(12) UK Patent Application (19) GB (11) 2 063 424 A

(21) Application No 8025452
(22) Date of filing 5 Aug 1980
(30) Priority data
(31) 95474
(32) 19 Nov 1979
(33) United States of America (US)
(43) Application published 3 Jun 1981
(51) INT CL³ F16K 1/32
(52) Domestic classification F2V D7X
(56) Documents cited
GB 1074439
GB 733152
GB 495222
GB 465850
GB 308193
(58) Field of search F2V
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(54) Sampling Valve with Piston Position Indicator Means

(57) A sampling valve structure includes a reciprocating piston (20) driven by a threaded stem (18) to open an inlet passage (36,40) and uncover an outlet passage (34) for sampling purposes. Indicator means (24) is rigidly secured to the threaded stem such that an operator of the valve will at all times know the relative position of the piston (20) with respect to the outlet passage (34) such as to preclude unexpected flow of fluid out of the sampling valve with the attendant risk of injury.

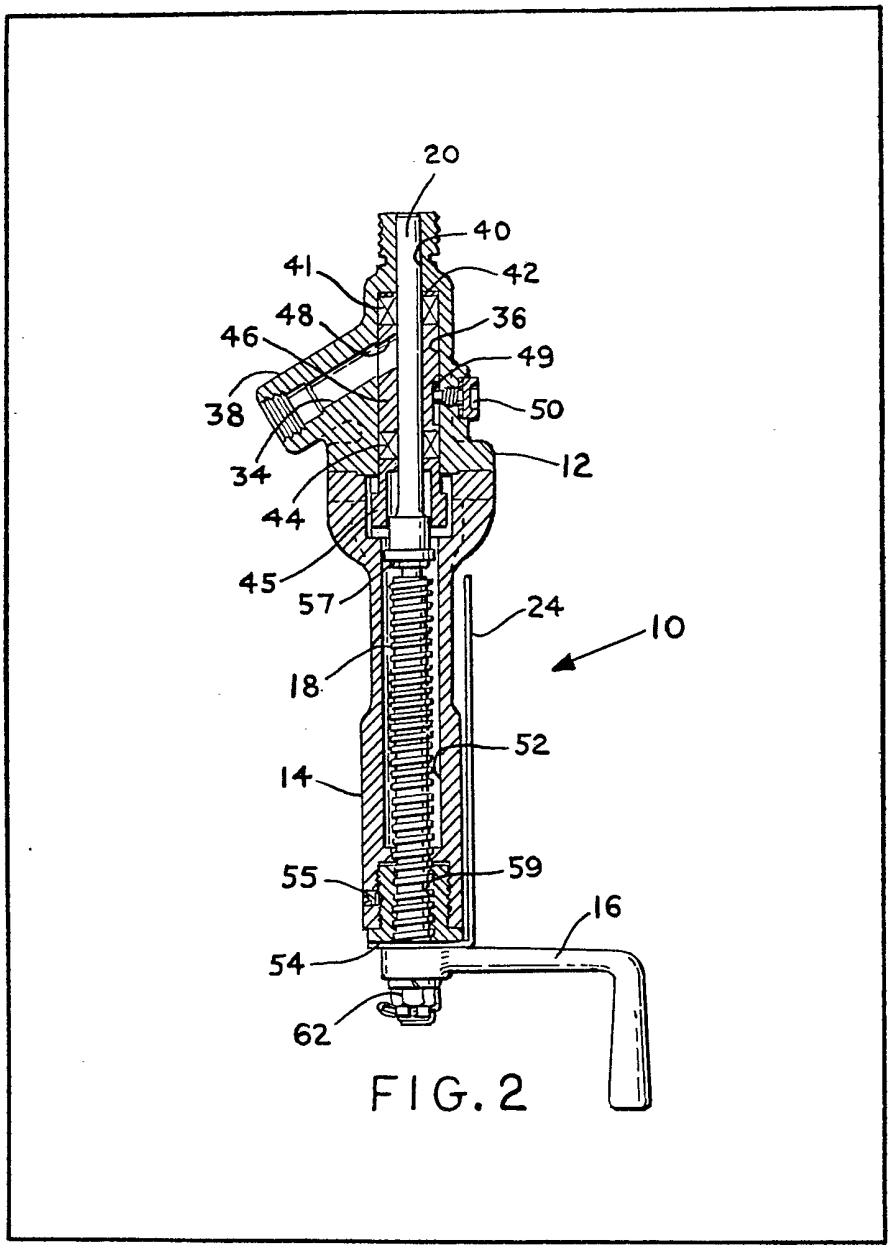

FIG. 2

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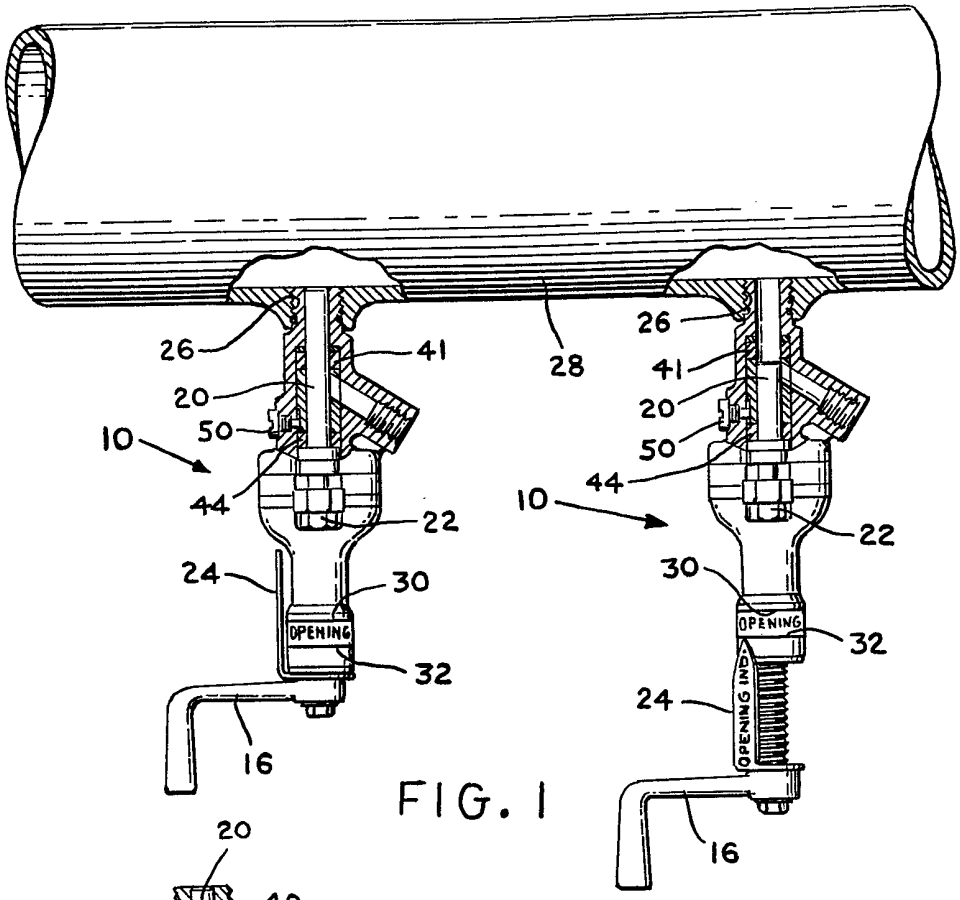

