United States Patent [19]

Horvath et al.

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[54] **WATER SOFTENER VALVE**

[75] Inventors: **John F. Horvath,** Milwaukee, Wis.; **Chester R. Nickols,** Sycamore, Ill.

[73] Assignee: **Aqua-Chem, Inc.,** Milwaukee, Wis.

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[52] **U.S. Cl.**..... **137/330,** 137/624.18, 137/599.1

[51] **Int. Cl.**..... **C02b 1/22**

[58] **Field of Search** 137/599.1, 137/624.18, 624.2, 624.13, 624.17, 627, 137/DIG. 2, 449, 330; 210/139, 140

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Primary Examiner—Alan Cohan

Attorney, Agent, or Firm—Fred Wiviatt; Ralph G. Hohenfeldt; John C. Cooper, III

[57] **ABSTRACT**

A water softener control valve has a number of cam operated valves each of which includes a ball located at a port. A lever is associated with each ball and lever movement by the cams unseats the balls to open the ports. The ports are located in a common, generally horizontal wall and internal generally vertical walls associated with the ports define channeling through which water is directed in achieving the service, backwash, brine slow rinse, and fast rinse cycles of the water softener, and in addition the brine tank water refill after the mineral bed of the water softener has been regenerated. Water pressure urges the balls toward their respective ports and holds the balls seated in the ports. One port is exposed, during the regeneration portion of the water softener program, to both return flow from the mineral tank on one side of the port and service flow to the service outlet on the other side. That port has a ball on both sides of the port to insure closure of the port and isolation of the flow on both sides of the port.

