

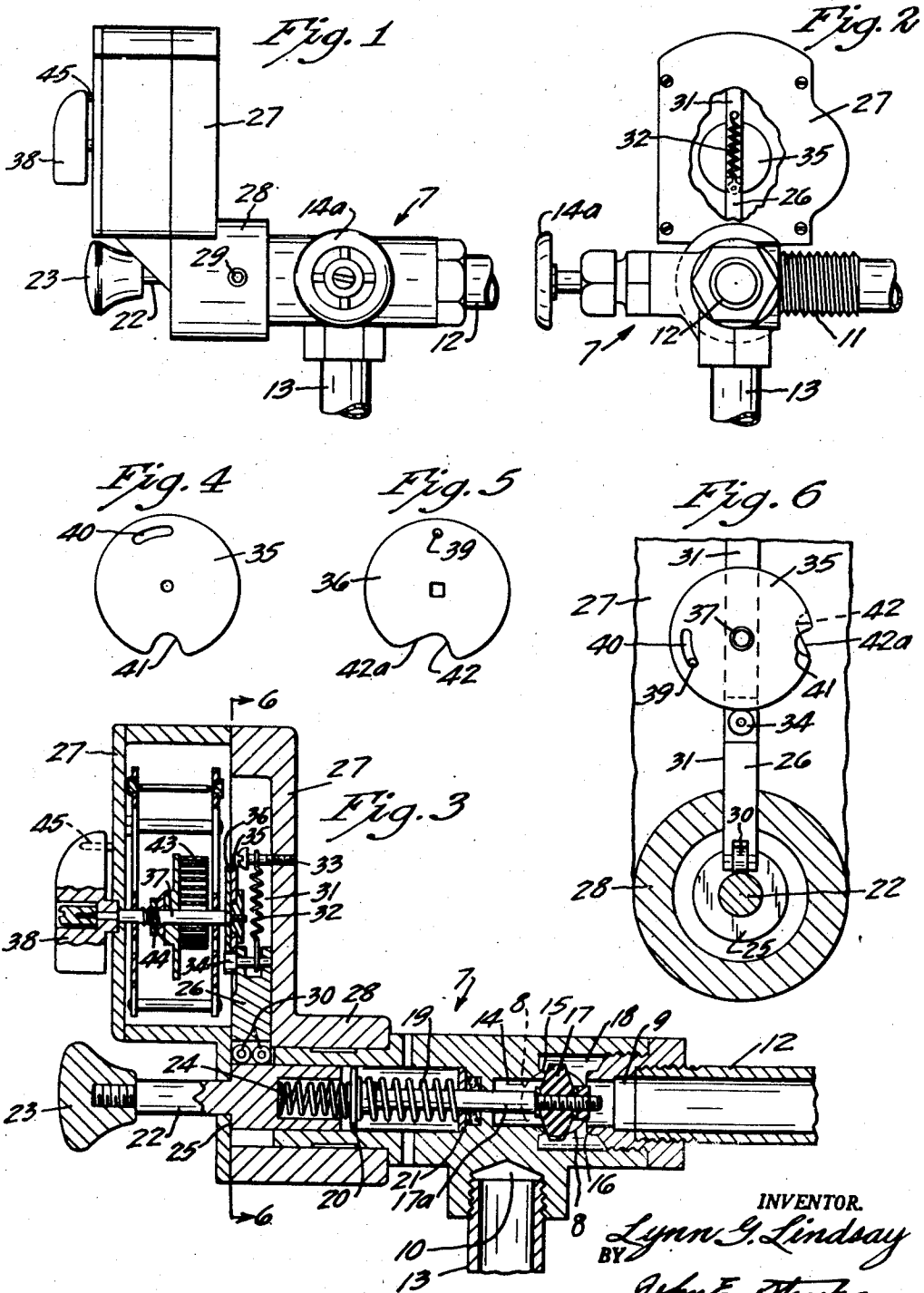
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CONTROL FOR WATER SOFTENING APPARATUS

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CONTROL FOR WATER SOFTENING
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tion of MinnesotaOriginal application October 2, 1948, Serial No.
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5 Claims. (Cl. 161-7)

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This invention relates to controls for valves and particularly to time controls suitable for use in the control of water softeners of the type wherein the water is caused to flow through a porous body of the water softening material requiring regeneration periodically.

