b. cup-shaped chamber means connected to the periphery of one of said end closure means to define said expansion and accumulation chamber whereby said end closure means form a wall common to both the storage chamber means and the expansion and accumulation means,

c. and said common wall is domed to trap foreign matter in said expansion and accumulation chamber at a point therein remote from the port means.

11. In a fluid-dispensing system operated at atmospheric pressure:

a. closed storage means for fluid to be heated,

b. means forming a closed expansion and accumulation chamber mounted in heat exchange relation with said storage means,

c. a dispensing means including a normally closed control valve means to regulate flow of fluid in said system, and a spout means having a discharge passage for dispensing fluid from said system,

d. said control valve having an inlet connected to a source of fluid to be dispensed and an outlet for said fluid,

e. first conduit means operatively connecting the outlet of said control valve means to said closed storage means to deliver fluid to the lower portion of said tank means,

f. said storage means having an outlet with a restricted orifice therein,

g. discharge conduit means connecting the outlet of said storage means to the spout means whereby fluid will pass through the discharge passage of said spout means when said control valve is actuated to an open position.

h. port means in said discharge conduit means adjacent the outlet for said tank and coacting therewith to provide communication substantially adjacent the bottom of said expansion and accumulation chamber means to permit expansion fluid from said tank and backflow fluid from said discharge passage to collect in said expansion and accumulation chamber when said control valve is closed and to pass therefrom when said control valve is opened,

i. and vent means adjacent to top of said expansion and accumulation chamber to maintain the system at atmospheric pressure.

12. In a fluid-dispensing system as claimed in claim **11** wherein the vent means comprises, conduit means, and said conduit means extends through said spout means to provide a vent flow path within and isolated from the fluid being discharged through said spout means from the storage means.

13. A storage means for a fluid-dispensing system to be operated at atmospheric pressure comprising:

a. tank means forming a storage chamber for fluid to be dispensed defined by a cylindrical shell, an upper closure means, and a lower closure means connected to opposite ends of said cylindrical shell,

b. means on said tank means disposed to form an inlet to deliver fluid to the lower portion of said tank means,

c. said upper closure having an outwardly domed configuration, and outlet means for the storage chamber formed at the highest point of the domed portion of said upper closure member,

d. cuplike closure means having its open end connected in fluid-type relationship with the periphery of said upper closure member to define an expansion and accumulation chamber,

e. discharge connecting means connected to said outlet and extending a portion of its length through said expansion and accumulation chamber to provide a discharge flow path for fluid to be dispensed from said tank means,

f. and port means in said discharge connecting means communicating between said expansion and accumulation chamber and said discharge connecting means to permit expansion fluid from the storage chamber of the tank and return fluid from said discharge connecting means collected in said expansion and accumulation chamber to be passed therefrom on discharge of fluid through said discharge connecting means.

14. A storage means for fluid to be dispensed as claimed in claim **13** wherein:

a. the outlet constitutes a restricted orifice,

b. and the port means coacts with the outlet when fluid is passed from the tank to move fluid from the expansion and accumulation chamber and mix the same with the fluid being passed to the discharge-connecting means.

15. Means for controlling fluid flow in a fluid dispensing system comprising:

a. valve body member defining a valve chamber having an inlet port at one end and a discharge outlet axially spaced from said inlet port,

b. control valve means axially moveable in said valve chamber for controlling the rate of fluid flow from said inlet port to said discharge outlet,

c. means biasing said control valve means towards said inlet port to maintain said inlet port normally closed,

d. manually operable means mounted for axial movement on the end of said housing means opposite from said inlet,

e. said control valve means extending through the end of said chamber opposite from said inlet and towards said manually operable means,

f. and cam means provided at the end of said housing means opposite from said inlet causing one of said control valve means and said manually operable means to move axially in one direction in response to axial movement of the other in the opposite direction.

16. In the means for controlling fluid flow in a fluid-dispensing system as claimed in claim **15** wherein said cam means comprises:

a. pair of diverging annular cam surfaces one encircling the other.

b. one of said cam surfaces being provided by said control valve means and the other being provided by said manually operable means,

c. a plurality of cam members constrains between said cam surfaces and move towards each of said cam surfaces by axial movement of the other of said cam surfaces causing said control valve means to move axially away from its closed position against said biasing means when said manually operable means is moved axially towards said housing means,

d. said manually operable means to move axially away from said housing means when said control valve means is moved towards its normally closed position by said biasing means,

e. and means providing a surface transverse to the axis of movement of said control and manually operable means which engages and constrains said cam members between said cam surfaces.

17. Connecting means for the spout in a dispensing system including:

a. dispensing valve body,

b. a plurality of longitudinally disposed bores in said dispensing valve body,

c. at least one of said bores having control valve means disposed to be mounted in and removed from the upper face of said dispensing valve body,

d. at least one of said bores spaced from said control valve bore having tapered seat adjacent the upper face of the

e. and spout means having a tapered section herein mated for a wring fit connection in said tapered seat to permit removal of said spout means along its longitudinal axis,

f. removably mounted cover means on the upper face of the dispensing valve body having openings therein disposed in alignment with said bores,

g. an actuator operatively and removably connected to said control valve means and in pivotal engagement with the cover means in assembled position,

h. and said actuator formed to extend in part about said spout means to prevent rotation of the actuator when said spout is in assembled position in the tapered bore.

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