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BALL COCK BACK LEVER

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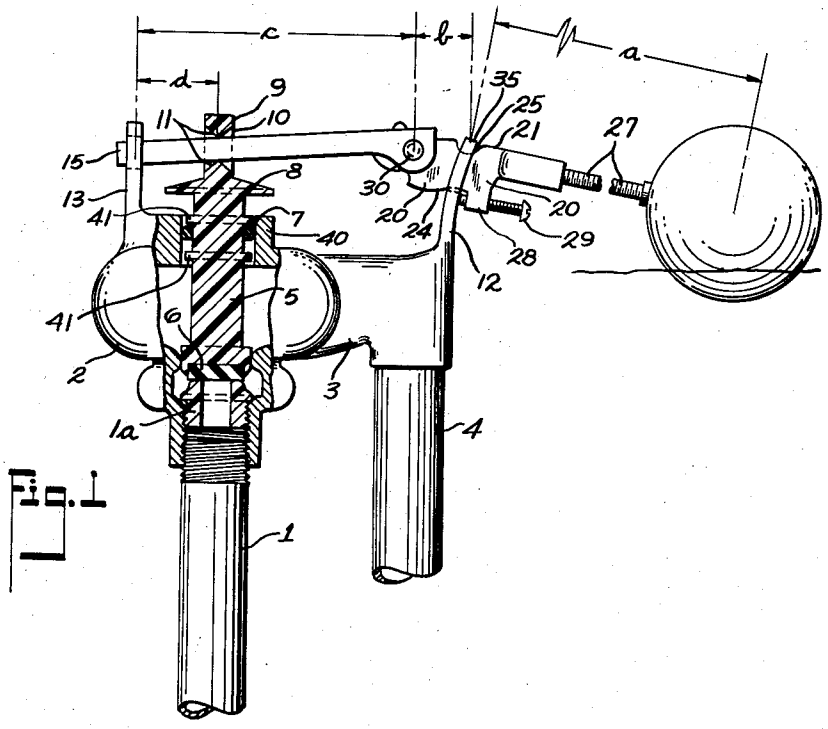


Fig. 1

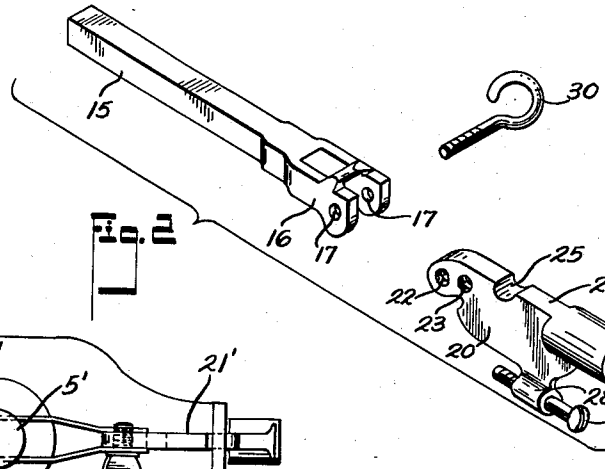


Fig. 2

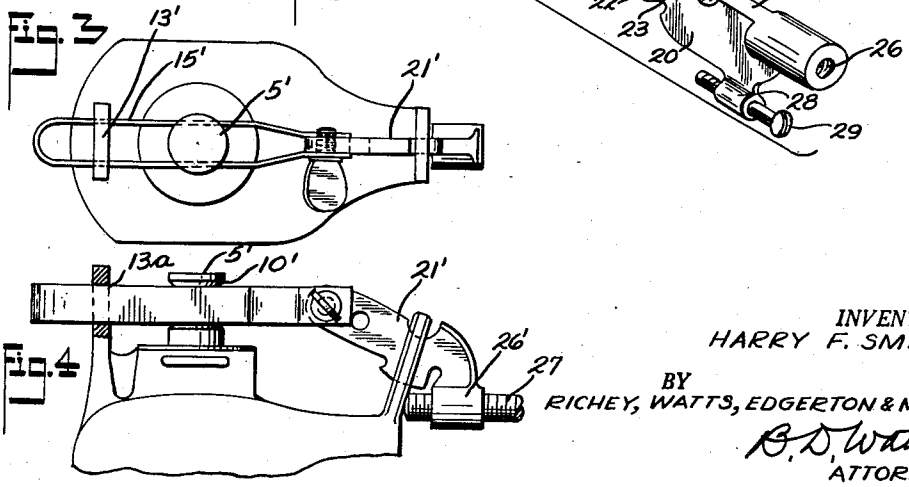


Fig. 3

Fig. 4

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BALL COCK BACK LEVER

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4 Claims. (Cl. 137—426)

This invention relates generally to ball cock valves and is more particularly concerned with a new lever and plug mechanism for such valves.

