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D. JOHNSTON
REVERSIBLE CHECK VALVE
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2,804,086

FIG. 1.

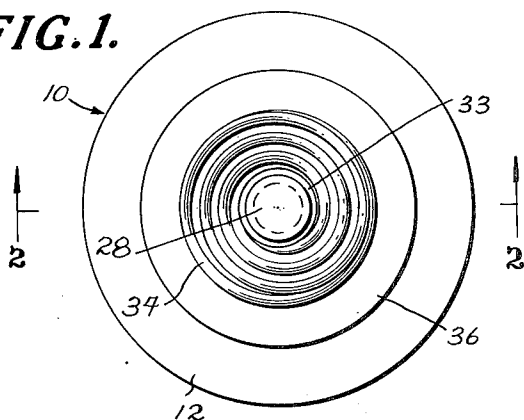


FIG. 2.

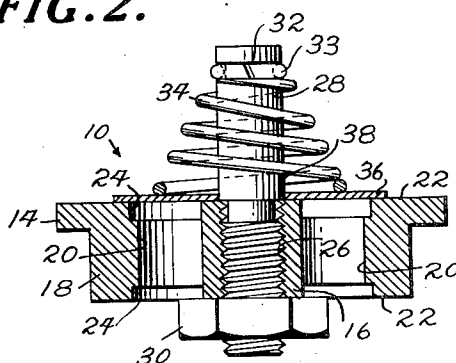
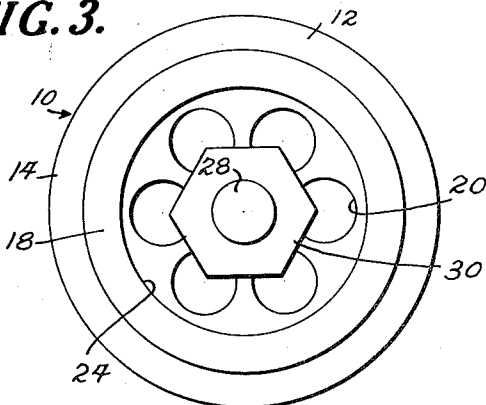


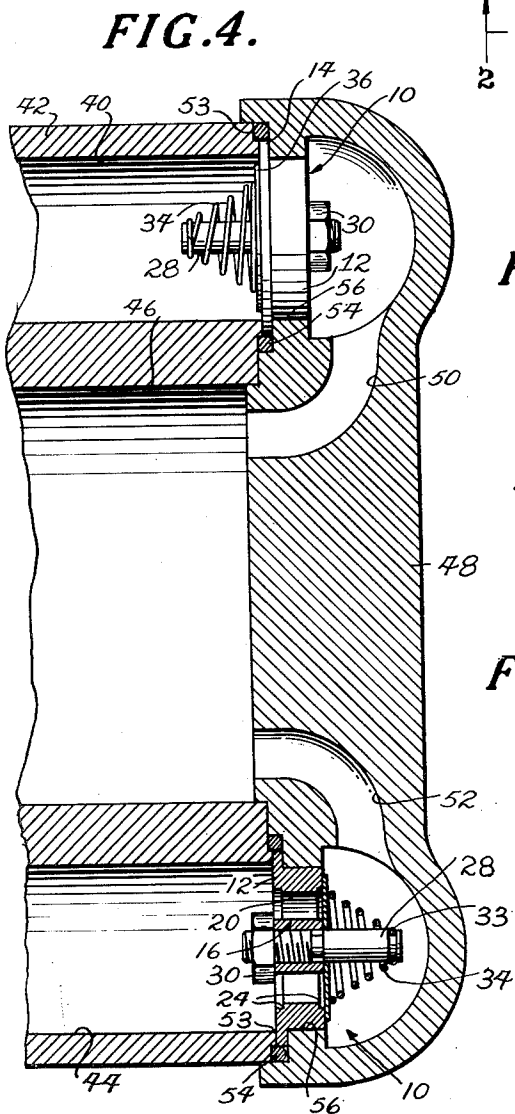
FIG. 3.



INVENTOR

Douglas Johnston

BY *Cushman, Darby & Cushman*
ATTORNEYS



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2,804,086

REVERSIBLE CHECK VALVE

Douglas Johnston, Huntsville, Ala., assignor to John Blue Company, Incorporated, Huntsville, Ala., a corporation of Alabama

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2 Claims. (Cl. 137—329.02)

This invention relates to valves, and more particularly to check valves for use in pumps or the like, and constitutes a continuation-in-part of the invention disclosed in my copending application Serial No. 292,914, filed June 11, 1952, which issued on November 20, 1956, as Patent No. 2,771,037.

In the above mentioned patent, there is disclosed a twin cylinder pump which is particularly adaptable for use in pumping agricultural sprays and the like. While the pump disclosed in the aforementioned patent proved quite satisfactory in use, because of the abrasive material usually found in agricultural sprays, considerable difficulty was encountered with the pump valves. This difficulty was occasioned by scoring and wear of the valve seat to such an extent that leakage occurred. The abrasive nature of the spray rapidly enlarged any small scratch or nick which might occur in the valve seat to such an extent that leakage would result.