FIG. 1

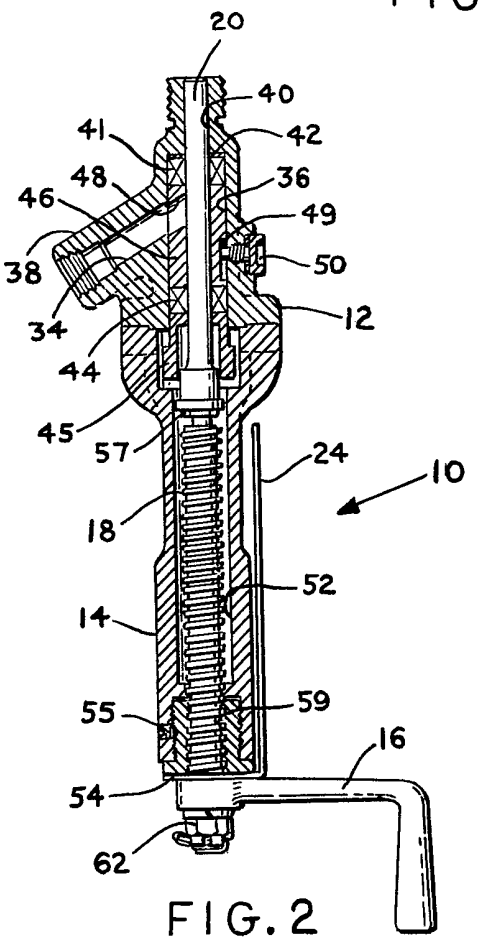

FIG. 2

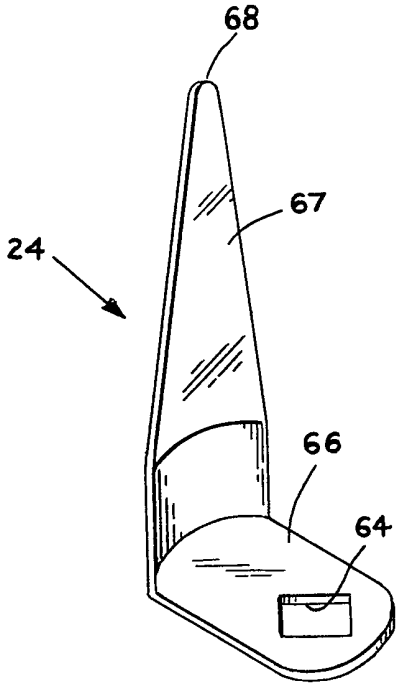

FIG. 3

SPECIFICATION

Sampling Valve With Piston Position Indicator Means

This invention relates to valves. More particularly this invention relates to piston type valve means wherein it is desirable to identify the position of the piston during valve operation.

As will be recognised by those skilled in the valve design arts, safety of operation has become a primary consideration in the design and utilization of all types of valves.

One of the primary types of valves in which safety is of paramount importance is the category of valves designable as sampling valves. More specifically, sampling valves are distinguishable from flow control valves in that their operation contemplates the removal of at least a portion of a contained or flowing fluid for purposes of test or the like. Thus, rather than merely interrupting or throttling a flow of fluid, sampling valves intrude upon the containment of the fluid.

It is often the case with respect to the operation of sampling valves that the fluid sample is caused to pass out of the fluid container and into a sample jar or other container. More often than not the sampling valve and the sample container are not in closed communication. Rather the use of the sampling valve is often similar to the use of a domestic water hose to fill a pail with water. As we all have experienced, such bucket filling often results in splashing of water on the individual doing the filling.

Where the fluid is water the problem is at worst a minor one. Where the fluid being sampled is a toxic substance or a corrosive fluid, the problem takes on a new dimension. In such cases it is imperative that the operator knows the position of the valve piston within the flow cavity so as to anticipate the commencement or termination of flow of thefluid being sampled.

Various approaches have been made to providing sampling valves with protective piston position indication. Most, however, have involved complex approaches to the problem including valves having vernier gauges, feeler gauges and similarly expensive structure.

In accordance with the present invention there is provided a sampling valve comprising a body section, a bonnet section, a first passage formed in said body section and defining an inlet passage, a second passage formed in said body section in fluid communication with said first passage and defining an outlet passage, a first bore formed in said body section, a second bore formed in said bonnet section and being coaxial with said first bore in said body section, bushing means disposed in an end of said second bore remote from said first bore, said bushing means including an internal threaded throughbore coaxial with said first and second bores, piston means slidably disposed within said first and second bore to and from a position interrupting said fluid communication between said inlet and outlet passages, stem means rotatably threadedly received in said throughbore of said bushing means so as to be reciprocable within said second bore upon rotation thereof in said bushing means, means connecting said piston means and said stem means such that reciprocating motion of said stem means causes corresponding reciprocating motion of said piston means, crank means rigidly secured to the end of said stem means remote from said piston for imparting rotational movement to said stem means, and piston means position indicator means rigidly secured to said stem means for reciprocation therewith, and arranged to indicate to an operator the position of the piston means with respect to said second passage in said body section.