In my U. S. Patent No. 2,649,772 is disclosed a new lever mechanism for ball cocks in which a single pivot pin is employed to connect the two levers, each lever engaging a column for pivoting movement. In my U. S. Patent No. 2,801,119 is disclosed a plug for ball cock valves having packing and valve composed of synthetic materials. While the lever and plug mechanism of that patent have given good satisfaction and are better in operation, and are less expensive to manufacture, than certain prior ball cock lever and plug mechanisms, they have certain disadvantages which it is the purpose of the present invention to overcome. These disadvantages relate to construction, operation and cost of manufacture.

The present invention will be better understood by those skilled in the art from the drawings which accompany and form a part of this specification and in which:

Fig. 1 is a side elevational view, partly in section, of apparatus embodying the present invention;

Fig. 2 is a perspective view of the lever mechanism in disassembled position;

Fig. 3 is a top plan view of a modified form of apparatus embodying the present invention; and

Fig. 4 is a fragmentary side elevational view of the apparatus of Fig. 3.

In the drawings, the inlet pipe 1 has attached to its upper end a conventional ball cock body 2 having a forward extension 3 from which a hush pipe 4 extends downwardly. The plug 5 is provided with a valve 6 on its inner end to seat on the open upper end of the inlet pipe, or preferably on seat 1*a* screwed into that pipe, has on O-ring to seal the space between the plug and the upper wall of the body 2, a splash flange 8 above the body, and an upwardly extending portion 9 provided with a substantially square aperture 10 which is to receive one of the levers of the lever mechanism and which has opposed knife-like edges 11 to engage the top and bottom surfaces of the lever.

From the extension 3, a front column 12 extends upwardly and forwardly and is provided with an elongated, narrow, rectangular hole to receive the other lever of the lever mechanism. From the opposite or rear side of body 2 a rear column 13 extends upwardly and is provided with a substantially square hole. The lever 15 extends through the rear column 13, through plug 5 and stops short of the rear side of front column 12 and is substantially square in cross section from its rear end to beyond the plug to fit in the holes in the rear column and in the plug, respectively. The lever 15, at its forward end, is bifurcated to form portions 16 and each such portion has a downwardly extending part provided with a drilled hole 17. The other lever 20 of the lever mechanism has a thin flat portion 21 to extend through the elongated rectangular hole in the front column 12 and has two drilled and tapped holes 22 and 23. It will be understood that one or more than two such holes may be formed in this part of the lever if

desired. The lower surface 24 of lever 20 is curved and the upper surface is provided with a notch 25 to engage with the upper portion of the front column 12 in certain positions of the levers. The lever 20 is provided with a forwardly extending boss which has a drilled and tapped hole 26 to receive a float lever 27 and also has a threaded bracket 28 depending from its lower side and carrying an adjusting screw 29 which is engageable with the front surface of the front column 12 and serves to limit the extent to which the valve may open.

When lever 15 is in position in the holes in plug 5 and rear column 13 and lever 20 is in the hole in the front column, one of the holes 22 or 23 may be aligned with the holes 17 in the bifurcated portions 16 of lever 15 and a pivot pin 30 may be inserted in these holes to connect the levers together. This pivot pin has threads engaging with the threads in hole 22 or 23 in lever 20, and thus moves with that lever and serves as a pivot about which the bifurcated ends of lever 15 may rotate. Since the holes in lever 15 are not tapped, they may be inexpensively formed by a simple drilling operation. Since the holes 22 or 23 are the only ones which have to be tapped, the drilling and tapping operation on this lever is inexpensive. Since lever 20 is flat, moves in a narrow hole, extends into the space between the bifurcated portions of lever 15 and carried the pivot pin 30, the relative movements of the two levers are effectively limited to a vertical plane and binding and the creation of undesired friction in the operation of the parts is thereby avoided. Moreover, the fact that the pivot pin is fixed in the front lever permits the bifurcated parts of the rear lever to be spaced apart a considerable distance, thus avoiding unnecessary friction while making the lever assembly quite rigid in a transverse horizontal plane while maintaining high flexibility in a vertical plane. This construction makes it possible to cut away one side wall of each of the lever holes in columns 12 and 13, i. e., making open sided notches. These notches are readily formed by casting and the cost is less than when the holes are formed by machining. The substantially square cross section of lever 15 makes for ease of manufacture both in casting and in machining while the forward end of lever 15 may be cast solid, drilled and then sawed to form the bifurcated parts or the bifurcated portions may be formed during casting and drilled later.