It is an object of my invention to provide a semi-automatic control and timing mechanism of the class described which is unusually reliable and easy to adjust to change the time period during which the valve mechanism is automatically retained in a predetermined position.

A particular object is to provide in association with a valve member which is spring biased to one position and adapted to be manually set in another position, novel and improved latch mechanism adapted to be actuated by clock mechanism to cause the valve member to move to the first mentioned position after the elapse of a predetermined period of time.

Further objects are to provide an inexpensive, compact and efficient control which is particularly, although not exclusively adapted to facilitate the regeneration and flushing of domestic water softeners.

The invention also includes certain other novel features of construction which will appear to be more fully pointed out in the following specification and claims.

Referring to the accompanying drawings which illustrate, by way of example and not for the purpose of limitation, a preferred embodiment of my invention:

Figure 1 is a side elevational view showing my improved timing control valve;

Fig. 2 is a rear elevational view of the same with a portion of the latch casing broken away;

Fig. 3 is a central vertical sectional view through the timing control valve;

Figs. 4 and 5 are elevational views showing the coacting cam disks for actuating the valve latch mechanism, and

Fig. 6 is a fragmentary vertical section taken approximately on the line 6-6 of Fig. 3.

Referring to the drawing, my improved valve has a casing indicated generally by the numeral 7 and ports 8, 9 and 10 which communicate respectively with pipes 11, 12 and 13. The port 10 is connected by passages (not shown) to a chamber 14 in the casing 7 and the rate of flow through these passages is under control of a manually operable valve 14a.

Spaced annular valve seats 15 and 16 are provided in the casing 7 for a valve head 17 which is fixed on a stem 17a and adapted to be moved

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from closed position in contact with one of these seats to closed position in contact with the other seat. The port 8 opens into a chamber 18 extending between the valve seats 15 and 16. Thus when the head 17 is closed against its seat 15 as shown in Fig. 3, flow of liquid from the port 8 to the port 9 and pipe 12 is permitted and flow from the port 8 to chamber 14 and port 10 is cut off. When the head 17 is closed against its seat 16, flow to the pipe 12 from port 8 is cut off and flow to the pipe 13 is permitted at a rate which is determined by the valve 14a. The valve head 17 is spring biased toward closed position on its seat 15 by a spring 19 which is confined on the stem 17a between a head 20 fixed on the outer end thereof and a bearing 21 formed in the casing 7.

Mounted in axial alignment with the valve stem 17a is a plunger 22 having an operating knob 23 on its outer end and carrying a spring 24 in a recess in its inner end. The spring 24 projects to engage the outer face of the head 20 and to transmit thrust to the stem 17a. An annular shoulder 25 is formed on the plunger 22 for engagement with latch mechanism comprising a radially movable detent 26 mounted in a housing 27 carried by the outer end portion of the valve casing 8. The housing 27 is formed with a cylindrical bearing 28 which embraces the casing 7 and is secured thereto by set screws 29 (Fig. 1). A pair of antifriction rollers 30 are carried by the lower end of the detent 26 for rolling engagement with the shoulder 25 on the plunger 22 and with radially extending guide surfaces formed in the housing 27. A guideway 31 is formed in the housing 27 to slidably receive the detent 26.

As shown in Fig. 3, the detent 26 is spring biased outward from the plunger 22 by a spring 32 which is connected at its lower end to the detent and anchored at its upper end to a pin 33 projecting from the housing 27. Carried by the upper end portion of the detent 26 is a small roller 34 (Figs. 3 and 6) which is held in rolling contact with the peripheries of cam disks 35 and 36 which are shown separately in Figs. 4 and 5 respectively. These disks are mounted in face to face contact one with the other on a spindle 37 which projects from actuating mechanism for the detent 26.