A more complete understanding of the present invention can be had from the following detailed description of an embodiment thereof, particularly when read in the light of the accompanying drawings, wherein:

Figure 1 discloses two sampling valve units embodying the present invention, each partly in section, one shown in the valve opening position and one shown in the valve closed position;

Figure 2 is a cross-sectional elevational view of the sampling valve of Figure 1 shown in the valve closed position; and

Figure 3 is a perspective view of a valve means position indicator pointer which is utilized in the embodiment of Figures 1 and 2.

As noted above the present invention relates to sampling valves of the piston type wherein there is provided a structure for providing an indication of the position of the valve piston whereby to provide and added degree of safety in the operation of the valve.

Referring, therefore, to Fig. 1, there are shown two valve units embodying the present invention, each valve unit being designated generally by the reference numeral 10.

Each of the valve units 10 can be seen to comprise a body section 12, a bonnet section 14 and a crank handle 16 which is utilized to rotate a threaded stem 18 such as to reciprocate a piston 20 within the valve body and bonnet all as discussed below in detail.

Body section 12 and bonnet section 14 are secured in rigid surface-to surface relationship by a plurality of nuts and bolts 22, all in a conventional manner. The nut and bolt assemblies 22 are disposed within suitable aligning bores formed in the body section and bonnet section all in a manner generally known to those skilled in these arts.

Rigidly secured on stem 18 and rotatable therewith in response to the rotation of crank handle 16 is a piston position indicator 24. Piston position indicator 24, being secured to stem 18 and rotatable therewith is displaced downwardly in a corresponding amount to the downward displacement of piston 20 during rotation of the crank handle 16. In this regard, the piston 20 is displaceable from the fully closed position shown in the left hand valve unit 10 in Figure 1 to the open position as shown in the right hand valve

unit 10 in Figure 1. Further, in Figure 1 the two units are shown as being threadedly received within threaded openings 26 which are disposed in a pipe 28 in which fluid to be sampled is either flowing or stored.

Disposed on the outer surface of bonnet section 14 are two vertically displaced circumferential lines 30 and 32. Upper circumferential line 30 is positioned so as to correspond to the position of the upper tip of piston position indicator 24 when the upper surface of piston 20 is adjacent the upper edge of a valve ring 41 position in body section 12 as described below. Similarly, the lower circumferential line 32 is positioned such that it corresponds to the position of the upper tip of piston position indicator 24 when the upper surface of piston 20 is adjacent the lower edge of valve ring 41. As can be seen from the structure disclosed in Figure 1, the word "OPENING" may be provided between the two lines such as to indicate the function which is occurring at the time the piston position indicator tip reaches the respective circumferential lines. More specifically, as the upper tip of piston position indicator 24 passes downwardly between circumferential lines 30 and 32, the operator is alerted to the fact that the valve is or is about to be "OPENING". As such the passage of fluid out of the valve will not come as a surprise.

Considering, therefore, the structure of the valve 10 in greater detail and with particular reference to Figures 2 and 3, body section 12 can be seen to comprise a generally cylindrical member having a vertically extending bore 36 and a generally outwardly and downwardly extending arm 38 in which is formed an outlet passage 34 which is in fluid communication with vertical bore 36.

Coaxial with bore 36 and extending through the upper end of body section 12 is a vertically extending bore 40. The bores 36 and 40 form an inlet passage. The diameter of bore 40 is slightly larger than the outside diameter of piston 20 and adapted to receive piston 20 slidably therethrough. The external surface of body section 12 adjacent bore 20 is threaded such as to permit the threaded engagement of valve unit 10 in a system, e.g. in the threaded opening 26 of pipe 28 as shown in Figure 1.

