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COMBINED VALVE AND YOKE
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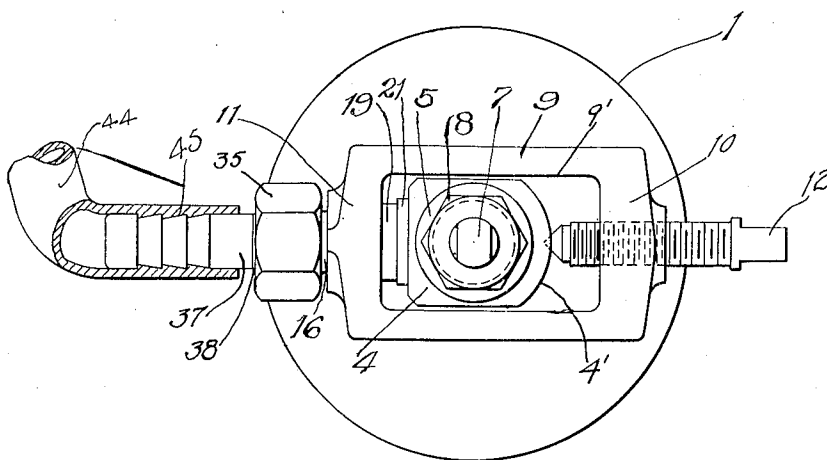


Fig. 2

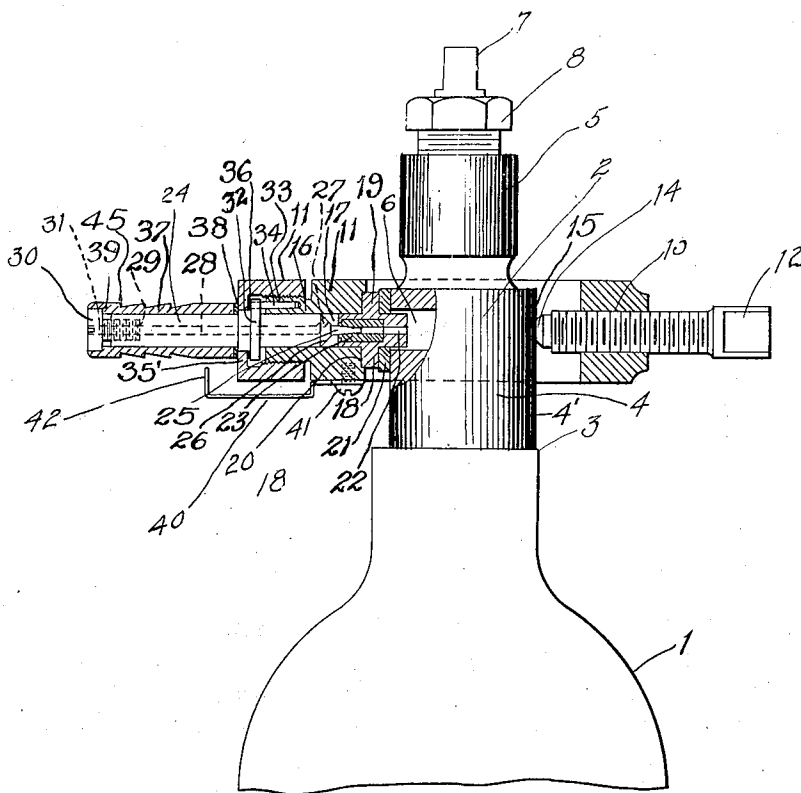


Fig. 1

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COMBINED VALVE AND YOKE

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5 Claims. (Cl. 221—73.5)

My invention relates to an improved combined valve and yoke and more particularly to improvements in the construction of a combined valve and yoke adapted to be used to facilitate the control of the flow of a fluid from a container.

Fluids stored under high pressure (often 1500 to 2000 pounds per square inch) are frequently used for commercial or medical purposes. When such a fluid is administered to patients by the medical profession, it is essential that a very delicate and accurate control over the flow of the fluid from the container therefor, be provided. Fluids are generally prepared for such use by introducing them under high pressure into strong containers or flasks which are equipped with an ordinary shut-off valve. Such valves are usually incapable of permitting an accurate and delicate control of the flow of the fluid from the container.