8 Claims, 11 Drawing Figures

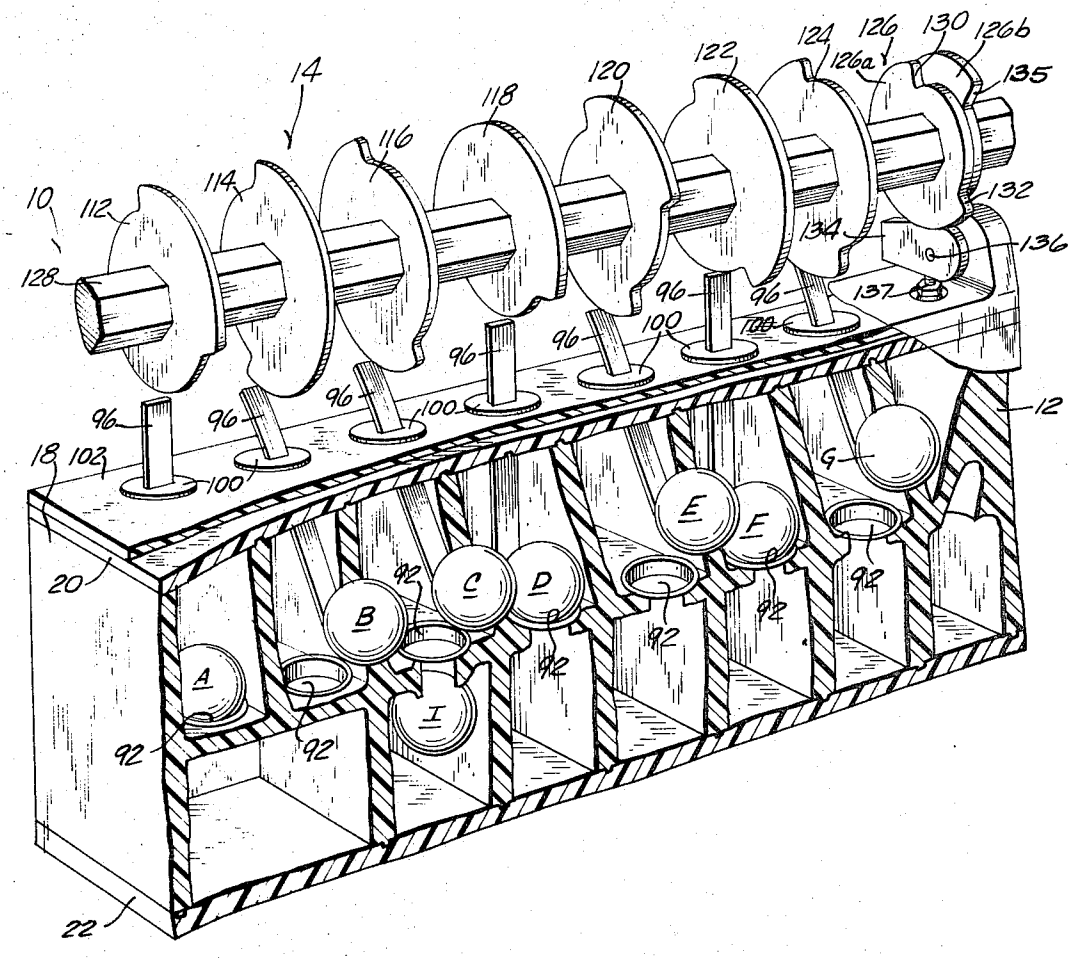


Fig. 1

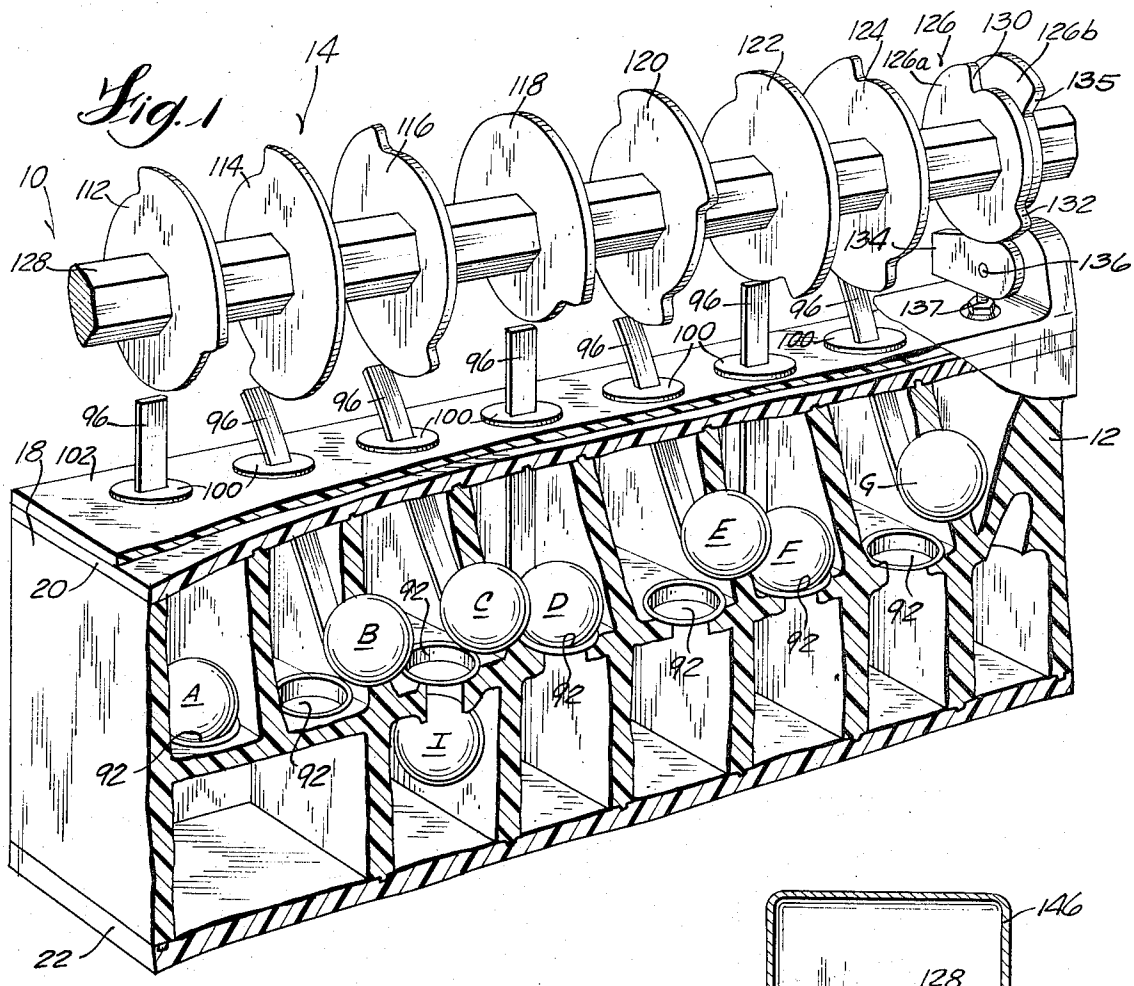


Fig. 6

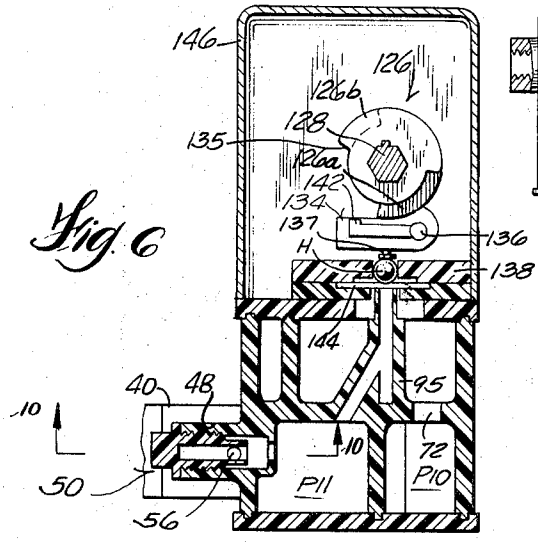
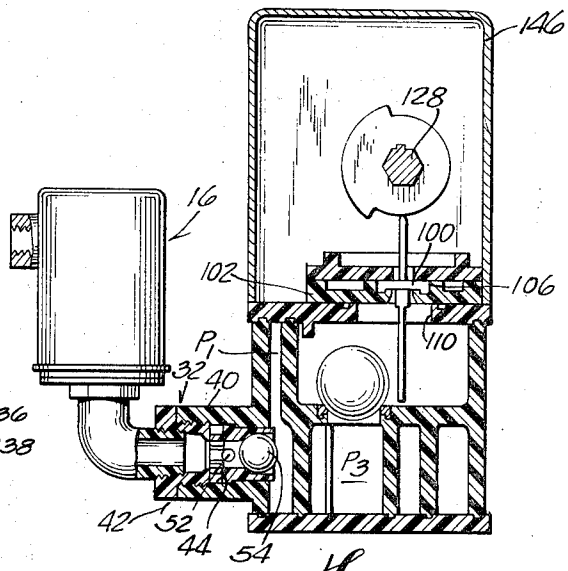


