United States Patent

[11] 3,552,421

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[54] SINGLE TRIP VALVE APPARATUS
4 Claims, 6 Drawing Figs.

[52] U.S. Cl. 137/321, 251/216, 251/266, 251/357
[51] Int. Cl. F16k 43/00
[50] Field of Search 137/318, 320, 321, 322, 323, 328, 533; 251/214, 215, 216, 266, 357

[56] References Cited

UNITED STATES PATENTS

2,116,770	5/1938	Scillia	137/328X
2,827,913	3/1958	Wagner	137/318
987,000	3/1911	Lukens	251/291X
1,790,683	2/1931	Strickler	251/291X
1,848,691	3/1932	Beach	251/291X

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Assistant Examiner—David R. Matthews
Attorney—Buell, Blenko and Ziesenhein

ABSTRACT: The application discloses valve apparatus suitable for, but not limited to use upon one trip, throw away fluid containers. A valve body is fitted to the container and has a bore with a port in the end for withdrawal of fluid from the container. A valve head threads into the bore to close the port. A separate member closes the bore and encloses a stem so that the valve head can be operated to open the port and permit controlled discharge of fluid from the container.

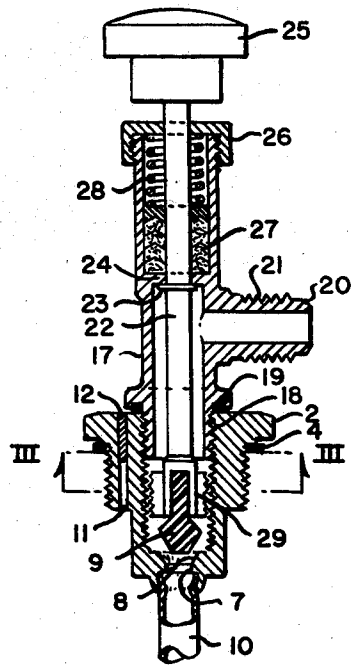


Fig. 1.

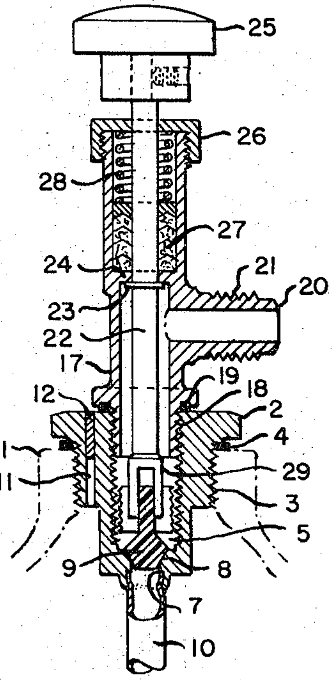


Fig. 2.

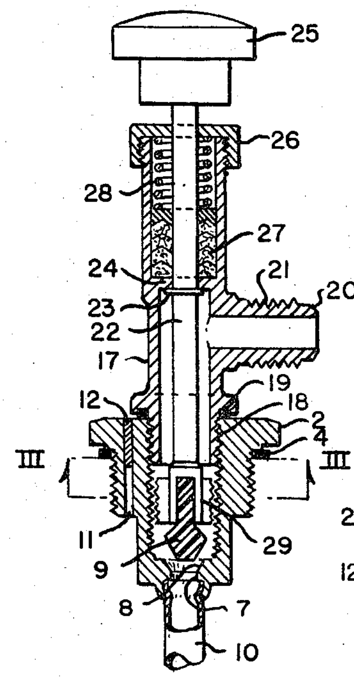


Fig. 4.

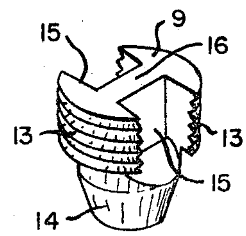


Fig. 3.

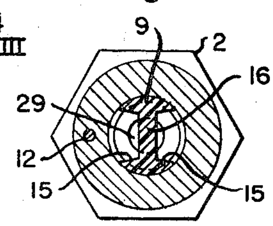


Fig. 5.

