March 4, 1969 G. G. WINTERS ET AL 3,430,820

VAPOR-LIQUID WITHDRAWAL VALVE

Filed May 11, 1967 Sheet 1 of 2

Fig. 1.

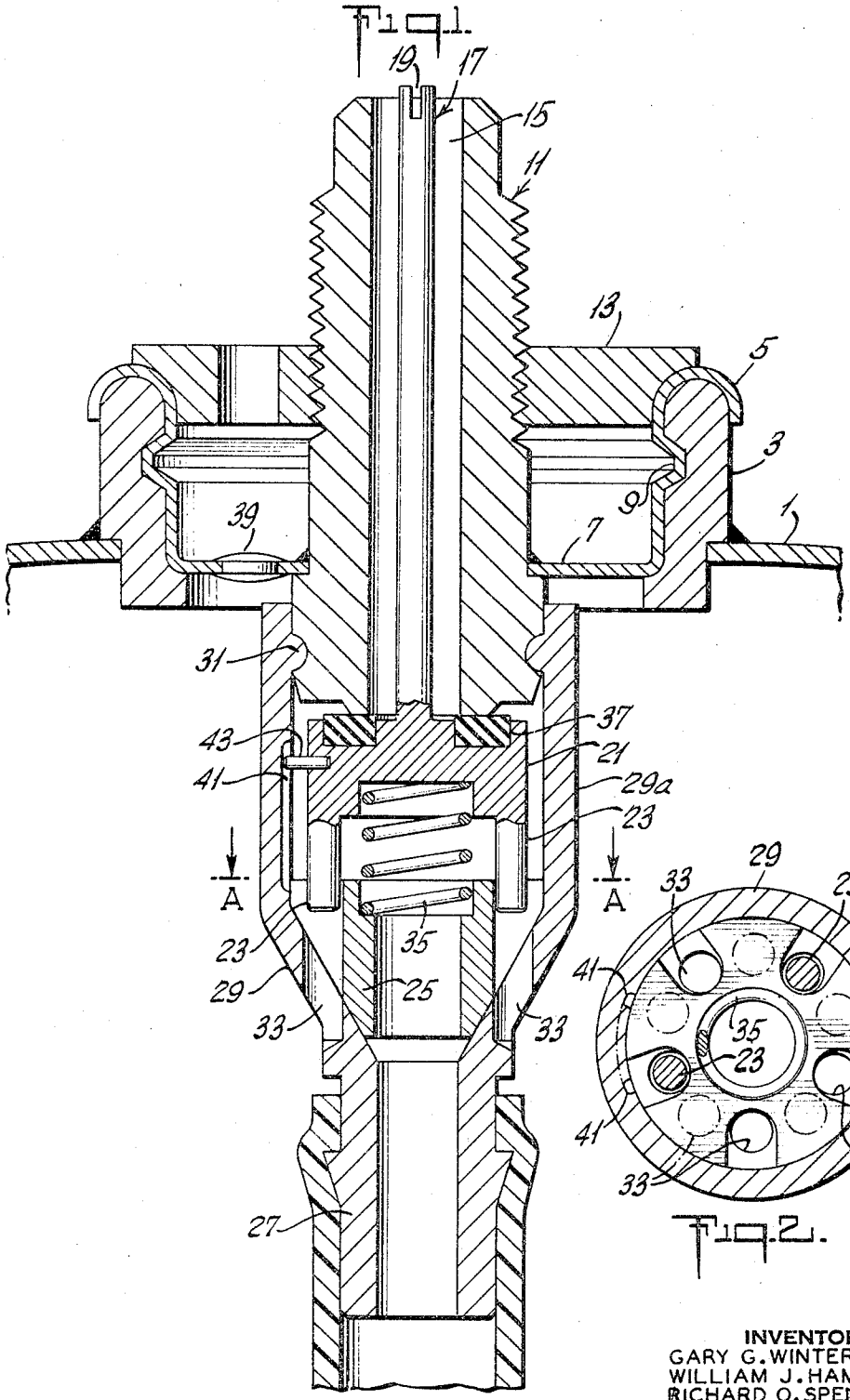


Fig. 2.

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Fig. 3.