Fig. 5



Inventors
John S. Horvath
Chester R. Nichols
By Joseph A. Genovese
Attorney

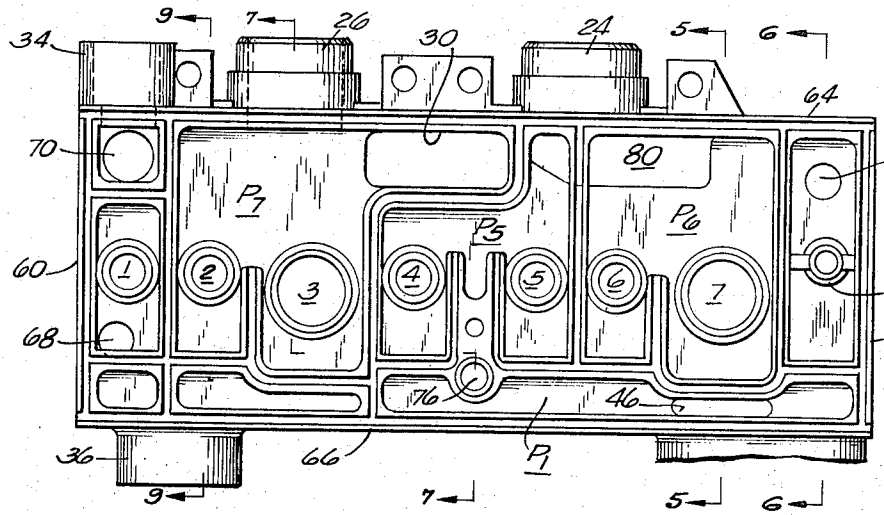


Fig. 3

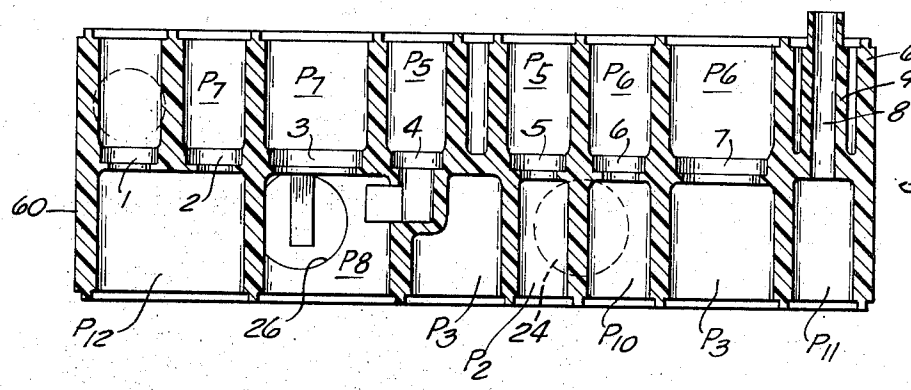


Fig. 2

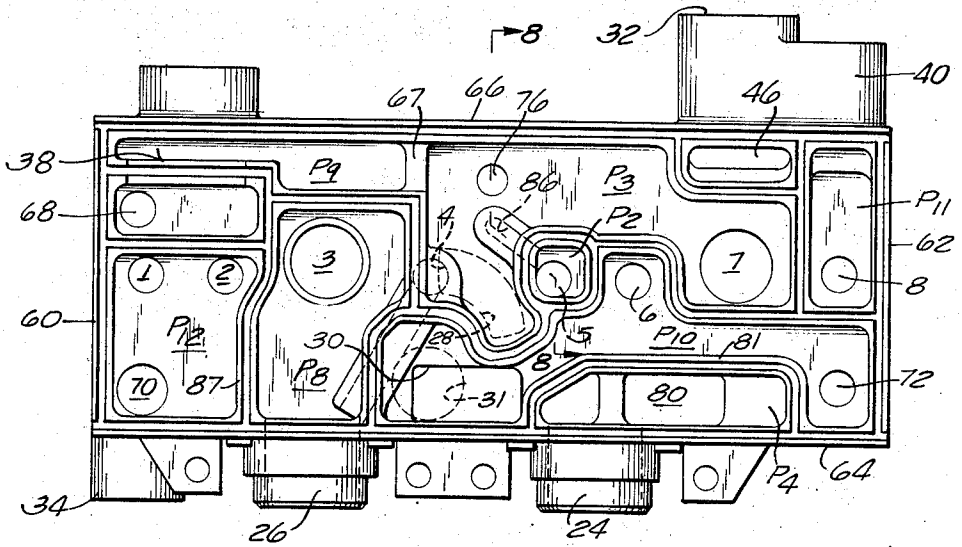


Fig. 4

Inventors
John F. Horvath
Chester R. Nichols
By Joseph A. Genuguna
Attorney

Fig. 7

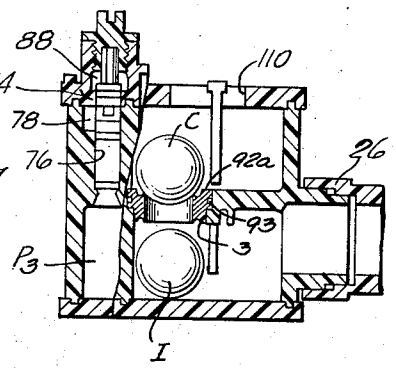
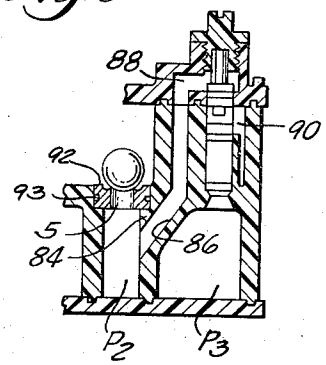