Suitable spring operated clock mechanism is contained in a front portion of the housing 27 and the spindle 37 projects from the front of the housing and has a manually operable knob 38 fixed on its front end for manual operation of the spindle. The cam 36 is fixed on the spindle 37 and the cam 35 is free to turn thereon within the lim-

its determined by the movement of a pin 39 which projects from the cam disk 36 in an arcuate slot 40 formed in the disk 35. A recess 41 is formed in the otherwise circular periphery of the cam disk 35 and a recess 42 of somewhat different shape is formed in the otherwise circular periphery of the cam disk 36, both of these recesses being adapted to receive the roller 34 carried by the detent 26. A cam surface 42a extends at a gradual incline from the inner extremity of the recesses 42 to the outer periphery of the cam disk 36 for engagement with the roller 34 and to actuate the latter radially outward relative to the cam disks and spindle 37 when it is desired to extend the detent 26 in engagement with the shoulder 25 of the plunger 22.

The clock mechanism in the housing 27 includes a main spring 43 operatively connected to the spindle 37 for winding and having a friction clutch device 44 which connects the spring 43 through suitable speed reducing bearing to turn the knob 38 counter-clockwise toward a stop pin 45 at a predetermined, relatively slow rate. The knob 38 is formed with a pointer which, by reference to a dial and legends on the front face of the housing 27, may be set for the selected time during which the valve head 17 is to be retained in closed relation to its seat 16.

Where my improved time control valve is to be used for a water softener such as that described in Patent No. 2,610,147, granted September 9, 1952, the pipe 11 may be connected to the soft water outlet of the tank, the pipe 12 to the service outlets and the pipe 13 to drain or waste. During water softening, soft water flows from the tank through the pipe 11, port 8 and port 9 to the service pipe 12, the valve head 17 being closed in relation to its seat 16.

When regeneration is required, a charge of salt is placed in the water softening tank and, after closing the tank, the knob 38 of the plunger 22 is thrust inward against the bias of the springs 19 and 24 to close the valve head 17 against its seat 16. The knob 38 of the timing mechanism is then turned clockwise to a position where its pointer indicates the time in minutes required for regeneration and flushing. When the knob 38 is in its terminal position in contact with a stop pin 45, the roller 34 is in its elevated position within the recesses 41 and 42 in the cam disks 35 and 36. The operator by turning the knob 38 clockwise from its zero position causes the cam surface 42 to engage the roller 34 and to actuate this roller downward out of the recesses 41 and 42 thereby extending the detent 26 downward. Such movement of the knob 38 and spindle 37 brings the roller 34 in contact with the circular peripheral surfaces of the cam disks 35 and 36 so that the detent 26 is held in its downwardly extended or locked position with respect to the shoulder 25 on the plunger 22. Rotation of the knob 38 and spindle 37 in a clockwise direction also winds the spring 43 of the clock mechanism so that thereafter, through the friction drive, the clock mechanism slowly returns the spindle 37 and knob in a counter-clockwise direction to the initial or zero position. During this operation the circular peripheries of the cam disks 35 and 36 revolve in contact with the anti-friction roller 34. Any required period for regeneration and flushing may be selected by suitable setting of the pointer on the knob 38 by reference to the dial and legends thereon.

During regeneration and flushing the valve head 17 is closed against its seat 16 and the spent

brine and impurities from the softening material enter the casing 7 through the port 8 and flow to and through the chamber 14 and passages leading to the waste pipe 13.

The valve members remain in the regenerating position until the brine is displaced by clear water whereupon the timing mechanism automatically returns the apparatus to the initial or softening position. The change in the position of the valve head 17 takes place automatically when the recesses 41 and 42 in the cam disks 35 and 36 reach a position in alignment with the roller 34 so that the roller enters these recesses under the force exerted by the spring 32 as it draws the detent 26 from engagement with the shoulder 25 on the plunger 22. The plunger is thereby released and moves to the position shown in Fig. 3, the spring 19 being allowed to expand and to actuate the valve head to open position relative to its seat 16 and to closed position against its seat 16. This stops the flow of liquid to the pipe 13 and allows water to flow to the pipe 12 through ports 8 and 9 and chamber 18.