A flask or container such as those in common use, is provided with a passageway so associated with the valve as to provide an outlet for the fluid when the valve is opened. In order that the fluid may be conveyed without dissipation to the point at which it is to be used, it is desirable that a suitable tube be supplied and suitable means be provided for connecting the conveying tube to the outlet of the container. The tubes most commonly used for such purposes are formed from flexible rubber hose.

One of the objects of this invention is to provide an improved combined valve and yoke of simple and inexpensive construction adapted to be used with a container, in which a fluid has been stored, to afford an accurate and delicate control of the flow of the fluid therefrom.

Another object of the invention is to provide in a combined valve and yoke of this character, an improved construction having provision for the connection of a conveying tube and also for affording a convenient and delicate control of the flow of fluid to such tube.

Another object of the invention is to provide a combined valve and yoke of improved design which will effectually control the flow of fluids under high pressure, during a long period of use.

Other and further objects of the invention will be obvious upon an understanding of the preferred embodiment about to be described, or will be indicated in the appended claims, and various advantages not referred to herein will occur to those skilled in the art upon employing the invention in practice.

In order that my invention may be more clearly understood a preferred embodiment has been

chosen for purposes of illustration and description and is shown in the accompanying drawing, wherein:

Fig. 1 is an elevation, partly in section, of a container equipped with one embodiment of my invention;

Fig. 2 is a top plan, partly in section, of the structure shown in Fig. 1 with a conveying tube connected to the outlet of the combined valve and yoke.

Referring to the drawing, the numeral 1 indicates the top portion of the usual container or flask and 2 the usual outlet valve casing tightly secured within and extending from the neck 3 of the flask. For purposes of description the valve casing 2 will be considered as divided into two sections, the lower one of which is indicated by the numeral 4 and the upper one by the numeral 5. The usual shut-off valve (not shown) is so positioned within the casing 2 as to permit or prevent, as the case may be, the flow of fluid from the container to a cylindrical outlet opening or passageway 6 provided in the lower section 4 of the casing. A valve stem 7, by means of which the shut-off valve may be opened or closed, extends from the upper section 5 through a gland or stuffing box 8. That part of the lower section of the valve casing which extends from the container 1, is substantially rectangular in cross section but has one end 4', opposite that end in which the opening 6 terminates, formed as a portion of a cylinder. The upper section 5 of the valve casing is circular in cross section, its diameter being slightly less than the width of the lower section 4.

According to my invention a frame or yoke 9 having a rectangular opening 9', is adapted to be positioned about and secured to the lower section 4 of the valve casing 2, as shown, with its ends 10 and 11 respectively facing the end 4' of said section and the end of the latter in which the passageway 6 terminates. The opening 9' of the yoke or frame, is slightly greater in width than the valve casing section 4 and considerably longer than such section, and accordingly said yoke may be readily positioned as described. The yoke 9, comprising the valve structure which will presently be described, is rigidly and removably secured in the position shown in Fig. 1 by a set-screw 12 which is threaded through an opening 13 in the end 10 of the yoke so that its conical end 14 tightly engages a depression 15 formed in said end 4' of the lower section of the usual valve casing 2 of the container. The inner end of the seat or

depression 15 lies in an extension of the axis of the passageway 6. The end 11 of the frame or yoke has an integral tubular portion 16 extending therefrom which is slightly smaller in outside diameter than the depth of the frame and which is coaxial with opening 13 in the end 10 of the frame. The bore 17 of the tubular portion 16 is extended through the end 11 of the frame 9 to the opening 9'. A tubular member 18, having an annular collar or flange 19 intermediate its ends, has one end portion thereof forced with a fluid-tight fit into the inner end portion of the bore 17 to a position in which the collar 19 engages a shallow seat 20 formed in the wall of the frame opening 9' about the inner end of said bore. The other end portion of member 18 projects a substantial distance into the opening 9' of the frame or yoke, and also when the frame is mounted on the lower section of valve casing 2 as shown, well into the opening or passageway 6 which is slightly greater in diameter than said end portion. To provide a fluid-tight connection between the tubular member 18 and the usual valve casing, when the yoke or frame is so mounted on the lower section 4 and the screw 12 is tightened to clamp the yoke firmly in position thereon, a packing ring or washer 21 is disposed around the said tubular member between the flange 19 and the adjacent flat end of the section 4.