Fig. 8



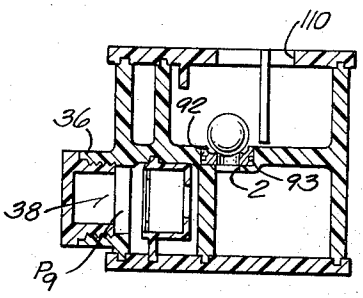
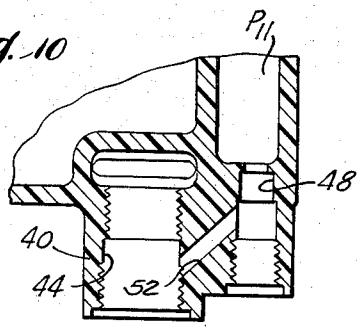


Fig. 9

Fig. 10



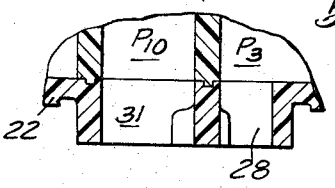


Fig. 11

Inventors
John F. Horvath
Chester R. Nichols
By Joseph A. Dennigan
Attorney

WATER SOFTENER VALVE

BACKGROUND OF INVENTION

This invention relates to water softener valves and, more particularly, to the control valve arrangement by means of which the various water softener cycles are achieved.

Conventional water softeners are generally programmed to operate automatically through the well known cycles of service, backwash, brine slow rinse, fast rinse, and brine tank water refill. This programmed operation is achieved by means of a control valve which directs the flow of source water to the mineral tank and brine tank, soft or hard water to the service outlet, and unwanted water (during backwash and rinses) to drain. Numerous control valves have been proposed in the past, the construction of such valves have varied but the function has remained generally the same, namely to achieve the above mentioned cycles.

SUMMARY OF INVENTION

This invention is directed to the problem of providing the water softener cycles and, among its general objects, is to provide a simplified and effective control valve by means of which such cycles can be achieved.

For the achievement of that and other objects, this invention proposes a construction wherein a ball is associated with each of a number of the valve ports in the valve. The balls normally close the ports to flow and are displaced from their respective ports in a programmed fashion. The ports are preferably located in a generally common wall with walls projecting from both sides of the common wall in preselected orientation to define channels associated with the ports through which flow occurs. The balls are selectively unseated to open the ports to influence flow through the valve, and to and from the brine and mineral tanks, to produce the various opertional cycles. The control valve also has suitable connections between its interior channeling and a water source, a service connection, the brine and mineral tanks, and a drain.

The ball arrangement affords a simplified and yet highly effective valving arrangement. The balls are generally free in the area of their respective ports and the seating surface of each ball in its port will be continuously changing throughout valve operation thereby insuring positive and effective seal-off over extended periods of service which increases reliability and reduces maintenance attention. Preferably, the balls being free at their respective ports, are urged into seating relationship in their respective ports only by water pressure; this allows the balls to rotate while disengaged from their seats thereby changing the valve seating surface from one operation to another. More specifically, the channeling within the valve is such that balls exposed to water flow are generally exposed from above relative to their respective ports so that they are urged into engagement in their respective ports by water, and the balls are preferably heavier than water to enhance this inherent biasing effect. Where a port is exposed to water flow on both sides two balls can be provided to insure port closure; for example, in the preferred embodiment during operation one port is exposed on its underside to flow to service while its upperside is exposed to flow to drain and a second ball capable of floating is provided on the underside of that port.

Also in the preferred arrangement, the balls are manipulated by levers extending through resilient discs supported in the valve housing. The levers are normally spaced from the balls and the discs are stressed as the levers move to unseat the balls so that the inherent bias of the discs moves the levers away from the balls when the ports are to be closed.

Other objects and advantages will be pointed out in or be apparent from the specification and claims, as will obvious modifications of the embodiments shown in the drawings, in which:

FIG. 1 is a perspective of a control valve embodying this invention with parts broken away to illustrate the interior of the valve and being somewhat in schematic form so as to better illustrate the operation of the overall valve;

FIG. 2 is a longitudinal section through the main portion of the control valve with operational parts removed for ease of illustration;

FIG. 3 is a top plan view of the structure shown in FIG. 2;

FIG. 4 is a bottom plan view of the structure shown in FIG. 2;

FIG. 5 is a section view taken generally along line 5—5 in FIG. 3;

FIG. 6 is a section view taken generally along line 6—6 of FIG. 3;

FIG. 7 is a section view taken generally along line 7—7 in FIG. 3;

FIG. 8 is a section view taken generally along line 8—8 of FIG. 4;

FIG. 9 is a section view taken generally along line 9—9 of FIG. 3;

FIG. 10 is a section view taken generally along line 10—10 of FIG. 6 and with operational parts removed; and

FIG. 11 is a partial view of a part of the bottom section of the valve illustrating the openings through which connection is made to the mineral tank.

