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DISPENSING APPARATUS

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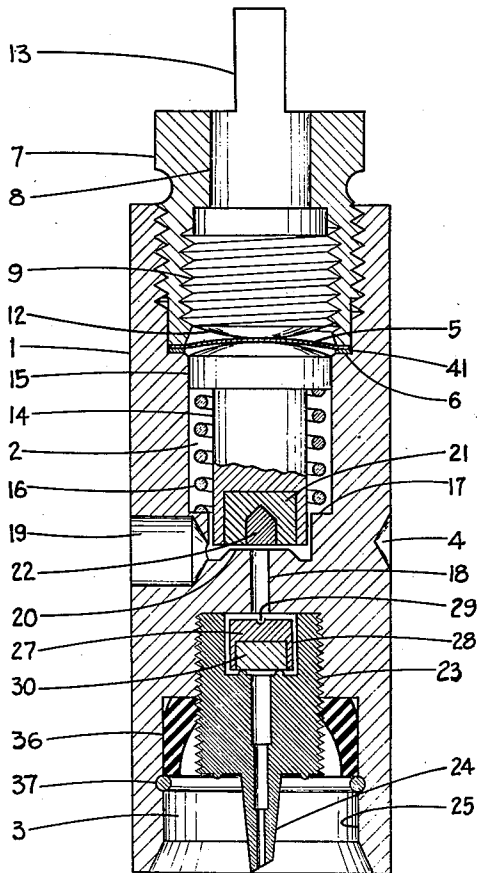


Fig 1

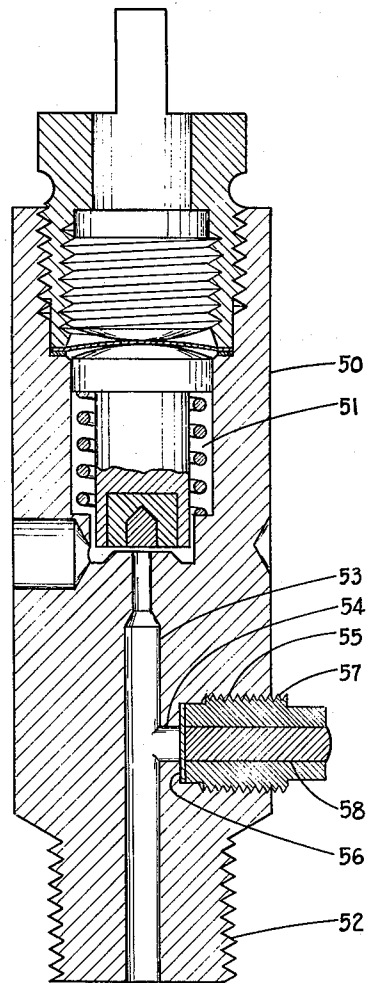


Fig 2

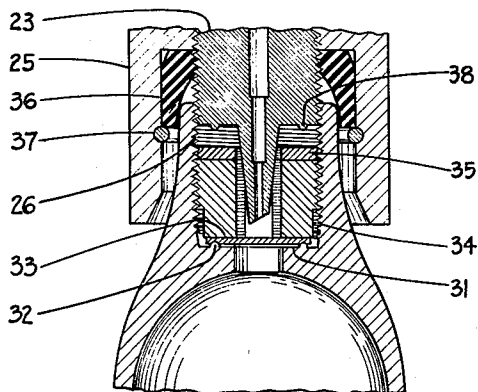


Fig 3

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DISPENSING APPARATUS

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4 Claims. (Cl. 221—73.5)

This invention relates to devices for controlling the discharge of compressed-or-liquefied gas containers, particularly devices for opening, and controlling the discharge of, containers of the puncturable-closure type; and has for its object the provision of simple and efficient devices of this type which are exceptionally gastight and are especially adapted for the dispensing of anesthetic gases.

Essentially, the devices of this invention consist of a unitary combination of a leakproof valve of the packless type and a coupling for connecting the valve with a gas container; the device may also include a check valve positioned between the main valve and the coupling, and adapted to prevent recharging of the container through the main valve; preferably, the device is adapted to be assembled with the container separately from the gas-dispensing machine (e. g., an anesthetizing machine), and the assembly connected with the dispensing machine when desired.

A preferred embodiment of the invention is illustrated in the accompanying drawing, wherein: Fig. 1 is a vertical sectional view of a device embodying the invention;

Fig. 2 is a vertical sectional view of a modification of the device of Fig. 1; and

Fig. 3 is a fragmentary vertical sectional view corresponding to Fig. 1, and illustrating a stage in the coupling of the device with a gas container.

