Nov. 14, 1950 W. EBERT 2,529,544

LIFT PLUG VALVE

Filed March 6, 1947

Fig. 1.

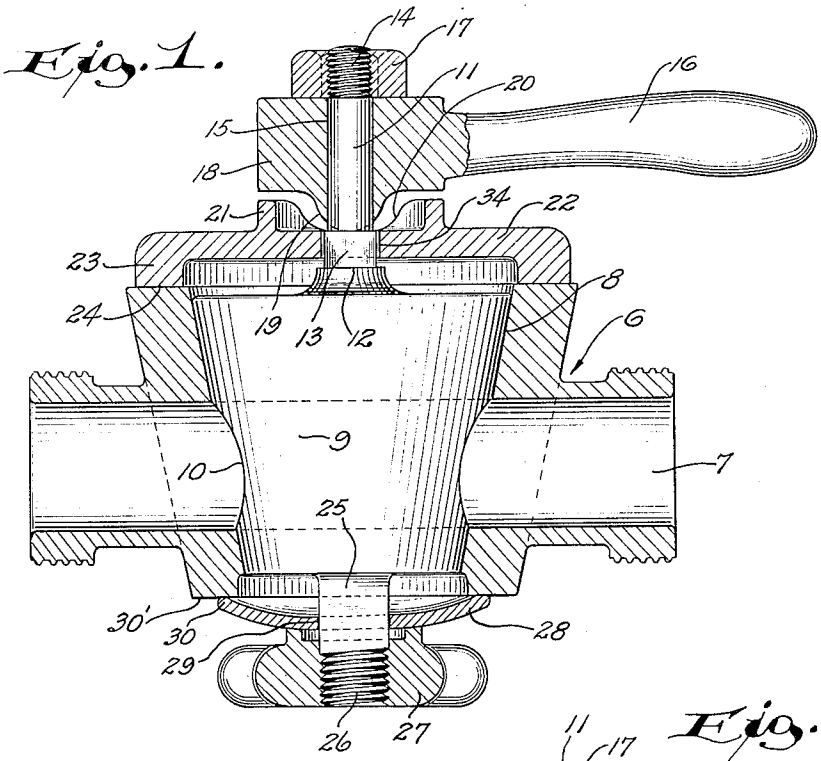


Fig. 2.

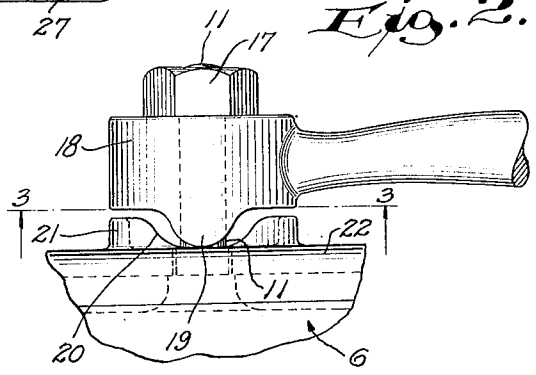
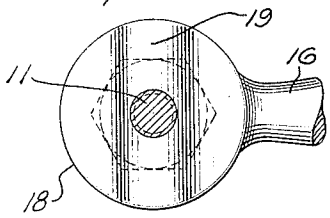


Fig. 3.



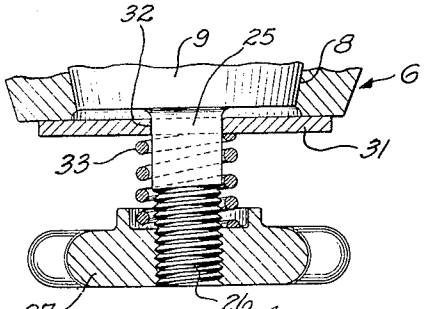


Fig. 4.

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LIFT PLUG VALVE

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9 Claims. (Cl. 251—97)

1

This invention relates to improvements in lift plug valves.

Plug valves, employing a tapered valve member rotatable in a tapered bore, are commonly employed to control the flow of liquid through a conduit. This type of valve has many desirable features, but is nevertheless objectionable in that the valve member frequently becomes stuck in the tapered bore, and the use of a hammer or other pounding tool is often required to loosen the plug and lift it from its seat, and such pounding is sometimes done so carelessly that parts are broken. Heretofore, various devices have been proposed for dislodging the plug to permit rotation thereof, but these devices have either embodied too many parts to be practical or have embodied interior threading, shoulders or recesses located in objectionable places whereby cleaning of the parts is rendered difficult or impossible. When plug valves are employed in pasteurizing equipment or in other apparatus where a high degree of sanitation is required and where the valves must be taken apart daily for cleaning, quick assembly and disassembly is essential and it is also essential that all of the valve parts be so constructed that every portion thereof is easily accessible for scrubbing. Furthermore, the fewer the number of parts the less the time that is required for taking down, cleaning, and reassembling.