DESCRIPTION OF PREFERRED EMBODIMENT

A water softener valve **10** is illustrated in the drawings and includes a valve body **12**, a rotatable cam bank **14**, a brine flow check valve **16** (FIG. 5), and suitable connections (not shown) to the brine tank and the mineral tank which contains the conventional ion exchange material such as zeolite. The mineral tank and the brine tank can be any conventional construction and neither is necessary to an understanding of this invention and hence they have not been illustrated and will not be described; this is also true of the brine flow check valve and it will not be described in detail. It should also be appreciated at the outset of this description that, in addition to the just mentioned tanks, much of the system elements and connections are also conventional, e.g., the connections to the mineral and brine tanks, and hence, although they may be referred to in a general manner therein, they too will not be described in detail as their construction and operation should be readily understood by those skilled in this art.

Valve body **12** is basically a three piece member including a main section **18**, a top wall **20**, and a bottom wall **22**. The body pieces are made of a suitable plastic material, for example a plastic presently available commerically as Arcylafil 640–35 provides satisfactory re-

sults. The pieces **18, 20,** and **22** are connected by a suitable bonding adhesive and a tongue-in-groove type connection to provide a leak proof seal for the interior of the valve body. FIG. **1** is somewhat of a general showing of the valve eliminating some details of constructions which have, however, been illustrated in other Figs.

In general terms, main section **18** includes an inlet port **24** in sidewall **64** for entry of hard water; an outlet port **26** also in sidewall **64** for exit of soft water for system usage; an opening **28** opening in bottom wall **22** (shown in dotted lines in FIG. **4** and in section in FIG. **11**) through which hard water is directed to the mineral tank for treatment; an opening **30** in central wall **58** and generally aligned with an opening **31** through bottom wall **22** through which soft water returns to the valve; port **32** in sidewall **66** through which brine is drawn from the brine tank to be channeled through the valve to the mineral tank and through which replacement water is directed to the brine tank; and an outlet **34** in sidewall **64** connected to drain for discharge of water during, for example, the fast and slow rinse cycles for the mineral bed. Hub **36,** extending laterally from sidewall **66,** is adapted to receive a flow regulator valve **38,** commonly referred to as a dole valve and which maintains a constant volume flow rate to drain outlet **34.** Hub **40,** in which port **32** is formed, includes a check valve assembly **42** positioned in bore **44.** Port **32** communicates through the check valve and opening **46** in wall **58** with passage P_1 and this channeling is used in directing brine from the brine tank to the mineral bed for regeneration as will be described hereinafter. Hub **40** includes a second bore **48** which carries a valve **50** (in FIG. **10** the assemblies in the bores have been removed for purposes of illustration). Bore **48** communicates with bore **44** through a cross passage **52** which enters the bore **44** behind ball **54** of the check valve assembly **42.** This channeling is utilized to direct water to the brine tank for refilling the brine tank after the mineral bed regeneration cycle. There is sufficient clearance between the valve member **50** and the inner walls of bore **48** to permit flow to passage **52.**

Wall **58** of main valve section **18** is disposed in a generally central location in the valve and extends between end walls **60, 62,** and side walls **64, 66,** the central, end and side walls being molded in one piece. The central wall carries the control valve ports, numbered **1** through **8** in the drawings, through which flow is directed as a result of selective opening of the ports by operation of the cam tank. Vertical walls are also provided and project on both sides of wall **58** and function to define flow channels associated with the ports for directing water in a manner which will become evident as this description proceeds, the walls will be numbered as required in the description.

Wall **58** also includes holes **68** and **70** which communicate with each other via channeling and port **1** and hole **72** which is operationally between ports **6** and **8** and in the flow channeling to the brine tank.

Ejector assembly **74** (FIGS. **7** and **8**) is mounted in bore **76** and communicates with passage **78.** Passage **78** has open communication with passage P_1 which communicates through opening **46,** check valve assembly **42** and brine check valve **16** with the brine tank. Ejector **64** is operative to create a vacuum through the passages just described, i.e., P_1 and **46,** causing ball **54** to be removed from its seat and brine to be drawn from the brine tank. To produce the vacuum, the ejector is exposed to the main water flow through inlet **24** via opening **80** in wall **58,** port **5,** hole **82** in the sidewall **84** communicating with passage P_2 below port **5,** channel **86,** channel **88** and down through ejector **74** into passage P_3 which communicates with opening **28** in bottom wall **22** to tank. A venturi effect is created by this flow through the ejector in area **78** which creates the vacuum condition described above causing brine to be drawn from the brine tank and mixed with the water being directed into the tank through the ejector.