In the device illustrated in Fig. 1, a metal valve body 1 is provided (as by boring and counter-boring) with a cylindrical valve chamber 2 at one end and a cylindrical coupling recess 3 at the other end. The device shown is adapted to fit in the yoke of an anesthetizing machine, being suitably clamped therein as at depression 4 on the side of the valve body. Valve chamber 2 is divided into two parts by a flexible sealing diaphragm 5, resting on an annular shoulder 6 and clamped thereto by means of an axially-apertured, externally-threaded compression nut 7 screwed into the correspondingly internally-threaded upper part of chamber 2. A resilient gasket 41 (e. g., of fiber) is interposed between the diaphragm edge and shoulder 6 to assure perfect contact. A valve-stem screw 8, externally-threaded as at 9, operates in the axial aperture of the compression nut, which has a corresponding internal threading. The valve-stem screw has a convex bottom 12 to which a suitable lubricant may be applied to permit ready rotation while engaging and flexing the diaphragm 5; and the top 13 of the valve-stem screw is noncircular in cross section or other-

wise adapted to receive a handwheel (not shown) or other operating means.

The lower part of the valve chamber 2 is occupied by a valve stem 14 having an enlarged head 15 slidable in the chamber; the top of the head 15 is convex and is held in contact with (and consequently follows the motion of) the bottom of diaphragm 5 by means of a coiled tension spring 16 surrounding the valve and retained between said head and an annular ledge 17 in the chamber. An axial passageway 18 leads into the bottom of the valve chamber, and a side exit 19 leads from the valve chamber to the gas dispensing machine (not shown). Passageway 18 terminates in a raised valve seat 20 at the bottom of the chamber, which is adapted to cooperate with the lower face of valve stem 14 to control the passage of gas. The lower face of the valve stem is specially constructed to prevent sticking thereof to the valve seat and/or protrusion thereof into passageway 18; in this construction, the passageway is closed by a "floating" plug 22 of hard metal (e. g., of drill rod) larger in diameter than the passageway, the plug being set in a soft-metal or alloy insert 21 (e. g., a mixture of copper, tin, and lead). Preferably, the valve stem and spring are cadmium-plated to prevent corrosion thereof.

Passageway 18 leads into a hollow bottom plug 23, which terminates in a hollow piercing point 24 adapted to puncture the soft-metal closure of a gas container.

Preferably, a check valve is provided between the piercing point and the valve chamber, to prevent refilling or recharging of the coupled gas container and, especially in the case of anesthetic dispensing apparatus, to prevent other gases, present in the apparatus under accidentally higher pressures, from "blowing up" said gas container or contaminating the contents thereof. As shown in Fig. 1, the check valve comprises a gravity-operated hard-metal plug 27 loosely slidable in a recess 28 in bottom plug 23; in effective position (i. e., to prevent recharging), the plug 27 rests on an annular bead at the base of recess 28, preventing passage of gas down into the extension of passageway 18 leading to the piercing point. When the device is properly used, the pressure of the gas being discharged forces plug 27 upwards, and the gas passes around it and along a trough 29 in the top of plug 27 into passageway 18. Plug 27 has set in its bottom a soft-metal insert 30 of greater diameter than the annular bead at the base of recess 28, and cooperating therewith to effectively close the passageway.

The coupling for the gas containers is situated

within a recess formed by skirt 25 (Fig. 1), depending from the valve body and surrounding the piercing point. Bottom plug 23 is externally threaded, part thereof being screwed into a correspondingly threaded recess in the bottom of the valve body, and the exposed part being adapted to receive the correspondingly threaded neck of a gas container. At the base of the annular recess formed by skirt 25 and bottom plug 23 is seated a resilient cup washer 36 (e. g., of rubber), retained in place by a split ring 37 seated in an annular recess on the inside wall of skirt 25.