It is therefore an object of the present invention to provide a lift plug valve having a minimum number of parts which are so arranged and constructed that the valve may be quickly assembled and disassembled, each part being so formed that thorough cleaning is a simple matter.

A further object of the invention is to provide a valve as above described including novel means for forcibly moving the plug a short distance in an axial direction so as to force it out of seated condition when it becomes stuck.

A still further object of the invention is to provide a lift plug valve as above described wherein there is a single operating handle which, when moved, first serves to forcibly unseat the plug, and then serves to rotate the plug to a selected open or closed position.

A more specific object of the invention is to provide a lift plug valve as above described wherein the lower end of the plug has a projecting stem with a threaded outer end portion for receiving a nut, there being yielding means inwardly of the nut and surrounding said stem for urging the plug into seated condition.

2

A more specific object of the invention is to provide a construction as above described, wherein in one form of the invention said yielding means may take a form of a yielding disc.

With the above and other objects in view, the invention consists of the improved lift plug valve, and all its parts and combinations, as set forth in the claims, and all equivalents thereof.

In the accompanying drawing, illustrating preferred embodiments of the invention, in which the same reference numerals designate the same parts in all of the views:

Fig. 1 is a longitudinal sectional view through the valve with the plug member shown in full;

Fig. 2 is a fragmentary side elevational view showing the lift cam arrangement;

Fig. 3 is a sectional view taken approximately on the line 3—3 of Fig. 2; and

Fig. 4 is a fragmentary longitudinal sectional view through the lower portion of the valve structure illustrating a modification.

Referring more particularly to the drawing, the numeral 6 designates a valve body having a longitudinal bore 7 and having a transverse tapered bore 8 intersecting the longitudinal bore 7. A valve member or plug 9 is seated in the tapered bore 8 and provided with the usual port 10 which is adapted to be brought into or out of alignment with the bore 7 of the body when the plug is rotated.

The upper end of the plug has a stem 11 projecting upwardly from the center thereof. The bottommost portion of the stem is enlarged to provide an annular shoulder 12 and above this is a squared stem portion 13 which is of less size than the portion therebelow. The stem proper which projects above the squared portion 13 is of round stock and is threaded on its upper end as at 14.

The main stem portion extends loosely and rotatably through an opening 15 in the inner end of a handle 16. A nut 17, which is threaded onto the upper end portion 14 of the stem, serves to restrict upward movement of the handle.

The inner end 18 of the handle is circular in shape and formed with a cam projection 19 which is substantially semi-circular in cross-section. The ends of the cam projection 19 register with oppositely disposed cam recesses 20 in a circular rim 21 projecting upwardly from a cover plate 22. The latter has a downwardly extending circular flange 23 which seats on the annular upper edge 24 of the valve body. When the plug 9 is in seated condition as in Fig. 1, the shoulder 12 below the squared portion 13 of the stem is some-

what below the lower surface of the cover 22.

Projecting concentrically from the lower end of the plug 9 is a squared stem 25 having its lowermost end portion round and threaded as at 26 for receiving an adjustment nut 27.

In order to constantly urge the plug to seated position, yielding means is employed around the stem portion 25. This yielding means is so arranged as to act to constantly urge the plug into seated condition. In the preferred form of the invention this yielding means takes the form of a yielding concavo-convex disc 28 having a central squared opening 29 through which the squared stem portion 25 projects. The periphery 30 of the disc 28 seats against the annular end 30' at the bottom of the valve body and is preferably rounded to minimize friction. When the nut 27 is suitably adjusted to compress the disc 28 somewhat, the disc will tend to return to its normal concavo-convex form and will thus act against the inner face of the nut 27 to constantly urge the plug 9 into seated condition. In this form of the invention, the disc also provides a bottom closure for the valve body.