Ports **1–8** are normally closed and are selectively opened for flow to achieve the conventional cycles of service, backwash, brine slow rinse, and fast rinse during which the brine tank is also refilled. In accordance with this invention, the closure of ports **1–7** is achieved by balls A–G one of which is associated with each of the ports as illustrated in FIG. **1.** Each of the balls A–G is made of a material heavier than water so that they do not float, for example glass. Port **8** is closed by the combination of metal ball H, disc **144,** and lever **134,** a positive seal off is achieved at this port where even a small amount of leakage cannot be tolerated. Each of the ports **1–7,** which cooperate with a glass ball, is provided with a removable seat member **92** of suitable material which is positioned in a respective port and provides a seat for receiving a respective ball A–G. The seats **92** fit into each port and have an O-ring **93** associated therewith to insure a seal. It will be noted that seat **92***a* at port **3** is a double seat to cooperate with both balls C and I. Being removable the seats can be removed and replaced during service as desired.

Disc **144** is made of rubber, or the like, and seats directly on the end of extension **95** which forms port **8** and is held in place by ball H and lever **134.** Balls A–G are all located above wall **58** as viewed in FIGS. **1** and **2** and, as will appear when the operational cycles are explained, the passages and channeling influencing flow direct all flow such that flow to a port when it is to be open and pass flow is from above wall **58.** This produces flow over the balls tending to seat the balls in their respective ports. Thus water pressure urges the balls into the ports and they must be positively displaced to open the ports and when released are returned to engagement in their ports under the influence of the water. A second ball I is associated with port **3** and is located on the underside of wall **58.** During a portion of the overall softener program port **3** is exposed to flow on both sides and the purpose of ball I is to insure closure of port **3.** This flow above and below port **3** occurs during the backwash, brine, and rinse cycles. Ball I is generally made of a material which will float (e.g., polypropylene) so that it will normally try to assume a position seated in and closing port **3.** However, when flow occurs down through port **3** it is readily displaced. Ball H holds disc **144** on port **8** and when the ball is released by lever **134** the inherent water pressure under the disc raises the disc to open the port.

The use of balls to control opening and closing of the ports provides a very simple and yet markedly reliable valve arrangement. Positive seal-off is insured, and without the need for precise location of the valve closure member with respect to the port. Furthermore, the balls at ports **1–7** are generally free once released from the port and can rotate virtually without restriction so that seal-off does not occur through repeated engagement between the port and the same surface on the

valve closure member. This minimizes problems due to wear and decreases the need for maintenance attention while increasing valve reliability.

It should be noted at this point that having provided a common wall **58** for the valve ports, and that wall being generally horizontal in use, contributes in permitting the use of the simple valve closure arrangement provided by the balls. Although port **8** is elevated above the level of ports **1–7** this can still be considered for practical purpose, as part of the common wall as the elevation of the upper part of the port **8** is merely to facilitate actuation.

As stated above balls A–G normally tend to assume a position secured in their respective ports and a relatively simple arrangement is proposed for unseating the balls to open their respective ports. Being unable to float and disposed over the upperside of wall **58**, which is normally horizontal, and with influenced flow being over the balls, the balls are biased into engagement in their respective ports without the use of springs. Although springs can be used, the free movement of the balls when released from the ports is preferred.

More specifically, the arrangement for unseating the balls includes a number of levers **96** extending through top section **20** for engagement with balls A–G. Levers **96** are rigid members of a suitable metal, such as brass, and are held captive in resilient discs **100** seated in a plate **102** overlying top section **20**. Levers **96** are vulcanized to the discs providing a sealed connection, discs **100** are in turn seated in openings **106**. The levers extend through clearance openings **110** in top section **20**. Discs **100** are made of resilient material, e.g., rubber, and the inherent bias of these discs cause levers **96** to assume a generally upright position, spaced from, i.e., not in contact with, their respective balls A–G. The resilient discs oppose movement of the levers in a port opening direction and return the levers to the upright position after the opening force is removed. To properly orient the levers relative to the balls, a notch and projection arrangement is provided between discs **100** and openings **106** locating the discs and thereby orienting the levers.

Movement of the levers to engage and unseat the balls is achieved by cams **112, 114, 116, 118, 120, 122, 124,** and **126** as can be seen in FIG. **1**. Cams **112–126** are provided with suitable cam lobes to engage and move the levers and all are mounted on a shaft **128** which is driven by a timer (not shown) programmed to cycle the cams to achieve the necessary water softener cycles. As the shaft **128** is rotated, cams **112–126** selectively operate their respective levers **96,** and **134,** to pivot the levers into engagement with and move the balls against water pressure to unseat the balls as required to achieve the various water softener operations. In the case of lever **134,** ball H is moved to free disc **144**.

At this point the construction of cam **126** and its operative connection to lever **134** should be noted. As illustrated, cams **112–124** carry lobes and the rise portion of the cams are used to operate their respective levers to displace balls A–G. In contrast, cam **126** is adapted to operate its lever **134** on a fall portion of the cam and hence a lever arrangement has been provided to accommodate this reversal of this operation. Moreover, cam **126** is intended to control the brine tank refill cycle and, therefore, is made adjustable to provide the prescribed amount of water to recharge the brine tank after the brine cycle. More specifically, cam **126** includes a first cam disc **126*a*** and a second cam disc **126*b***. Cam disc **126*a*** is fixed to shaft **128** whereas disc **126*b*** can be rotated relative to the shaft whereby the cam fall opening can be set at a maximum where faces **130** and **132** of disc **126*a*** are both exposed but can be reduced by exposing face **135** and moving that face toward face **132**.