An object of the present invention is the provision of an improved valve structure particularly adapted for use in pumps handling abrasive containing fluids, which valves are self-cleaning, self-seating and self-curing so as to reduce the tendency of leakage and substantially overcome the difficulties heretofore noted.

Another object of the present invention is the provision of an improved valve structure which may be readily mounted within the fluid passageway of a pump or the like and which may operate either as an inlet or outlet valve depending upon the operation desired.

A still further object of the present invention is the provision of a valve structure having improved seating characteristics by reason of which any irregularities or nicks present in the valve seat are automatically removed by the operation of the valve thereon.

Still another object of the present invention is the provision of a valve which is of a simple construction, is easy to operate and economical to produce and maintain.

These and other objects of the present invention will become more apparent during the course of the following specification and claims.

The invention may best be understood with reference to the accompanying drawings wherein an illustrative embodiment is shown.

In the drawings:

Figure 1 is a top plan view of a valve embodying the principles of the present invention;

Figure 2 is a cross-sectional view taken along the line 2—2 of Figure 1;

Figure 3 is a bottom view of the valve shown in Figure 1; and

Figure 4 is a fragmentary vertical sectional view of a pump showing valves of the present invention incorporated therein both as an inlet and outlet valve.

Referring now more particularly to the drawings, there is shown in Figures 1-3 a valve structure, generally indicated at 10, which comprises an annular member 12

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having a circumferential flange 14 at one end thereof arranged to mount the annular member within a fluid passageway of a pump or the like as will be explained in detail hereinafter.

The annular member 12 includes a central hub portion 16, a concentric outer ring portion 18 interconnected by an intermediate portion having a circular series of circumferentially spaced circular apertures or ports 20 extending longitudinally therethrough. The central hub 16 and outer ring 18 present a pair of coplanar, transversely disposed, annular seating surfaces 22 on each end of the annular member 12. Extending axially inwardly of each pair of seating surfaces 22 is an annular groove 24 having an outer diameter greater than the inner diameter of the outer ring 18, and an inner diameter substantially equal to the diameter of the central hub 16. As can be seen from Figure 2, by providing annular grooves in the member 12, the end surfaces of the intermediate portion of the member 12 are disposed longitudinally inwardly of the seating surfaces 22.

The central hub 16 preferably is provided with a central threaded aperture 26 adapted to receive the threaded end of a stud 28 therein. As best shown in Figure 2, the end of the stud 28 is threaded to an extent sufficient to enable the same to extend completely through the aperture 26 so that a suitable locking bolt 30 may be threadedly engaged thereon for a purpose hereinafter to be more fully explained. The outer end portion of the stud 28 is provided with an annular recess 32 for receiving a snap ring 33 against which bears the small outer end of a conical volute spring 34, the large inner end of which bears against a thin valve disk 36. The valve disk 36 is provided with a central aperture 38 through which the stud 28 extends so that the disk is mounted for sliding movement thereon against the action of the spring 34. The valve disk has an outer diameter greater than the outer diameter of the annular grooves 24 so that it may engage one set of the concentric annular seating surfaces 22 of the outer ring and cylindrical hub. The valve disk is preferably made of metal such as stainless steel or the like, while the annular member may be made of brass or in the event that the fluid controlled by the valve is corrosive to brass, the annular member may be made of stainless steel or other suitable metal. It has been found that the use of a thin metallic valve disk cooperating with concentric coplanar annular valve seats, such as those presented by the central hub and outer ring will effectively prevent the enlargement of any irregularity or nick that may be present in the valve seat by reason of the abrasive action of the fluid passing through the valve. In other words, with the present construction, if there is an irregularity, scratch or nick in the valve seat, the valve disk tends to grind the irregularity away and reseal itself.

Another important feature of the present invention is the fact that the valve is usable either as an inlet valve or as an outlet valve for a pump depending upon the individual requirements. Thus, with the present invention it is necessary only to provide a single valve structure for all of the valves in a pump regardless of the direction of flow therethrough. To accomplish this function, the annular member 12 is provided with seating surfaces 22 on both ends thereof. The stud 28 may be threaded into the central aperture 26 from either end of the annular member 12 so as to bias the valve disk 36 against either pair of concentric seating surfaces. It also will be noted that when the valve disk 36, spring 34 and stud 28 are assembled in operative relationship, the stud 28 may be moved axially relative to the annular member so as to regulate the spring pressure exerted on

the valve disk. The locking nut 30 is effective to lock the stud 28 in any adjusted position.