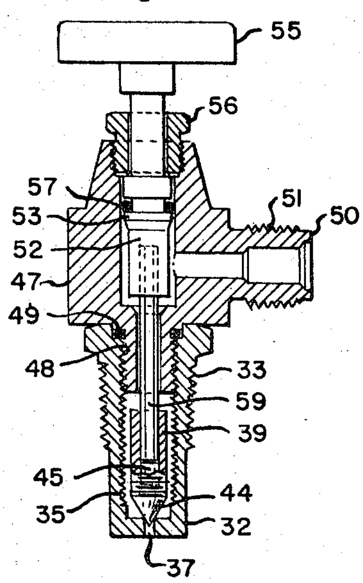
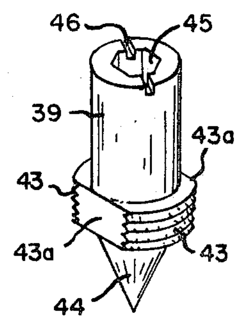


Fig. 6.



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SINGLE TRIP VALVE APPARATUS

It is becoming more common to ship numerous fluids in disposable or throw-away containers which are intended to make only a single trip. Such containers are used for storage and shipment of a variety of gases and liquids, such as oxygen, hydrogen, helium, propane, various refrigerants, etc. at both high and low pressures. Commodities such as refrigerants are normally shipped at relatively low pressure for recharging of refrigeration systems. Some gases are compressed to high pressures in so-called "lecture bottles" for use in demonstrations, classrooms, etc.

After such single trip containers have been used they are customarily placed in trash containers for usual trash collection. If the trash is incinerated, the container is subject to the possibility of an explosion with hazard to any person who may be in the vicinity. If, for example, a refrigerant is rapidly withdrawn from the container it will be chilled by withdrawal of the heat necessary for expansion of the gas. Such chilling will reduce the vapor pressure of the refrigerant and will cause some of it to remain in the container, in the form of liquid, or low vapor pressure gas, or both. Since no further refrigerant will discharge from the container, it will appear to be empty. If the outlet from the container is then closed, a pressure will be generated in it as the contents come to ambient temperature. Heating, as by incineration, then raises a severe possibility of generation of excessive pressures internally of the container. Explosion is particularly likely if a liquid is confined within the container, but the possibility of explosion exists wherever a container is discarded into trash and it is thereafter possible for pressure to build up inside the container. While it is a practice to use plugs of low melting point fuse metal, these may be ineffective in case of localized heating remote from the plug.

In order to overcome the foregoing problems, I provide a valve apparatus which is readily dismantled and inactivated following withdrawal of the contents of the container so as to leave an opening between the inside of the container and the atmosphere. I provide a valve body adapted to be fixedly attached to a container and having an internally threaded bore with a port in the end thereof communicating between the bore and the inside of the container. I provide a valve actuating assembly which is removable from the container and valve body and which may be reused with a number of containers. I further provide a threaded valve head having a face which cooperates with said port to close the port when the valve head is threaded to the bottom of the bore. I further prefer to provide valve body closure means engageable with the valve body and capping the open end of the bore in the valve body. A discharge fitting is preferably formed with the valve body closure means for controlled discharge of fluid from within the container. I further preferably provide a stem member extending through the closure means and having an end portion engageable with the valve head to impart a rotational motion thereto from the stem member. Preferably the end of the stem member and the valve head have cooperating offset surfaces which engage the valve head and stem for concurrent rotational motion but which allows free longitudinal motion between them. The end portion of the stem is so extended that the cooperating surfaces on the stem and valve head engage prior to the time that the valve body and closure means engage.

Other details, objects, and advantages of my invention will become more apparent as the following description of a present preferred embodiment thereof proceeds.

In the accompanying drawings I have illustrated a present preferred embodiment of my invention in which:

FIG. 1 is a side elevation of a valve apparatus embodying my invention and adapted for low pressure applications taken in section with the valve head in closed position;

FIG. 2 is a side elevation of the valve apparatus of FIG. 1 with the valve head in open position;

FIG. 3 is a sectional view taken along line III–III of FIG. 2;

FIG. 4 is a perspective view of the valve head of the valve apparatus shown in FIGS. 1 and 2;

FIG. 5 is a side elevation of a valve apparatus similar to the valve apparatus of FIG. 1 and adapted for high pressure applications taken in section with the valve head in closed position; and

FIg. 6 is a perspective view of the valve head of the valve apparatus shown in FIG. 5.

Referring to FIG. 1 a single trip container 1 for refrigerant and the like is shown in chain lines. A valve body 2 is threaded into an opening in the neck of the container by cooperating threads 3 formed in the inside of the neck and the outside of the valve body. A gasket 4 seals the valve body 2 to container 3 to prevent leakage between them. Valve body 2 has a bore 5 in it which is threaded internally. A port 7 is drilled in the closed end of bore 5 and has a valve seat in the form of an annular facing surface 8 against which a valve head 9 may be applied. A dip tube 10 may be fitted to the lower end of valve body 2 where a liquid, such as a refrigerant, is contained within container 1. A passage 11 is bored through valve body 2 and is filled with a plug of fuse metal having a low melting point.