The coupling operates in three stages, the first of which is illustrated in Fig. 3, namely, the effecting of a temporary seal before the puncturable closure of the gas container is pierced. The provision of a temporary seal permits tolerances in the dimensions of the coupling, piercing point, and gas container without the danger of losing gas during the coupling and the puncturing of the closure. The container shown in Fig. 3 is of the type described and claimed in copending application Ser. No. 196,824 filed March 19, 1938; it has an elongated internally-threaded neck 26 and a seat 31 therein provided with an annular bead 32; a soft-metal sealing disc 33 (e. g., of aluminum) is clamped between the seat and an axially apertured, externally-threaded plug 34 screwed into the neck; resting on top of the plug 34 and frictionally engaging the threaded wall of the neck is a soft-metal washer 35 (e. g., of aluminum). At the temporary sealing stage shown in Fig. 3, the lip of the gas container neck contacts washer 36; and as the neck is further screwed upon the bottom plug 23, the puncturable closure is pierced by hollow piercing point 24, and then a permanent all-metal gas-tight seal is effected by the clamping of soft-metal washer 35 between plug 34 and bottom plug 23. An annular bead 38 on the bottom of plug 23 makes for better contact with the washer 35.

In operating the valve (shown open in Fig. 1), clockwise rotation of valve-stem screw 8 to thread it downwards flexes diaphragm 5 downwards, which in turn forces valve stem 14 down (against the action of spring 16) to close passageway 18; reverse rotation of the valve-stem screw permits the spring 16 to act in opening the valve.

The diaphragm construction of the valve eliminates the possibility of leakage of gas around the valve stem screw and obviates the necessity of troublesome, replacement-requiring packing. The diaphragm may be in the form of a thin metal disc or a series of thin disc laminations. In view of the small disc diameter (about $\frac{3}{4}$ inch) necessitated by the dimensions of a valve body to fit the yoke of a standard anesthetic machine, the materials ordinarily employed for valve-sealing diaphragms are unsuitable. It has been found that "beryllium-copper," a suitably-heat-treated beryllium-nickel-copper alloy, is eminently suited for the construction of valve-sealing diaphragms, and makes possible the successful construction of diaphragm-type valves of small dimensions, such as these valves for standard anesthetic machines. Diaphragms constructed of this alloy are extremely resilient, noncorrodible, and nonfatiguing.

The device shown in Fig. 2 is a modification of that shown in Fig. 1 with respect to the coupling

device. In this modification, the metal valve body 50 is provided with a valve chamber 51 at one end and operating mechanism therein identical with that described in connection with Fig. 1; the other end is provided with an externally threaded tapered extension 52 adapted to be coupled with a standard gas cylinder. An axial passageway 53 leads from the bottom of said extension to the valve chamber, and, preferably, is provided with a safety passage 54 having an enlarged, internally-threaded exit 55. The safety passage is closed by a soft-metal rupture disc 56, clamped between the base of the enlarged exit 55 and an axially-apertured, externally-threaded plug 57, the aperture of which is filled with a fusible filler 58 (e. g., an alloy consisting of 30% lead and 70% tin). This safety plug permits the escape of the gas content of a container when the surrounding temperature reaches the melting point of the fusible filler.

The invention may be variously otherwise embodied, within the scope of the appended claims.

We claim:

1. A unitary device for opening, and controlling the discharge of, compressed-or-liquefied-gas containers of the puncturable-closure type, comprising a valve, an externally threaded coupling for connecting the valve with a gas container, a hollow piercing point associated with the coupling for puncturing the closure of a gas container, and resilient means outside of the coupling for effecting a temporary seal with the container before the closure is punctured.

2. A unitary device for opening, and controlling the discharge of, compressed-or-liquefied-gas containers of the puncturable-closure type, comprising a valve, an externally threaded coupling for connecting the valve with a gas container, a hollow piercing point associated with said coupling for puncturing the closure of a gas container, and resilient means outside of the coupling for effecting a temporary seal with a gas container before the closure is punctured, said coupling being adapted to effect a permanent, gastight, all-metal seal with the container after the closure is punctured.

3. In a device for opening, and controlling the discharge of, compressed-or-liquefied-gas containers of the puncturable-closure type, a valve body having a depending annular skirt, an externally-threaded axially apertured plug situated within the skirt and terminating in a hollow piercing point, and a resilient annular washer retained between said skirt and plug and adapted to effect a temporary seal with a gas container before the closure thereof is punctured.

4. In a device for opening, and controlling the discharge of, compressed-or-liquefied-gas containers of the puncturable-closure type, a valve body having a depending annular skirt, an externally-threaded axially apertured plug situated within the skirt and terminating in a hollow piercing point, and a resilient annular washer retained between said skirt and plug and adapted to effect a temporary seal with a gas container before the closure thereof is punctured, the plug being adapted to cooperate with the gas container to effect a permanent, gastight, all-metal seal therewith after the closure is punctured.

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