The provision of two or more tapped holes in lever 20, the knife edges in the hole in plug 5 and the plane top and bottom surfaces of lever 15 result in the new advantage of being able to adjust the lever mechanism to correspond with different water pressures.

It will be noted that lever 20 and float rod 27 comprise a lever of the first order in which the fulcrum is at the point of engagement of the notch 25 of lever 20 with the forward column 12. In Fig. 1 the approximate location of this fulcrum is indicated at 35. The force arm of this lever extends from the fulcrum point 35 to the float on rod 27 and is indicated by the line marked *a* on Fig. 1. The weight arm of this lever extends from fulcrum 35 to pivot pin 30 and its length is indicated by line *b*. The lever 15 is a lever of the second order. Its force arm extends from the rear column 13 to pivot 30 and has a length as indicated by line *c* while its weight arm extends from column 13 to the knife edges 6 in portion 9 of plug 5 and has a length as indicated by line *d* on Fig. 1.

When the pivot pin 30 is shifted from the forward hole 23 to the rearward hole 22 of lever 20, the lever arm length *b* of the weight arm is increased and the ratio of that length to the length *a* of the force arm is decreased since the length *a* is unchanged. At the same time the lever 15 is moved rearwardly and the ratio of the length *d* of the weight arm of that lever to the length *c* of the force arm is decreased since the length *d* is unchanged.

The decrease of both of these ratios doubles the effect of the compound lever arrangement. Thus the combined effect of shifting the pivot pin **30** from the forward hole to the rearward hole in lever **20** is to decrease the amount of force applied by the float to the plug **5** to urge the latter toward the inlet pipe. Hence, the valve can be closed against higher water pressure when the pivot pin **30** is in the forward hole **23**. In this manner the device may be adjusted to different water pressure.

The adjusting screw **28** serves to regulate the extent of opening of the valve since it limits the extent of downward movement of the float lever.

The plug **5** of Fig. 1 extends up through the upper wall of body **2** and a boss **40** and is provided with two axially spaced flanges **41** positioned to lie within that wall and boss. These flanges are of smaller outside diameter than the inside diameter of the aperture in that wall and in boss **40**. The O-ring **7** is mounted between these flanges **40** and is of a size simultaneously to engage the outer surface of the plug between the flanges and the inner surface of the aperture in the boss and not only serves to prevent free flow of liquid through the space between the plug and body but also to serve as a support for positioning the plug in the body and facilitating endwise movement of the plug. The space between the flanges **40** is long enough axially to permit the ring **7** to roll on the plug as the latter is moved endwise.

The plug **5** has an annular splash flange **8** which is positioned a short distance above the upper end of boss **40** and which serves to intercept any liquid under pressure which may escape from the body around the plug and to direct such liquid downwardly.

The plug **5** may be made of various metallic or synthetic materials. It may consist of brass or bronze but is preferably made of hard, sulfur-free rubber, molded polystyrine, "nylon," vinyl copolymers, for example, "Uscolite," or other similar synthetic resins. Of these various materials "nylon" is preferred. The valve **6** and the ring **7** should be elastically deformable and may be made of various materials, such as sulfur-free rubber, polystyrine, "nylon," "neoprene," synthetic resins of the ordinary vinyl copolymers, as well as vinyl copolymers with synthetic rubbers such as Buna-N rubber, and other similar synthetic resins.

The valve **6** may engage the open upper end of the inlet pipe **1**, but preferably seats on a "nylon" seat **1***a* which may be threaded into the upper end of the inlet pipe.

In the modification shown in Figs. 3 and 4 the construction of the upper part of the body and the associated parts have been altered. The upward extension **13** has been replaced by extension **13'** which consists of a post having notches **13***a* on opposite sides thereof to receive the U-shaped lever **15'** which is preferably made of flat strip metal. This U-shaped lever is received in an annular recess **10'** near the upper end of plug **5'**. Since the groove **10'** extends around the plug, the latter may rotate relative to the lever **15'**.