The spring 24 is somewhat stiffer than the spring 19 and is only slightly compressed when the valve head 17 is closed against its seat 16. The spring 24 thus compensates for wear on the valve head 17 and insures firm closing of the head against the seat 16.

An important feature of my invention resides in the arrangement of the clock operated spindle 37 in laterally spaced relation to the plunger 22 and the latch mechanism comprising the detent 26 which is movable perpendicularly to the axes of the spindle 37 and plunger 22 in a straight line extending between these axes. This arrangement of latch and operating mechanism is peculiarly compact and simple and results in unusually reliable operation. Such operation is further promoted by the anti-friction rollers 34 and 30 and by my arrangement whereby the roller 34, throughout the time control period, engages the circular periphery of the cam disks 35 and 36 which are concentric with the operating spindle 37. With this arrangement there is a minimum of resistance to the operation of the clock mechanism and no increase or other variation in such resistance during any part of the cycle of operation.

The present application is a division of my application Serial No. 52,551, filed October 2, 1948, for Control for Water Softening Apparatus, now Patent No. 2,610,147.

Having described my invention, what I claim as new and desire to protect by Letters Patent is:

1. For a valve, an operating plunger and means for actuating said plunger to a first position, a control comprising a detent movable to and from locking relation to said plunger whereby said plunger may be held in a second position and released to said first position, time controlled mechanism having a rotary spindle extending in laterally spaced relation to said plunger, said detent being movable along a straight line extending between the axes of said plunger and spindle, means biasing said detent to plunger release position and cam means projecting from and rotatable with said spindle and disposed to retain said detent in locking relation to the plunger.

2. For a valve, an operating plunger and means for actuating said plunger to a first position, a control comprising a detent movable to and from locking relation to said plunger whereby said plunger may be held in a second position and released to said first position, time controlled

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mechanism having a rotary spindle extending in laterally spaced relation to said plunger, said detent being movable along a straight line extending between the axes of said plunger and spindle, means biasing said detent to plunger release position, an antifriction roller carried by said detent and cam means projecting from and rotatable with said spindle and disposed to make rolling contact with said roller to retain said detent in locking relation to the plunger.

3. For a valve, an operating plunger and spring means for actuating said plunger to a first position, a control comprising a detent movable to and from locking relation to said plunger whereby said plunger may be held in a second position and released to said first position, manually operable means for actuating said plunger to said second position against the bias of said spring means, time controlled mechanism having a rotary spindle extending in laterally spaced relation to said plunger, said detent being movable along a straight line extending between the axes of said plunger and spindle, means biasing said detent to plunger release position and cam means projecting from and rotatable with said spindle and having a cylindrical surface which is concentric to the axis of said spindle and disposed to support said detent in locking relation to said plunger.

4. For a valve, an operating plunger and means for actuating said plunger to a first position, a control comprising a detent movable to and from locking relation to said plunger whereby said plunger may be held in a second position and released to said first position, time controlled mechanism having a rotary spindle extending in laterally spaced relation to said plunger, said detent being movable along a straight line extending between the axes of said plunger and spindle and at right angles to said axes, means biasing said detent to plunger release position and cam means projecting from and rotatable with said spindle and having a cylindrical surface which is concentric to the axis of said spindle and disposed to support said detent in locking relation

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to said plunger, said detent having a member disposed in operative contact with said cylindrical surface and said surface being formed with a recess adapted to receive said member to permit the movement of said detent to plunger releasing position.

5. For a valve, an operating plunger and means for actuating said plunger to a first position, a control comprising a detent movable to and from locking relation to said plunger whereby said plunger may be held in a second position and released to said first position, time controlled mechanism having a rotary spindle extending in laterally spaced relation to said plunger, said detent being movable along a straight line extending between the axes of said plunger and spindle, an antifriction roller carried by said detent, cam means operatively connected to said spindle and having a cylindrical surface concentric with the axis of said spindle disposed to make rolling contact with said roller and to support said detent in locking relation to said plunger, a recess being formed in said cylindrical surface to receive said roller and to permit withdrawal of said detent from locking relation to the plunger and resilient means for biasing said detent toward said cam means.

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