Lever **134** is supported on a pin **136** for pivotal movement. Lever **134** includes a projection **142** which rides on the rise portion of cam **126** and holds lever **134** such that ball H urges disc **144** into engagement with port **8**. When projection **142** falls into the opening defined between surfaces **130** and **132** or **135** and **132,** spring ball H is released and the water pressure under disc **144** lifts the disc to open port **8**.

It will also be noted that cover plate **140** serves to hold resilient discs **100** and **104** in their respective openings, this cover plate and outer housing **146** were removed in FIG. **1**. Cover plate **140** is attached to member **102** and member **102** to top section **20** by a suitable adhesive.

Screw **137** is threaded into lever **134** and makes the actual engagement with ball H to thereby provide a measure of adjustment in the force with which the disc closes port **8**.

With this structural description of the overall valve in mind, a general description of the operation of the valve through the various water softener cycles in a complete water softener program will now be made. Starting with the service cycle and assuming that the zeolite bed is properly conditioned for softening and that the brine tank is properly charged with water and salt, cams **116** and **124** will have moved balls C and G to open ports **3** and **7**. During the service cycle only ports **3** and **7** are open and all other ports are closed. Hard water enters inlet **24** and inlet **24** opens into passage P_4 which is isolated from the underside of wall **58** by wall **81**. Inlet water must then flow up through opening **80** on both sides of wall **83** into passages P_5 and P_6. This exposes ports **4, 5, 6,** and **7** to inlet flow at all times. Port **7** being the only one that is open, water flows down through port **7** to passage P_3 from which it is directed to and through opening **28** to the zeolite bed in the mineral tank. Soft water returns from the mineral tank through opening **31** into passage P_{10} up through opening **30** into passage P_7 and down through open port **3** (the water flowing through port **3** will unseat ball I), into passage P_8, and out service outlet **26** to provide soft water as required.

The service cycle will continue until the point is reached wherein the zeolite bed requires regeneration. The first step in regeneration is a backwash cycle which produces a reversed flow through the zeolite bed to loosen the bed. At this point the levers associated with balls C and G are moved from engagement with those balls allowing the balls to seat in and close ports **3** and **7**. Cams **112, 118,** and **122** engage their operating levers to displace balls A, D, and F and open ports **1, 4,** and **6,** all other ports remain closed. With this arrangement, hard water entering inlet **24** again flows through opening **80** but, in this instance, it proceeds to port **6** and down into passage P_{10} which communicates with opening **31,** ports **2** and **3** also having open communication with Passage P_{10} through opening **30** being closed, flow proceeds directly to the bottom of the mineral tank so that the hard water is directed from the

bottom of the tank up through the zeolite bed to loosen the bed. This water returns to the valve through opening **28,** into passage P_3. Port **1** being open return flow is now directed through vertical wall opening **67,** passage P_9, valve **38,** and up through opening **68.** The water flows upwardly through opening **68** then proceeds down through open port **1** into passage P_{12} and up again through opening **70** to be discharged through outlet **34** to drain.

Port **4** is also open during the backwash cycle and this port has direct communication with hard water entering inlet **24** through opening **80.** The hard water passes from opening **80** through passage P_5 and port **4** which has open communication with the underside of port **3** through channel **4a** so that hard water can flow directly to and through service outlet **26** to meet water demands during the backwash cycle. It will be understood that port **4** remains open throughout the regeneration cycle to provide hard water service at this time. In accordance with conventional practice, the regeneration cycle takes place during the early morning hours so that the lack of soft water is not critical and hard water is sufficient to satisfy the demands at that time. Moreover, it will be noted that ball I will be urged toward its seat in port **3** to insure closure of that port during the backwash cycle.

After the backwash cycle, the actual regeneration starts as the brine slow rinse cycle takes place. During this cycle, ports **2** and **5** are open, cams **114** and **120** having engaged and pivoted levers **96** to displace balls B and E, that is in addition to port **4** being open to maintain hard water service. All other ports are closed during this cycle. It is necessary to draw the brine from the brine tank. To accomplish this, hard water entering inlet **24** is directed to ports **4** and **5** through passage P_5. Hard water flows down through port **5,** through wall opening **82** an up through passage **86** to area **88** from which it is directed down through ejector assembly **74.** The hard water passes through the ejector assembly directly into passage P_3 and out opening **28** to the mineral tank. In passing through ejector **74,** a vacuum is created in area **78,** creating a vacuum through passage P_1, opening **46,** and in the area of check valve **42.** A pressure drop occurs across ball **54** of the check valve unseating the ball and causing brine to be drawn from the brine tank through the brine check valve and port **32.** The brine is mixed with the water being discharged into the mineral tank and flows down through the zeolite bed. This will continue until the brine solution has been completely drawn from the brine tank at which time the conventional brine tank flow check valve will operate to interrupt communication between the valve, specifically port **32,** and the interior of the brine tank. The brine circulates through the zeolite bed and returns to the valve through the opening **31.** From passage P_{10} return flow proceeds through opening **30** to passage P_7 down through port **2** to passage P_{12} (which is isolated from passage P_8 by wall **87**). Port **2** communicates with opening **70** so that the brine solution flows up through opening **70** to and through drain outlet **34.**