This same function may be performed by the arrangement illustrated in Fig. 4. In this form of the invention, however, there is a flat closure disc 31 having a squared central opening 32 through which the squared stem portion 25 extends. A coil spring 33, surrounding the stem and positioned between the disc 31 and the nut 27 acts to constantly urge the plug 9 into seated condition. This form of the invention has more parts than the form of Fig. 1 and the parts of Fig. 1 are easier to clean.

In use of the improved valve, assuming that the valve is in the open position of Fig. 1 and it is desired to close it, it is merely necessary to move the handle 16. During the first part of this movement, the handle rotates a very small distance around the stem 11 until the cam starts to ride up the inclined sides of the cam recesses 20. This will cause an upward lift on the plug 9 to move the latter just enough to break the seal between the tapered plug and the tapered bore 8 of the body. The amount of lift may be controlled by the amount of clearance between the shoulder 12 and the lower face of the cover 22. By limiting this clearance to an amount just sufficient for seal-breaking purposes, any leakage while the valve is unseated can be held to a minimum. As soon as this seal is broken, further rotation of the plug becomes a simple matter. This rotation is performed by further movement of the handle 16. During such further movement, the handle will act to rotate the cover 22, and the latter through the engagement of its square hole 34, with the squared stem portion 13, produces rotation of the stem and plug 9 so that the plug may be easily rotated to closed position. During such rotation the fit of the squared lower stem portion 25 in the square hole 29 of the disc 28 will cause rotation of the disc 28. The rounded edge 30 will minimize friction during such rotation. The arrangement is such that there will be no tendency to loosen the nut 27. As soon as the handle is released the yielding disc 28 or spring 33 will pull the plug 9 back to seated condition and the handle cam 19 will automatically return to the position of Fig. 1, wherein the cam 19 is located in the lowermost portions of the cam recesses 20.

With the form of the invention of Fig. 4, when the plug is being rotated, the fit of the squared stem portion 25 in the squared opening 32 of the bottom disc 31 will cause rotation of the disc with the plug. Thus, the spring 33 and nut 27 will rotate as a unit with the plug and disc 31 and there will be no tendency to loosen the nut 27 and no relative rotation between the upper end of the spring 33 and the disc 31.

It is apparent that with the improved construction there is a combination seal breaking and plug rotating movement produced by the same manipulation of a single handle. It is also apparent that the construction has been so worked out that there is a minimum number of parts. Furthermore each part is so constructed that it can be thoroughly cleaned without difficulty. Complete disassembly of the valve can be accomplished by merely removing the two nuts 17 and 27.

Although only two forms of the invention have been shown and described, it is obvious that various changes and modifications may be made without departing from the spirit of the invention, and all of such changes are contemplated as may come within the scope of the claims.

What I claim is:

1. A valve comprising a valve body having a tapered bore, a tapered plug having a port therein, said plug being cooperable with said tapered bore and rotatable therein, a stem projecting from the large end of said tapered plug, a cover for the large end of the tapered bore of said valve body having an opening through which the stem of the plug non-rotatably extends, a handle rotatable on a projecting end of said stem, cooperating cam means on the inner portion of said handle and on said cover operable to cause axial movement of the plug during initial rotating movement of the handle, said cam means having engaging portions arranged to thereafter cause rotating movement of the cover and plug upon further rotating movement of said handle, and yielding means normally urging said tapered plug into seated position.

2. A valve comprising a valve body having a tapered bore, a tapered plug having a port therein, said plug being cooperable with said tapered bore and rotatable therein, a stem projecting from the large end of said tapered plug, a rotatable cover for the large end of the tapered bore of said valve body having an opening through which the stem of the plug non-rotatably extends, upstanding cam surfaces on said cover surrounding said opening, a handle rotatable on a projecting end of said stem and having a cam projection at its inner end cooperable with said cam surfaces on said cover to cause axial movement of the plug during initial rotating movement of said handle and rotating movement of the cover and plug upon further rotating movement of said handle, and yielding means normally urging said tapered plug into seated position.

3. A valve comprising a valve body having a tapered bore, a tapered plug having a port therein, said plug being cooperable with said tapered bore and rotatable therein, a stem projecting from the large end of said tapered plug, a rotatable cover for the large end of the tapered bore of said valve body having an opening through which the stem of the plug non-rotatably extends, means upstanding from said cover and having oppositely disposed cam recesses on its upper edge, a handle rotatable on a projecting end of said stem and having at its inner end an elongated cam projection engageable with said oppositely disposed cam recesses of the cover to cause axial movement of the plug during initial

rotating movement of the handle and to cause rotating movement of the cover and plug upon further rotating movement of said handle, and yielding means normally urging said tapered plug into seated position.