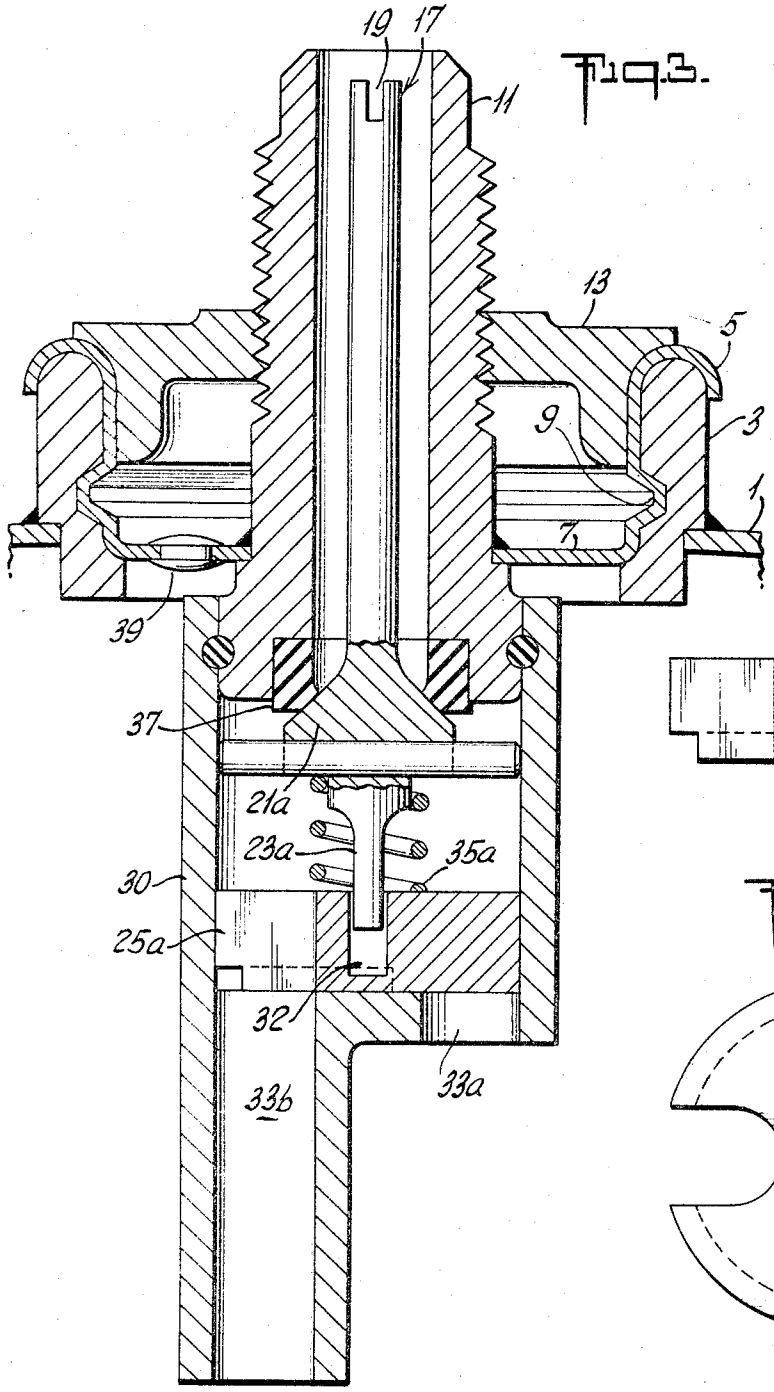


Fig. 4.

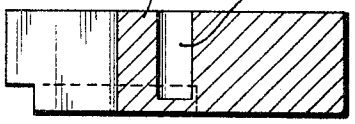
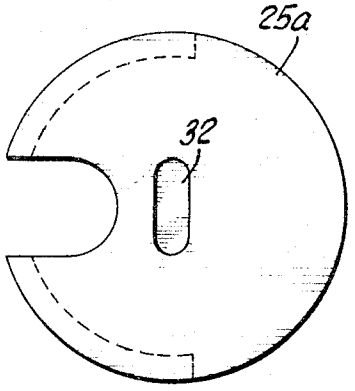


Fig. 5.