To clearly illustrate the use of the present valve, there is shown in Figure 4 a portion of a spray pump of the type disclosed in my patent heretofore noted. A pump of this type includes a main cylinder block 40 providing an upper fluid passageway 42, a lower passageway 44 and an intermediate open ended cylinder 46. A cylinder head 48 encloses the ends of the passageways 42 and 44 and provides communicating passageways 50 and 52 between the cylinder and the ends of the passageways 42 and 44, respectively. Disposed between the open end of each fluid passageway 42 and 44 and the associated structure of the cylinder head 48 is a valve 10 of the present invention. It will be noted that the flange 14 seats in an annular recess 53 provided between the cylinder block and cylinder head and is surrounded by an O-ring sealing member 54 to provide an effective pressure-tight mounting of the valve. Of significant importance is the fact that the annular member 12 fits within a suitable circular opening 56 formed in the cylinder head and it is not required that the annular member itself be reversed in order to enable the valve to function properly with opposite directions of flow.

It will be understood that a piston (not shown) is slidably mounted within the cylinder 46 and in accordance with the usual practice in pumps or the like, one of the valves 10 of the present invention must be utilized as an inlet valve while the other is utilized as an outlet valve. As shown in Figure 4, the valve 10 disposed within the passage 44 is arranged to act as an inlet valve and hence, the stud 28 is mounted to extend outwardly of the annular member on the side thereof opposite from the annular flange 14. Conversely, the valve 10 disposed within the passageway 42 must operate as an outlet valve and hence, the stud 28 extends outwardly from the annular member on the same side as the annular flange. Of course, the valve disk of each valve is spring urged into engagement with the seating surfaces of the annular member on the same side from which the stud 28 extends.

In operation, movement of the piston away from the cylinder head 48 will cause fluid in the passageway 44 to be drawn through the valve 10 disposed therein, into the passageway 52 and thence, into the cylinder 46. During this movement, the valve disk 36 of the valve 10 in the passageway 42 is urged into seating engagement with its seating surfaces to close off the flow of fluid through the associated apertures or ports 20. When the piston moves in the opposite direction toward the head 48, the valve disk of the valve in port 44 will be spring urged into engagement with its seating surfaces 22 to close the associated apertures or ports 20, while the fluid within the cylinder 26 is forced outwardly thereof through passageway 50, and ports 20 of upper valve 10 and thence into passageway 42.

It can thus be seen that there has been provided an improved valve structure which effectively prevents the increase of seating surface irregularities by reason of abrasion in the fluid passing therethrough, and which tends to reseal itself and effectively provide an improved sealing action. In this regard, valves constructed in accordance with the present invention were tested in a pump of the type disclosed in my patent using an abrasive containing fluid which was passed through the pump for 350 continuous hours at a pressure of 450 pounds (p. s. i.) without failure of the pump valves.

It will also be seen that there is provided a valve structure which may be conveniently utilized to control fluid passing in either direction therethrough, that is, the

valve may be utilized alternately either as an inlet or an outlet valve. Furthermore, this function is accomplished by means of a reversible stud which is adjustably mounted to apply any desired spring pressure to the valve disk. With the present construction, there are relatively few parts so that initial manufacturing costs are reduced to a minimum and maintenance costs are likewise very low. Furthermore, a great savings may be effected with the present invention, since a single construction is all that is necessary for all of the valves of a pump. The self-resealing characteristics of the present valve insure a long operating life for the valve and in addition where two such valves are utilized as shown in Figure 4, they may be reversed after considerable use so that the opposite seating surfaces may then be used for an extensive period of operation.

It is to be understood that the form of the invention herewith shown and described is to be taken as the preferred embodiment of the same and that various changes may be made without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. In a fluid control valve, an annular member having a flange extending outwardly from one end thereof for mounting the same within a fluid passageway of a pump or the like to operate either as an inlet or outlet valve therein, said annular member including a central hub portion and a concentric outer ring portion and having a plurality of annularly spaced circular apertures extending axially therethrough between said hub and outer ring portions, said hub and outer ring portions presenting coplanar transversely disposed concentric annular seating surfaces on each end of said annular member separated by an annular groove extending axially inwardly from the seating surfaces on each end of said annular member, each of said annular grooves having an outer diameter greater than the internal diameter of said outer ring and an inner diameter substantially equal to the diameter of said central hub, a stud engageable within a central aperture formed in said hub and extending axially outwardly therefrom, a thin metallic valve disk slidably mounted on said stud spring means between the outer end of said stud and said disk for biasing said disk into engagement with the seating surfaces on one end of said annular member to close said apertures, said stud being engageable within said central aperture so as to extend outwardly from either end of said annular member whereby said disk may be biased into engagement with the seating surfaces on either side of said annular member depending upon the operation desired.

2. A fluid control valve as defined in claim 1 wherein said stud is threadedly engaged in said central aperture and a lock nut is provided on the threaded end of said stud for engaging the sealing surface of said central hub portion remote from the sealing surface engaged by said disk, said lock nut being operative to lock said stud in different positions of axial adjustment corresponding to the spring pressure desired.

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