4. A valve comprising a valve body having a tapered bore, a tapered plug having a port therein, said plug being cooperable with said tapered bore and rotatable therein, a stem projecting from the large end of said tapered plug, a rotatable cover for the large end of the tapered bore of said valve body having an opening through which the stem of the plug non-rotatably extends, means upstanding from said cover and having oppositely disposed cam recesses on its upper edge, a handle rotatable on a projecting end of said stem and having at its inner end an elongated cam projection which is rounded in cross-section engageable with said oppositely disposed cam recesses of the cover to cause axial movement of the plug during intial rotating movement of the handle and to cause rotating movement of the cover and plug upon further rotating movement of said handle, and yielding means normally urging said tapered plug into seated position.

5. A valve comprising a valve body having a tapered bore, a tapered plug having a port therein, said plug being cooperable with said tapered bore and rotatable therein, a stem projecting from the large end of said tapered plug, a cover for the large end of the tapered bore of said valve body having an opening through which the stem of the plug non-rotatably extends, a handle rotatable on a projecting end of said stem, cooperating cam means on the inner portion of said handle and on said cover operable to cause axial movement of the plug during initial rotating movement of the handle, said cam means having engaging portions arranged to thereafter cause rotating movement of the cover and plug upon further rotating movement of said handle, and adjustable yielding means at the opposite end of the tapered plug for normally urging said plug into seated position.

6. A valve comprising a valve body having a tapered bore, a tapered plug having a port therein, said plug being cooperable with said tapered bore and rotatable therein, stems projecting from both ends of said tapered plug, a cover for the large end of the tapered bore of said valve body having an opening through which one of said stems of the plug non-rotatably extends, a handle rotatable on a projecting end of said last mentioned stem, cooperating cam means on the inner portions of said handle and cover positioned to cause axial movement of the plug during initial rotating movement of the handle and rotating movement of the cover and plug upon further rotating movement of the handle, yielding means on the stem at the opposite end of the tapered plug normally urging said plug into seated condition, and means on said stem for adjustably maintaining said yielding means in position.

7. A valve comprising a valve body having a tapered bore, a tapered plug having a port therein, said plug being cooperable with said tapered bore and rotatable therein, stems projecting from both ends of said tapered plug, a cover for the large end of the tapered bore of said valve body having an opening through which one of said stems of the plug non-rotatably extends, a handle rotatable on a projecting end of said last mentioned stem, cooperating cam means on the inner portion of said handle and cover positioned to cause axial movement of the plug during initial rotating movement of the handle and rotating movement of the cover and plug upon further rotating movement of the handle, a yielding concavo-convex disc axially movably positioned on the stem at the opposite end of the plug and positioned to normally urge said plug into seated condition, and an adjustable retaining means on said stem outwardly of said disc and coacting with the latter.

8. A valve comprising a valve body having a tapered bore, a tapered plug having a port therein, said plug being cooperable with said tapered bore and rotatable therein, stems projecting from both ends of said tapered plug, a cover for the large end of the tapered bore of said valve body having an opening through which one of said stems of the plug nonrotatably extends, a handle rotatable on a projecting end of said last mentioned stem, cooperating cam means on the inner portion of said handle and cover positioned to cause axial movement of the plug during initial rotating movement of the handle and rotating movement of the cover and plug upon further rotating movement of the handle, a yielding concavo-convex disc non-rotatably and axially movably positioned on the stem at the opposite end of the plug and positioned to normally urge said plug into seated condition, and a nut threaded on said stem outwardly of said disc and coacting with the latter.

9. A valve comprising a valve body having a tapered bore, a tapered plug having a port therein, said plug being cooperable with said tapered bore and rotatable therein, a stem of relatively small diameter projecting from the large end of said tapered plug, said stem having a squared portion and having a portion which is circular in cross-section, a rotatable cover for the large end of the tapered bore of the valve body having a squared opening through which the squared portion of the stem of the plug non-rotatably extends, means upstanding from said cover and having cam recesses on its upper edge, a handle rotatable on the portion of the stem which is circular in cross-section and having at its inner end a cam projection which is rounded in cross-section and positioned for engagement with said cam recesses of the cover to cause axial movement of the plug during initial rotating movement of the handle and to cause rotating movement of the cover and plug upon further rotating movement of the handle, and yielding means normally urging said tapered plug into seated position.

WALTER EBERT.

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