After completion of the brine slow rinse cycle, a fast rinse cycle is provided. This fast rinse cycle is achieved by cam **114** remaining in engagement with its lever **96** to hold ball B away from port **2** and cam **124** engages its lever **96** to displace ball G from port **7** so that ports **2** and **7** are open, together with port **4** which maintains hard water service. With this arrangement hard water enters inlet **24,** a portion thereof flowing to service through port **4** and another portion flowing through port **7** and from port **7** through passage P_3 and opening **28** to and through the zeolite bed. It will be noted at this point that port **7** is larger than port **5** so that a greater quantity of water is being directed through the bed during fast rinse as compared to slow rinse. Hard water passes down through the bed and returns as soft water through opening **31** to passage P_{10} and through opening **30** and passage P_7 to open port **2,** which having open communication with hole **70,** allows the rinse water to proceed directly through outlet **34** to drain. Upon the completion of the fast rinse cycle, the valve operates to establish a service setting and service of soft water is resumed as described previously and until a subsequent regeneration cycle is called for.

One other operational cycle is to be described and that is the brine refill cycle. During the fast rinse cycle when ports **2** and **7** are open, cam **126** has also been rotated to allow lever **134** to pivot and ball H to be displaced by disc **144** and open port **8.** Water entering inlet **24** passes from opening **80** through port **7** and to passage P_3 to be directed to the zeolite bed in the mineral tank as described above. During the fast rinse cycle, cam **122** will have engaged and operated its lever **96** to displace ball F from port **6.** Port **6** being open, hard water is permitted to flow from inlet **24** and opening **80** down through port **6** to passage P_{10} on the underside of opening **72** which has open communication with port **6.** This water flows up through opening **72** and down through open port **8** into passage P_{11} and to valve **50** in bore **48.** From valve **50** this water proceeds through passage **52** to the check valve assembly **42,** entering the check valve assembly behind ball **54** so that the water can be directed into the brine tank. Ball **54** is held closed in that it is exposed on its right side to inlet pressure. From the check valve water flows to the brine tank. Adjustable cam **126** will determine the length of time that port **8** remains open and when the amount of water necessary to fill the brine tank has been supplied, ball H will be moved toward and will reseat disc **144** in port **8** closing that port and interrupting the refill cycle. It will also be noted that port **6** is at times exposed on its underside to return flow from the mineral tank but the upperside of port **6** is at all times exposed to inlet pressure in passage P_6, which will be greater, and hence is held closed.

Although but several embodiments of this invention have been illustrated and described, it will be apparent to those skilled in the art that various other modifications may be made without departing from the spirit of this invention or from the scope of the appended claims.

We claim:

1. A water softener valve comprising, in combination,

means defining a housing,

means defining an inlet opening into the interior of said housing for admitting source water into said housing,

means defining a service outlet opening into the interior of said housing for delivering water for service,

means defining tank openings in said housing adapted to be connected to a mineral tank and a brine tank,

means defining a first wall within said housing,

a plurality of valve ports in said first wall,
a generally spherical valve member associated with each of said ports,
means defining a plurality of walls projecting laterally on both sides of said first wall in association with said ports to define flow passages within said housing communicating with said ports and arranged relative to said ports and said inlet, outlet, and tank openings to direct water through said valve and through said ports from the spherical valve member side thereof so that water flow through said valve urges said spherical valve members into engagement with said ports,
lever means movable into selective engagement with said spherical valve members for selectively displacing said spherical valve members from their respective ports and at an angle relative to the axis of said ports to thereby modify the orientation of said spherical valve members to said ports whereby upon movement of said lever means out of engagement with said spherical valve members a different seating surface thereof will be returned to said seat by the flow of said water,
means for moving said lever means to displace said spherical valve members from their respective ports,
a plurality of resilient members supported on said housing,
and wherein said lever means extend through said resilient members and said resilient members are stressed when said lever means are moved to displace said spherical valve members and the inherent bias thereof as a result of said stressing movement of said levers releases said spherical valve members for return to their respective ports when said lever means are released from said means for moving said lever means.

2. The water softener valve of claim **1** wherein
said spherical valve members are in the form of balls heavier than water and all balls are positioned on the same side of said first wall.

3. The water softener valve of claim **2**
wherein said balls are made of non-resilient material,
and including annular seat members releasably mounted in each of said ports and engageable by said balls in closing said ports.

4. The water softener valve of claim **2**
wherein one of said balls cooperates with a resilient disc to open and close said resilient disc on the port through which brine tank refill occurs,
and including cam means operatively engaging said one of said balls and being adjustable to vary the length of time said brine tank refill port is open.

5. The water softener valve of claim **1** wherein
said spherical valve members are all positioned on the same side of said first wall
and said lever means are normally spaced from said balls when released from said means for moving said lever means.

6. The water softener valve of claim **5**
including means defining a drain outlet in said housing,
wherein said flow passages provide a path to said service outlet past one of said ports and a path to said drain past said same port,
and including a spherical valve member positioned on a first side of said one port opposite to the side upon which said first mentioned spherical valve members are located.

7. The water softener valve of claim **6** wherein said spherical valve members are balls and the ball on said first side of said one port is lighter than water and the balls on the opposite side of said ports are heavier than water.

8. The water softener valve of claim **7**
wherein one of said balls cooperates with a resilient disc which seats directly on the walls of its respective port,
and including annular seat members releasably mounted in each of said other ports and engageable by said balls in closing said other ports.

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