The forward lever **20** of Figs. 1 and 2 has been replaced by lever **21'** of Figs. 3 and 4. The major difference between these two levers is that the threaded boss **26** and the bracket **28** and adjusting screw **29** of Figs. 1 and 2 have been replaced by a threaded boss **26'** through which the float lever **27** may be screwed for attachment as well as for adjustment of the extent of opening of the valve.

Having thus described the present invention so that others skilled in the art may be able to understand and practice the same, I state that what I desire to secure by Letters Patent is defined in what is claimed.

What is claimed is:

1. Lever mechanism for a ball cock valve comprising a valve body having a forward hush pipe extension, a front column extending upwardly and forwardly from said extension and a rear column extending upwardly

from the body, said front column having an elongated rectangular hole therethrough near its upper end, a valve plug in the body between said columns and having an upward extension, said rear column and valve plug extension having substantially square holes therethrough, the hole in said extension having opposed upper and lower knife edges, a first lever having a portion substantially square in cross section extending through the holes in the plug and rear column and a forward bifurcated portion projecting downwardly and having holes therethrough near its front end, a second lever having a portion extending through and conforming generally to the elongated rectangular hole in the front column, having a plurality of tapped holes spaced apart longitudinally along said lever near its rear end, having a curved lower surface, having a notch in its upper side to engage the front column at the upper end of the hole therein, having a tapped opening in its forward end to receive a threaded float lever and having an adjusting screw on its forward end to engage the front side of said front column and a threaded pivot pin extending through the drilled holes in the bifurcated portions of the first lever and threaded in the tapped hole of the second said lever.

2. Lever mechanism for a ball cock valve comprising a valve body having a forward hush pipe extension, a front column extending upwardly and forwardly from said extension and a rear column extending upwardly from the body, said front column having an elongated rectangular hole therethrough near its upper end, a valve plug in the body between said columns and having an upward extension, said rear column and valve plug extension having substantially square holes therethrough, the hole in said extension having opposed upper and lower knife edges, a first lever having a portion substantially square in cross section extending through the holes in the plug and rear column and having a hole therethrough near its front end, a second lever having a portion extending through and conforming generally to the elongated rectangular hole in the front column, having a plurality of tapped holes spaced apart longitudinally along said lever near its rear end, having a notch in its upper side to engage the front column at the upper end of the hole therein, and having a float lever attached to and projecting from its forward end, and a pivot pin extending through the holes in the first lever and in one of the holes of the second said lever.

3. Lever mechanism for a ball cock valve comprising a valve body having a forward hush pipe extension, a front column extending upwardly and forwardly from said extension and a rear column extending upwardly from the body, said front column having an elongated rectangular hole therethrough near its upper end, a valve plug in the body between said columns, said plug having a valve at its inner end, extending through the upper wall of the body, having axially spaced annular flanges disposed in but out of contact with said upper wall of the body and having an upper end engageable with a first lever, an O-ring and the plug between said flanges and engageable with the plug and surrounding surfaces in the upper wall of the body, a first lever having a portion operatively engaging the rear column and the upper end of the plug, and a forward bifurcated portion having bored holes therethrough near its front end, a second lever having a portion extending through and conforming generally to the elongated rectangular hole in the front column, having a plurality of tapped holes spaced apart longitudinally along said lever near its rear end, having a curved lower surface, having a notch in its upper side to engage the front column at the upper end of the column therein, having a tapped opening in its forward end to receive a threaded float lever and having a threaded pivot pin extending through the drilled holes in the bifurcated portions of the first lever and threaded in one of the tapped holes of the second lever.

4. Lever mechanism for a ball cock valve comprising

a valve body having a forward hush pipe extension, a front column extending upwardly and forwardly from said extension and a rear column extending upwardly from the body, said front column having an elongated rectangular hole therethrough near its upper end, a valve plug in the body between said columns and having an upward extension, a first lever comprising a flat U-shaped metal strip operatively engaging grooves in said rear column and in said plug, and having bored holes near its front end, a second lever having a portion extending through and conforming generally to the elongated rectangular hole in the front column, having a plurality of tapped holes spaced apart longitudinally along said lever near its rear end, having a curved lower surface, having a notch in its

upper side to engage the front column at the upper end of the column therein, having a tapped opening in its forward end to receive a threaded float lever, and a threaded pivot pin extending through the drilled holes in the first lever and threaded in one of the tapped holes of the second lever.

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