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VAPOR-LIQUID WITHDRAWAL VALVE

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Int. Cl. B65d 83/00; F16k 45/00

ABSTRACT OF THE DISCLOSURE

A device has been provided for attachment to the opening on top of a pressurized container and adapted to selectively withdraw liquid or vapor therefrom. It comprises a closure cap such as a standard aerosol valve cap fitted within a spud attached to the opening of the container. The closure cap has a closed bottom end with a central opening adapted to threadedly receive a hollow externally threaded body. Inside the container, there is a funnel-shaped structure defined by a lower tubular member and an upper truncated conical section securely engaged into the closure cap and containing a plurality of circumferentially disposed perforations for the passage of vapor. A depressible pin extends through the hollow externally threaded member and is integrally attached at its lower end to an upper seat from which projects a plurality of rotational pins. A lower seat defined by a circumferentially serrated section is disposed below and adapted to be rotatingly driven by the rotational pins so as to permit the passage of liquid or vapor selectively by proper positioning of the serrated sections of the lower valve seal with respect to the vapor passages.

This invention relates to valves and in particular to a specially constructed valve suitable for selective withdrawal of vapor or liquid from a pressurized container.

In withdrawing fluids from a pressurized vessel containing both vapor and liquid under pressure, it is sometimes desirable to withdraw vapor and at other times to withdraw liquid only. There are several valves or similar devices which, when mounted on or attached to the top of such pressure vessels permit the withdrawal of vapor or liquid selectively. Typical valves of this kind are described, for example, in U.S. 2,365,423 and 3,021,870. However, these valves as well as many others which are currently in use are often complicated to construct and expensive to fabricate.

In the shipment of refrigerants in recent years it has become increasingly necessary and commercially desirable to ship the refrigerant (usually fluorocarbons) in low-cost, pressurized cylinders without a conventional discharge valve. Simplicity of construction and economy of fabrication of such cylinders have become of paramount commercial importance and have in turn resulted in the use of so-called "disposable" cylinders which can be discarded after one use by the consumer. Simplicity in cylinder construction has in turn necessitated simplicity and economy of the types of dispensing mechanisms and devices which must be employed with such cylinders.

Accordingly, this invention provides a valve device which can be readily attached on a pressurized vessel containing both vapor and liquid under pressure and which can be conveniently operated to withdraw vapor or liquid selectively. The valve described herein is simple and inexpensive to construct and is therefore readily adaptable for use with such disposable cylinders, although it is equally adaptable for reusable cylinders.

The present invention will be more clearly comprehended from the following detailed description taken in

connection with the accompanying drawings in which like numerals are employed to designate like parts:

FIGURE 1 is a schematic view of the valve device of this invention;

FIGURE 2 is a top view of a section in FIGURE 1 taken along the line A—A;

FIGURE 3 is a schematic view of another embodiment of the valve device embodying the principles of this invention;

FIGURE 4 is a side view only of part **25***a* shown in FIGURE 3;

FIGURE 5 is a top view of part **25***a* shown in FIGURE 4.

Referring now specifically to FIGURE 1, numeral **1** designates a cylinder having a central opening to which a spud **3** is attached in a suitable manner. A typical aerosol valve cap such as a closure cap **5** with a flat bottom **7** is securely attached to the spud by the crimped sections **9** as shown in FIGURE 1. A hollow externally threaded body **11** is securely attached to closure cap **5** and is threadedly engaged with a stabilizing nut **13** which serves to maintain the valve body in an upright and stable position.

Extending centrally through the body **11** is a passage **15** through which centrally extends an elongated member **17** (hereafter depressor pin **17**) having a groove or a slot **19** at its top end which is adapted for the insertion of a screwdriver or a similar device in order to rotate the depressor pin in a clockwise or counter-clockwise direction. The depressor pin is integrally attached at its lower end to a valve seat **21** (hereafter upper valve seat) from which projects one or more rotational pins **23**. Depressor pin **17**, upper valve seat **21** and rotational pins **23** constitute a unitary structure which can be rotated in a clockwise or counter-clockwise direction with the rotation of the depressor pin. Rotational pins **23** are adapted to rotatingly drive lower valve seat **25** which is suitably positioned within the dip tube connector as will hereinafter be described.

Within the container there is shown a substantially funnel-shaped member defined by a vertically extending conduit **27**, a substantially truncated conical wall portion **29** (hereafter referred to as dip tube connector) and a further upward extension **29***a* adapted to be securely engaged into the lower end of the externally threaded body **11** as shown in **31**. Conduit **27** extends partially down within the cylinder and a plastic or rubber tubing (dip tube) can be attached thereto which extends to the bottom of the cylinder.