Disposed within and positioned at the upper end of vertical bore 36 is upper valve ring 41 which cooperates with a base ring 42 to define an upper sealing means for precluding flow of fluid through upper bore 40 into bore 36 around piston 20 when the piston is extended through the upper seal and the valve is thus in the closed position.

Similarly disposed within vertical bore 36 in body section 12 is a lower valve ring 44 which cooperates with a gland 45 to define a lower valve seal such as to preclude the flow of fluid downwardly out of the valve body within bore 36 and around piston 20 when the valve is in the open position.

Disposed between upper valve ring 41 and lower valve ring 44 is a generally cylindrical member 46, the outside diameter of which is substantially equal to the inside diameter of bore 36 and the inside diameter of which is substantially equal to the outside diameter of piston 20 such as to permit sliding movement of the piston therein. An angled bore 48 is formed within member 46 such as to be coaxial with outlet passage 34. Bore 48 is retained in radial alignment with outlet passage 34 through the use of a flat 49 provided to cooperate with a set screw 50 which is threadedly received within a threaded opening formed in body section 12.

Bonnet section 14 is a generally cylindrical member having a flared upper end to correspond in a basic diameter to the outside diameter of body section 12. As noted above, the two sections are secured through the use of nuts and bolts in the conventional manner.

Formed generally vertically within bonnet section 14 is an axially extending bore 52. Bore 52 is provided to be coaxial with bore 36 in body section 12. The lower end of bore 52 is internally threaded to receive a bushing 54 which is retained rigidly in place by a lock screw 55 disposed within a radially extending threaded opening formed in the wall of bonnet section 14. Bore 52 is sized to have a diameter which is somewhat in excess of the external diameter of threaded stem 18. In this regard, the upper end of threaded stem 18 includes a rotating connection with the lower end of piston 20 the structure of which may be any of those generally known in the art. The rotating connection is secured by a split nut 57. Thus, displacement of threaded stem 18 upwardly and downwardly causes a corresponding displacement of piston 20 upwardly and downwardly. However, a rotation of threaded stem 18 does not necessarily result in a corresponding rotation of piston 20 because of the rotating connection between the two elements.

Formed to extend axially through bushing 54 is a threaded bore 59. The threading of bore 59 is designed to threadedly receive therethrough thread stem 18 thus permitting bushing 54 to define a reaction element for causing the vertical displacement of threaded stem 18 and therewith piston 20 in response to rotation of threaded stem 18 by crank handle 16.

In this regard, the bottom end of stem 18 is provided with a crank receiving element which is generally square in cross-sectional configuration, which crank receiving element accommodates the mounting thereon of piston position indicator 24 and crank handle 16. Immediately below the crank receiving element is a threaded end for receiving a securing nut 62 thereon, which securing nut may be any of the many known to those skilled in these arts, for example, a castle nut and cotter pin configuration.

In a manner well known in the art the crank handle 16 is provided with a throughbore generally rectangular in cross-sectional configuration and corresponding substantially in

dimension to the crank section of stem 18. Similarly, and with reference to Figure 3, piston position indicator 24 is provided with an opening 64 which is generally square in cross-sectional configuration and which corresponds substantially in dimension to the dimension of the crank section of stem 18. Thus, rotation of crank handle 16 causes the rotation of stem 18 and, together therewith, the rotation of piston position indicator 24. Further, because piston position indicator 24 is rigidly secured between the upper surface of crank handle 16 and the lower end of the threads of threaded stem 18, the piston position indicator is displaced upwardly and downwardly with threaded stem 18 in response to the rotation of crank handle 16.

Referring to Figure 3, the piston position indicator 24 can be seen to comprise a generally L-shaped member having a base 66 and a generally arcuate vertically extending member 67. The vertical dimension of arcuate section 67 is provided to insure that the upper tip 68 of section 67 is located vertically adjacent the upper circular line formed on the external surface of bonnet section 14 as best may be seen in Figure 1 when the upper surface of piston 20 is disposed at the upper edge of upper valve ring 41.