The bore of the tubular member 18 is coaxial with the bore 17 and comprises an inner end portion 22 of small cross section, an intermediate portion which is of substantially greater cross section than the portion 22, and a very short outer end portion which is only slightly greater in cross section than the said inner portion. An insert 23 is formed within the intermediate largest portion of the bore of member 18, preferably by melting some comparatively soft metal, such as lead, pouring the molten metal into said portion and then permitting it to cool and harden. The insert 23 is provided in any suitable manner, with a longitudinal passageway which is coaxial with the inner end portion 22 of the bore of member 18 and is of the same size as such portion except at its outer end portion, which is conical and flares outwardly.

Reference character 24 designates a cylindrical plunger or stem which is slidably mounted and fits snugly within the bore 17 of the tubular portion 16 of the yoke, the said plunger being of such length that it extends outwardly, for a considerable distance, from said tubular portion. At its inner end the plunger 24 is provided with a reduced conical portion 25 constituting a valve which is adapted to coact with the insert 23 of member 18 to control the flow of fluid from the container, the wall of the outer conical end portion of the bore of the insert forming a seat for such valve. Between its reduced portion 25 and its main body portion, plunger 24 is provided with a beveled shoulder 26. An opening 27 extends inwardly from and substantially at right angles to the face of the shoulder 26 and connects with a passageway 28 which extends therefrom and axially of the plunger to the outer end of the latter. The passageway 28 is provided with an enlargement 29 at its outer end portion into which a screw 30 is threaded, this screw having an axial opening 31 extending there-through of the same size as the main portion of the passageway 28. The plunger 24 is provided with a collar 32 which when the valve 25 engages its seat in the insert 23, is positioned only a slight

distance beyond the end of the tubular portion 16 of yoke 9. A small opening 33 provided in the tubular portion 16 and extending longitudinally thereof, is slidably engaged by a pin 34 fixed to the collar 32, and coacts with such pin to prevent rotary movement of plunger 24 in the bore 17 of said tubular portion while permitting sliding movement of the plunger to and from the position (shown in Fig. 1) in which the reduced end portion or valve 25 thereof engages its seat in insert 23. A nut 35 is mounted on and in screw-threaded engagement with the tubular portion 16, and is provided at its outer end with an inwardly extending annular flange 35' which projects between the collar 32 and the adjacent inner end of a sleeve 37 on the outer end portion of plunger 24. Suitable wear preventing washers 36 and 38 are disposed on the plunger between the flange 35' of nut 35 and the collar 32 and sleeve 37 respectively. The sleeve 37 fits closely on plunger 24 and is held in proper assembled position thereon by screw 30, the head of which is seated in a countersink 39 provided in the outer end of the sleeve. Obviously upon turning nut 35, flange 35' thereof will coact with collar 32 or sleeve 37 to effect sliding movement of plunger 24 either inwardly or outwardly of the bore 17, dependent upon the direction of such turning. A flat strip 40 is secured at its inner end, as by a screw 41, to the end 11 of the yoke 9 and is provided with an angular outer end portion 42 which projects into the path of nut 35 and serves as a stop to limit the outward movement of the latter and thereby prevent the same from being turned off the tubular portion 16 of the yoke and accidental removal of the plunger 24 from the bore 17.