The dip tube connector contains one or more perforations **33** for the passage of vapor. The number of these perforations, their geometrical configuration and arrangement will be discussed hereafter.

The lower valve seat is a generally circumferentially serrated member as shown in FIGURE 2 which is disposed in the truncated wall portion of the funnel-shaped member and is adapted to be rotatingly driven by the rotational pins. A resilient member such as a spring **35** is suitably positioned between the upper part of the lower valve seat and the lower part of the upper valve seat with its lower end snugly fitted against the upper end of the lower valve seat and its upper end snugly fitted against the lower part of the upper valve seat. Spring **35** is adapted to be compressed by the downward movement of the depressor pin and the upper valve seat. Sealing element **37** attached to the upper valve seat insures against leakage when the valve is in its normal closed position. This sealing element can be constructed of plastic, rubber or rubber-like substance which would provide an effective seal between the interior of the cylinder and the hollow passage in the valve body.

A safety element **39**, such as fusible metal plug can

be placed in the bottom end of closure cap **5**. This safety element protects the cylinder against excessive pressure build-up, due to temperature rise therein.

The number of perforations in the dip tube connector is not per se critical but must otherwise correspond to the number of the serrated sections in the lower valve seat, as will become apparent from the description of operation of the valve. Similarly, the configuration of the perforations are not critical. They may be oval, circular, rectangular, square or any other shape, so long as sufficient flow area is available to prevent siphoning of liquid during vapor withdrawal operation.

The perforations in the dip tube connector are preferably circumferentially and equidistantly spaced. Thus, the serrated sections of the lower valve body must be similarly equidistant so as to assume a registering relationship with respect to the perforations. In other words, the serrated sections must completely cover these perforations during liquid withdrawal operation.

In operation, the operator would insert a screwdriver into slot **19** in the depressor pin and rotate the pin in a clockwise or counter-clockwise direction, thereby rotating the upper valve seat and the rotational pins which, in turn, will rotate lower valve seat **25**. The relative position of lower valve seat **25** during liquid withdrawal operation is shown in FIGURE 2 wherein the dotted circles indicate the position of vapor passages **33** during liquid withdrawal. As indicated in FIGURE 2, the vapor passages are blocked off by the serrated sections of the lower valve seat and only liquid can be withdrawn from the cylinder through the dip tube and the hollow passage in the valve body. When vapor withdrawal is desired, the depressor pin is first turned in a clockwise direction thereby rotating the upper valve seat and the rotational pins in a clockwise directon. This in turn results in the alignment of the lower valve seat in such relationship that vapor passages are unobstructed as indicated by the solid circles in FIGURE 2, therefore permitting the withdrawal of vapor from the cylinder through the vapor passages and the hollow passage in the valve body. A charging hose can be attached threadedly onto the valve body to depress the depressor pin thus opening the valve and permitting the withdrawal of the preselected vapor or liquid.

A position indicating device attached to the valve body, or an internal guide stop can be employed to guide the operator during liquid or vapor withdrawal. Thus a position indicator (not shown) attached to the valve body would instruct the operator how far he should turn the depressor pin in order to withdraw either liquid or vapor from the cylinder. Alternatively, an internal guide stop consisting of a groove **41** and a pin **43** engaged therein could be employed to indicate when the serrated sections of the lower valve seat are in registering relationship with the vapor passages, in which case liquid is wthdrawn, or they are out of such registering relationship, in which case only vapor is withdrawn from the cylinder. The groove **41** extends a specific predetermined distance around the dip tube connector and a predetermined degree of counter-clockwise rotation of the depressor pin positions pin **43** at the counter-clockwise end of the groove, so that, for example, only liquid can be withdrawn. Clockwise rotation of the depression pin will position pin **43** at the clockwise end of groove **41**, thus resulting in vapor withdrawal.

Although the valve device of this invention has heretofore been described with a certain degree of particularity, it should be emphasized that several modifications and revisions may be suggested in the light of the present disclosure which nevertheless fall within the purview of this invention. For example, the assembly represented by the closure cap **5** and body **11** may be made by a die casting or plastic molding or may be machined from bar stock, and then threadedly attached to the cylinder spud. In this type of construction the stabilizer nut **13** would not be necessary.