By being so positioned, it can be seen that an operator during rotation of crank handle 16 and the attendant downward displacement of threaded stem 18, piston 20 and piston position indicator 24 can determine accurately when the piston will be in a position to permit initial opening of the valve. Thus, the operator will not experience unexpected flow of fluid through the valve and the likelihood of splash or uncontrolled flow by reason of accident will be substantially reduced.

Continued rotation of crank handle 16 such as to cause further downward displacement of stem 18 will also cause further downward displacement of piston position indicator 24 and at such time as tip 68 is adjacent the lower line as seen in Figure 1, the operator will know that the valve is in the fully open position.

As best may be seen with respect to Figure 2, the rotation of crank handle 16 such as to cause displacement of the piston 20 to the full upward position results in the upper tip 68 of piston position indicator 24 to be slightly below the expanded portion of bonnet section 14 and further results in the upper surface of piston 20 to be substantially coplanar with the upper edge of bore 40 in body section 12. As will be recognized by those skilled in the arts, the positioning of piston 20 in such a manner precludes the creation of a "dead spot" in the sampling valve which otherwise might define a collection pool for materials contained in the fluid to be sampled thus resulting in invalid samples being drawn. However, by reason of the positioning of piston 20 in the manner shown in Figure 2, not only is there no dead spot created but there is presented to a flowing fluid a substantially smooth surface thus minimizing any adverse fluid flow reactions by reason of the use of the sampling valve.

The sampling valve according to the invention may be manufactured of materials which are generally known in the arts. Thus, stainless steel may be used for the bonnet section 14, threaded stem 18, gland 45, the bonnet nuts and bolts, cylindrical member 46, split nut 57, piston 20, body section 12, base ring 42 and the respective lock screws.

Similarly, the crank handle may be manufactured of a malleable iron, the bushing 54 may be manufactured from bronze and the respective valve rings and appropriate gaskets used in assembly of the valve may be of a suitable material such as teflon.

Further, with respect to manufacturing a valve such as valve 10, known manufacturing techniques and methods may be utilized.

It will be recognized by those skilled in these arts, therefore, that the sampling valve of the present invention constitutes a fundamental but utilitarian structure which provides for accurate sampling under controlled operation and which offers safety of operation not heretofore experienced. It will further be recognized by those skilled in these arts that many modifications and variations to the structure of the embodiment described in detail may be made.

Claims

1. A sampling valve comprising a body section, a bonnet section, a first passage formed in said body section and defining an inlet passage, a second passage formed in said body section in fluid communication with said first passage and defining an outlet passage, a first bore formed in said body section, a second bore formed in said bonnet section and being coaxial with said first bore in said body section, bushing means disposed in an end of said second bore remote from said first bore, said bushing means including an internal threaded throughbore coaxial with said first and second bores, piston means slidably disposed within said first and second bore to and from a position interrupting said fluid communication between said inlet and outlet passages, stem means rotatably threadedly received in said throughbore of said bushing means so as to be reciprocable within said second bore upon rotation thereof in said bushing means, means connecting said piston means and said stem means such that reciprocating motion of said stem means causes corresponding reciprocating motion of said piston means, crank means rigidly secured to the end of said stem means remote from said piston for imparting rotational movement to said stem means, and piston means position indicator means rigidly secured to said stem means for reciprocation therewith and arranged to indicate to an operator the position of the piston means with respect to said second passage in said body section.

2. A sampling valve according to claim 1 including position lines disposed on the exterior surface of said bonnet section for cooperating

with said piston means position indicator means to identify the position of said piston means within said first passage and with respect to said second passage.

3. A sampling valve according to claim 1 or claim 2, wherein said piston means position indicator means is secured to said stem means such as to be both rotatable and reciprocable therewith.

4. A sampling valve according to any preceding claim wherein said means for connecting said piston means and said stem means connecting means comprises a rotating joint arranged so that reciprocating but not rotary motion is transmitted from said stem means to said piston means.

5. A sampling valve subtantially as herein before described with reference to the accompanying drawings.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1981. Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.