From the foregoing it will be apparent that if the yoke or frame 9 is clamped on the lower section 4 of the usual valve casing, as shown, and the usual shut-off valve is opened by turning the stem 7, fluid under pressure from within the container 1 will flow through the outlet opening 6 into the bores of member 18 and its insert 23, but will be prevented from leaving said member 18, assuming the valve 25 is then in its closed position in engagement with the seat therefor provided in the insert. Upon now turning the nut 35 so as to move it away from member 18, the plunger 24 will also be moved away from said member and the valve 25 thereby opened. With the construction described the degree of opening of valve 25 and thereby the flow of fluid from tank 1 through the member 18 and its insert 23, can be very nicely, sensitively and accurately regulated from a point where such flow is very minute to a point where the flow is equivalent to the full capacity of the bore 22 of member 18. The fluid which thus flows through the tubular member 18 is discharged into the bore or passageway 17, from whence it flows through the opening 27 and passageway 28 of plunger 24 and opening 31 of screw 30 into a conveying tube 44 formed of suitable resilient material, preferably rubber, which is connected to the sleeve 37 by having one end portion thereof forced over the annular serrations 45 formed on the sleeve. It will be noted that upon turning the nut 35 to impart a limited rectilinear movement to the plunger or stem 24, the sleeve 37 will not be rotated although it will, of course, move inwardly or outwardly, as the case may be, with the plunger. This construction permits opening and closing of the valve without disconnecting the conveying tube 44.

One of the features of my invention resides

in the construction whereby only non-rotary sliding or rectilinear movements are imparted to the plunger 24 in the operation of the device described. Because of this, wear between the lead insert 23 and the valve 25, which is preferably formed of a material harder than lead, is reduced to a minimum. The working life of the device is thus greatly prolonged as the valve 25 will not soon become worn, scarred, or cut. It is not essential that lead be used for the insert 23, as any rigid material which is softer than that of the valve or conical end portion 25 of the plunger can be used. I prefer to use lead, however, because of its low fusion point and readily workable qualities.

As various changes may be made in the shape, form and arrangement of the parts of the structure herein specifically described, without departing from the spirit of the invention, all matter contained herein is to be interpreted as illustrative and not in a limiting sense.

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

1. In a device of the class described, in combination a frame provided with an opening and adapted to be secured to the outlet of a container, a member associated with said opening in said frame and having an opening adapted to be registered with the outlet of the container, a plunger movably mounted in respect to said opening in said frame, an insert of softer material than said plunger disposed within said member and having an opening communicating with the opening in such member, said plunger having an unperforated portion adapted to cooperate with the opening in said insert and having another portion provided with an opening adapted to be in communication with the opening in said frame, and means for adjusting said plunger in respect to said frame so as to move the said unperforated portion thereof either into or out of fluid-tight engagement with said insert, whereby the flow of a fluid from said container may be regulated.

2. In a device of the class described, in combination, a frame, a member mounted in association with said frame and having a passageway adapt-

ed to be registered with the outlet of a container, a plunger slidably mounted on said frame, means operable to effect sliding movement of said plunger into and out of engagement with said member to thereby respectively close and open said passageway, and means for holding said plunger positively against rotation when so moved.

3. In a device of the class described, in combination, a frame, a member carried by said frame and having an opening, a plunger slidably mounted in association with said frame and adapted to engage said member to close said opening, means mounted on said frame for rotary movement independent of movement of said frame and adapted in such movement to effect positive nonrotating and sliding movement of said plunger to closing or unclosing position with respect to said opening, and means for limiting the extent of such movement of the plunger.

4. In a device of the class described, in combination, a frame adapted to be removably secured to the outlet member of a container, an element associated with said frame and having an opening adapted to be in communication with the outlet of said container when the frame is so secured to said outlet member, a plunger, positively held against rotation having a longitudinally extending opening in communication with the opening in said element, said plunger having a portion adapted to cooperate with the opening in said element to control the flow of fluid from the container through said outlet and openings, and means for moving said plunger into and out of engagement with said element.

5. In a device of the class described, in combination, a frame having a passageway, means for removably securing said frame to the outlet member of a container with said passageway in communication with the outlet of the container, an element movably mounted in respect to said passageway, and means comprising softer material than said element provided with an opening in communication with said passageway and adapted to cooperate with said movable element to control the flow of fluid from said container through the outlet thereof.

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