One modification of this valve is illustrated in FIGURE 3 wherein, there is shown, in addition to those parts which are common to both FIGURES 1 and 3, a hollow valve body **30** which is sealably attached to the lower end of the externally threaded hollow body **11** and having two openings **33***a* and **33***b* in the bottom end thereof which communicates respectively with the vapor zone and liquid zone in the pressurized container. A dip tube (not shown) extends from valve body **30** to the bottom of the container and provides the communication to the liquid zone.

The lower end of depressor pin **17** in this embodiment is an enlarged substantially truncated conical head **21***a* which serves to seal hollow externally threaded member **11** when the valve device is in its normal closed positon. An upper seat **37** is integrally attached to body **11** as shown in FIGURE 3. A single rotational pin **23***a* projects downwardly from head **21***a*. A rotatable lower seat **25***a* (see FIGURES 4 and 5) is suitably positioned within valve body **30** below the rotational pin. Seat **25***a* contains a groove or a depression **32** in its upper surface which is aligned with and adapted to receive the rotational pin. Thus lower seat **25***a* is rotatably driven by the rotational pin.

In operation, the depressor pin may be turned clockwise or counter-clockwise as was previously described in connection with the description of operation of the valve described in FIGURE 1. When rotated in a clockwise direction, lower seat **25***a* will be rotated in a clockwise direction by the rotational pin until liquid passage (opening **33***b*) is completely obstructed thus only permitting vapor withdrawal from the container. By turning the depressor pin in a counter-clockwise direction, lower seat **25***a* can be made to rotate until the vapor passage (opening **33***a*) is completely obstructed in which case only liquid can be withdrawn from the container. Thus it can be seen that 180° rotation of the lower seat **25***a* in a clockwise or counter-clockwise direction will result in complete obstruction of the liquid passage or vapor passage thus resulting in selective withdrawal of vapor or liquid respectively.

What is claimed is:

1. A device to be attached to an opening on top of pressurized container for the selective withdrawal of vapor or liquid therefrom, comprising, in combination, a receptacle member with a closed bottom having a substantially central opening therein, said receptacle member being securely positioned into the opening of said pressurized container; a hollow externally threaded valve body with an upper end and a lower end extending through said opening in the bottom of said receptacle member and being securely engaged thereby, a substantially funnel-shaped member inside said pressurized container defined by a downwardly extending hollow member having a lower end and an upper end and a substantially truncated conical wall portion extending from said upper end, and engaged with the lower end of said valve body, said truncated wall portion having a plurality of circumferentially arrayed perforations; an elongated depressible member having an upper end and a lower end and extending substantially centrally through said hollow externally threaded member; an upper seat member attached to the lower end of said elongated depressible member; a plurality of pin members downwardly projecting from said upper seat member; a lower seat member defined by a circumferentially serrated member disposed below said upper seat member and adapted to be rotatingly driven by said pin members so as to align the serrated sections of said circumferentially serrated member in register or nonregister relationship with respect to the perforations in said truncated wall portions, and a resilient member disposed between said upper seat member and said circumferentially serrated member.

2. A device as in claim **1** wherein the perforations in said truncated wall portions are equidistantly spaced.

3. A device to be attached to an opening on top of pressurized container for the selective withdrawal of vapor or liquid therefrom, comprising, in combination, a receptacle member with a closed bottom having a substantially central opening therein, said receptacle member being securely positioned into the opening of said pressurized container; a hollow externally threaded body having an upper end and a lower end extending through the opening in the bottom of said receptacle member; a hollow valve body subtending said hollow externally threaded body and sealably attached thereto and having a first opening at the lower end thereof arranged to communicate with the vapor zone in said pressurized container, and a second opening in the lower end thereof arranged to communicate with the liquid zone in said pressurized container; an elongated depressible member extending through said hollow externally threaded body and having an enlarged lower end adapted to seal said hollow externally threaded body, an upper seat member integrally attached to said enlarged end of said elongated depressible

member, a rotational pin member downwardly projecting from said enlarged end of the elongated depressible member; a rotatable lower seat member having a depression aligned with and adapted for the insertion of said rotational pin member so as to rotatingly drive said rotatable lower seat member.

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U.S. Cl. X.R.

137—636.4, 210, 588