Valve seat 9 (FIG. 4) includes a threaded section 13 which engages the internal threads of bore 5. The valve apparatus shown in FIGS. 1, 2, 3 and 4 is intended to operate under relatively low pressures ranging no higher than perhaps 100—120 p.s.i. Accordingly, valve head 9 is preferably formed of a plastic material such as nylon which is readily formed and has sufficient plastic resiliency to seal when pressed lightly against a metal surface. Valve head 9 has a tapered annular sealing surface 14 which engages and cooperates with surface 8 of valve body 2 to close off port 7. Notches 15 are cut in the upper portion of valve head 9 interrupting threads 13 and forming a radially extending ridge 16 in valve head 9. The offset surfaces formed in valve head 9 by the cutting of notches 15 engage cooperating surfaces on actuator means described further below for rotation of valve head 9. It will also be observed that notches 15 enable fluid to pass through bore 5 from port 7 when valve head 9 is in an open position as shown in FIG. 2.

A valve bore closure member 17 threads 18 formed at its lower end which engage and thread into the threads of bore 5. A gasket 19 is provided to seal closure member 17 to valve body 2 and to prevent leakage therebetween. A discharge fitting 20 is formed integral with closure member 17. The fitting is equipped with threads 21 to receive a coupling or the like for connection to a hose, refrigerating system, etc. A valve actuating stem 22 is fitted within closure member 17. A collar 23 fits against a land 24 formed internally of closure member 17 to limit axial movement of stem member 22. An operating knob 25 attached to the protruding end of stem 22 limits movement of the stem in the opposite direction. A bonnet 26 is threaded to the end of closure member 17 and a cavity is formed between land 24 and bonnet 26. A gasket material 27 and a gasket compression spring 28 are fitted within the cavity to prevent leakage out around stem 22.

The lower end of stem 22 is formed with offset surfaces which engage the offset surface of valve member 9. In the form shown in FIG. 1 a fork 29 is formed on the end of stem 22 and the two prongs of the fork extend into the notches 15 in the valve head 9. Stem 22, including fork 29, extend from the lower end of closure member 17 as can be seen in FIGS. 1 and 2. If valve head 9 is in closed position as shown in FIG. 1 and closure member 17 is then inserted into the bore 5, fork 29 will, therefore, engage valve head 9 before threads 18 engage the threads of the inside of bore 5.

The valve apparatus of FIGS. 5 and 6 is similar in construction and operation to the valve apparatus of FIGS. 1—4 except that it is intended to separate at pressures extending as high as perhaps 2400 p.s.i. A valve body 32 is provided with threads 33 which thread into threads formed in the opening in a lecture bottle or other like container. Valve body 32 is formed with an internally threaded bore 35 having a port 37 in the lower end thereof. A valve head 39 is provided and has a threaded section 43 which engages the threads of bore 35. A

tapered face 44 cooperates with port 37 and forms a sealing surface when valve head 39 is fully threaded into bore 35. Offset faces are formed in valve head 39 in the form of a hexagonal hole of the type used in set screws etc. A notch 46 extends radially across the face of valve head 39 to permit gas flow from the container to a discharge fitting 50 when valve head 39 is threaded outwardly against valve body 47. The notch will also receive a screwdriver blade for manual rotation. Flat surfaces 43*a* are formed in the section of threaded portion 43 to enable fluid to pass through bore 5 when port 37 is open.

A valve closure member 47 is fitted with threads 48 which engage the threads of bore 35. A sealing gasket 49 is provided between valve body 32 and closure member 47. Closure member 47 includes a discharge fitting 50 having threads 51. A stem 52 is fitted internally of closure member 47. Its upper end is sealed by an O-ring 57 extending between a shoulder 53 and a bonnet member 56. An operating knob 55 is fitted to the extending end of shaft 52. The opposite end of shaft 52 terminates in a section having offset surfaces which engage and cooperate with the offset surfaces in valve head 39. In the embodiment of FIGS. 5 and 6 the lower end of shaft 52 is a hexagonal section 59 such as is used for set screw wrenches and the like. Hexagonal section 59 extends sufficiently far from valve body 47 that when valve head 39 is in closed position, as shown in FIG. 5, hexagonal section 59 will engage hole 45 before threads 48 engage the threads internally of bore 35.

In the use of the valve apparatus shown in FIGS. 1—4, container 1 is customarily shipped with valve body 2 fitted to it and with valve head 9 in closed position as shown in FIG. 1. The container is commonly shipped in a cardboard carton which is often used to hold it until empty. Ordinarily container 1 is shipped without closure member 17 being fitted to it. When container 1 is to be used the user will then insert the valve closure member 17 into position. Since fork 29 will necessarily engage valve head 9 before threads 18 engage bore 5, it will be necessary to have fork 29 spanning ridge 16, with the prongs of the fork in notches 15. In this manner it is impossible for fork 29 to become misaligned with valve head 9 and for damage to result when closure member 17 is threaded into bore 5. After fork 29 is fitted to valve head 9, closure member 17 is threaded into bore 5 until gasket 19 seats. Discharge fitting 20 is then connected as necessary. Rotation of knob 25 will cause valve stem 22 and valve head 9 to rotate together and valve head 9 will thereby be threaded away from port 7 to the position shown in FIG. 2 allowing fluid within container 1 to flow through port 7 and discharge from fitting 20. When further fluid is no longer needed from container 1, knob 25 may be rotated in the opposite direction so that valve head 9 will close port 7. Further fluid may be withdrawn from container 1 by opening and closing port 7 from time to time as necessary.

When container 1 is emptied (e.g., no further fluid will discharge from it) closure member 17 is then removed from valve body 2. Rotation of closure member 17 will tend to carry valve head 9 with it. Thus when closure member 17 becomes unthreaded valve head 9 will have been rotated a substantial distance away from port 7. Preferably, the user will continue to unthread valve head 9 until it has been removed completely from bore 5 and will then discard valve head 9. In this manner, container 1 will be open to the atmosphere and cannot accidentally be closed. Thus if it is picked up and incinerated with trash, there will be no possibility of explosion by reason of buildup of pressure within the container. The likelihood of incineration is strong since users of such containers often keep them in their shipping cartons as a matter of convenience.

Operation of the valve apparatus shown in FIGS. 5 and 6 is similar to that described above in all material respects. Thus, when the container has been discharged, removal of valve body 47 will tend to remove valve head 39. Removal may be completed using either stem 52 or a screwdriver. Although the valve apparatus disclosed herein is particularly useful in connection with one-trip containers, it may also be used in connection with multiple-trip containers where the same end purposes are desired and in which like problems arise. For example, the valve apparatus may be used where multiple-trip containers are desired to be returned at atmospheric pressure for refilling, or where for some reason it is desired to separate the valve seat and operating mechanism at certain times.

I claim:

1. Valve apparatus comprising:

a valve body adapted to be fitted to a container, said valve body having an internally threaded bore, a valve port in the end of said bore, and a tapered valve seat formed in said port;

a threaded valve head member adapted to engage the threads in said bore and having a tapered face cooperating with said valve seat and port to close and seal the port when the valve head member is threadably advanced against the valve seat;

said tapered valve seat and tapered face being characterized by forming a seal in the absence of intermediate gasketing material;

valve body closure means having external threads formed at one end, said external threads being engageable with said internally threaded bore of said valve body to close the end of said bore at the end thereof remote from the container; and

a stem member extending through said valve body closure means, and including an end portion engageable with and overlapping a portion of the valve head member, said stem member being engageable with said valve head member before the valve body closure means engages the valve body, whereby upon assembly and disassembly of said valve body closure means and said valve body relative rotational motion between the valve head member and the stem member is prevented while relative reciprocating longitudinal motion therebetween is allowed.

2. Valve apparatus as claimed in claim 1 in which the valve head member includes a ridge extending radially of the bore in the valve body, and the end portion of the stem member includes a forked portion which clasps said ridge to engage the valve head member and stem member for joint rotational motion.

3. A valve assembly as claimed in claim 1 in which the valve head member has threaded portions with sections thereof removed for passage of fluid from the container through the port in the bottom of the bore and through the bore.

4. Valve apparatus as claimed in claim 1 in which the threads of the valve body extend to the end of the bore in the valve body remote from the container whereby the valve head member is removable from the valve body by rotating the valve head member until it is released from the threads.

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,552,421 Dated January 5, 1971

Inventor(s) William C. Yocum

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the cover sheet [72] "Lebanon Township, Pa." should r -- Mt. Lebanon Township, Pa. --. Column 2, line 22, "seat" should read -- head --; line 40, after "17" insert -- has --.

Signed and sealed this 15th day of June 1971.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

WILLIAM E. SCHUYLER, J
Commissioner of Patent