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PLUG FOR GAS CONTAINERS

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Inventor

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The present invention relates to sealing plugs for fluid containers.

It will be described in connection with containers for gas, with which it is particularly designed to be used, although it will be understood that its use is not confined to that specific purpose.

In the transportation of rare, lethal or explosive gases in containers, great care must be exercised to prevent their escape and to guard against possible explosion by reason of excessive pressure; with consequent damage to life and property, for those containers if subjected to high temperatures or other conditions which cause expansion of their contents to the danger point, will, unless relieved, be exploded.

It is customary to provide these containers with a sealing plug when in transportation or storage, and that plug may be removed, or be of such construction, that the control valve ordinarily used with such containers for filling or drawing off the contents, may be attached to the container or directly to the sealing plug. In the present instance, the sealing plug is shown as capable of receiving the control valve without removing the plug from the container.

In the accompanying drawings I have shown two embodiments of my invention, but it will be understood that the disclosure is illustrative, and that I do not restrict my invention to the mechanical details, as mechanical expedients other than those herein shown and described may be adopted without departing from the range of my invention.

Referring to the drawings:

Fig. 1 is a central vertical section of a plug embodying my improvement.

Fig. 2 is a similar view of a plug with a slightly different form of sealing valve.

Fig. 3 is a view showing the control valve for filling the container or drawing off from the container, mounted directly in the plug.

Referring to the drawings by numbers, 10 indicates the sealing plug having the threaded nipple 11 designed to be screwed into an orifice in the container, (not shown) so as to give a gas tight fit. The said plug 10 has, at its lower end, a valve receiving chamber 12 in which is mounted a valve 13 seating upwardly against a valve seat 14 at the upper end of the chamber, there being provided below the valve 13 a perforated disk 15 to retain the valve 13 in the chamber 12. The valve 13 has the upwardly projecting stem 16 which passes upwardly through a passage 17 leading from the chamber 12, and delivering to the threaded open-ended chamber 18 in the upper part of the plug.

The valve 13 has the passage 19 extending through its body and stem and delivering to the recess or chamber 18 referred to, and the lower end of the passage 19 is normally sealed by a breakable seal 20 of any suitable material which will fracture or break under a predetermined pressure, this seal 20 being secured in any suitable manner, as, for example, by the flanged ring 21, to the bottom of the valve.

With the construction thus described, it will be observed that when the plug 10 is fitted in the neck of a container, that the pressure within that container passing through the perforated disk 15 and standing against the valve 13, will hold that valve to its seat 14 and effectively prevent the escape of the container contents. If, for any reason, the pressure within the container should rise to the danger point, that pressure will be relieved by breaking of the sealing disk 20 permitting the pressure to pass by the passage 19 to the recess 18 of the plug. In transportation these plugs 10 are ordinarily capped to prevent tampering with and unseating of the valve 13. The cap 22, which I have provided, is herein shown as threaded exteriorly to the plug, and in order to further seal the plug and prevent leakage of any gas which might possibly seep past the valve 13, I provide the cap 22 with a breakable seal 23 seating preferably upon a packing disk 24 so as to effectually seal it upon the top of the plug. The disk seals the opening 25 in the bottom of the cap which leads to the lateral openings 26 in the top of the cap leading to atmosphere. It will be seen that the second seal furnishes a double safeguard against accidental leaking, but that in event of excessive pressure, breakage of the disk 20 and passing of that excessive pressure into the recess 18 will break the sealing disk 23, and the gas can then escape by the lateral
the passage to the atmosphere. The arrangement of the passage 26 laterally in the cap is preferable, as this prevents the possibility of accidental puncturing of the disk 23 which might occur if the vertical passage 25 led directly to atmosphere.

With this construction, it is possible to provide a sealing plug which will very effectively prevent the escape of gas, but which, if the pressure within the container becomes abnormal, will at once, by reason of the breakable disks, relieve that pressure and prevent explosion of the container.

It will be observed that the stem 16 of the valve 13 projects upwardly into the chamber 18 which receives the tapering screw-threaded plug of the control valve used in filling or drawing off the container. When it is desired to fill or draw the contents of the container, the cap 22 will be removed and the control valve screwed down into the chamber 18 until its lower end impinges upon the projecting tail 16 of the valve, whereupon the valve 13 will be forced from its seat and the gas is then free to pass from the container around the valve 13, and, by passage 17, enter the control valve, which may be of any suitable type, as, for example, that type shown in Fig. 3.

In that form of the invention shown in Figs. 2 and 3, the plug 27 is the same in all of its essential features as the form shown in Fig. 1, being provided with the lower chamber 28, the upper valve receiving chamber 29, and the cap 30 exactly as heretofore described.

The valve 31 is of the same general construction, having a port or aperture there-through, and seating against the valve seat 32 at the lower end of the passage 33 which connects the upper and lower plug chambers. The integral projecting tail 34 described in connection with the valve shown in Fig. 1 is dispensed with, and the ported valve 31 is provided with a relief valve 34 having a stem 35 projecting upwardly into the chamber 29, the stem 35 passing through a disk 36 threaded into the chamber 29 and having openings there-through for the passage of gas. Normally, the relief valve 34 will be held closed by the spring 37, which is strong enough to hold the relief valve 34 closed against normal pressure in the container which stands against the main valve 31 and the reduced lower end of the relief valve 34.

If excessive pressure be set up within the container, however, so that the danger point is reached, such abnormal pressure against the lower end of the valve 34 will unseat it against the pressure of the spring 37 and relieve pressure in the container, which pressure will bleed past the relief valve into the chamber 29. The cap 30 may be provided, if desired, with the breakable sealing disk 38 as an additional safeguard, which disk, if used, will be broken by the excessive pressure coming past the relief valve 34 and allow the pressure to bleed off through the relief passages in the cap, as in the manner described in connection with Fig. 1.

From the foregoing, it will be observed that a shipping plug which will effectually take care of excessive cylinder or container pressures is provided, and one in which after the pressure has been reduced to normal, will close and seal the container against further loss of gas.

In Fig. 3 is shown the plug illustrated in Fig. 2, and hereinbefore described, with the control valve 39 applied thereto. The control valve is threaded into the plug chamber 29, said valve being provided with a passage-way 40 leading to the filling inlet or the drawing off outlet 41. The valve 42 is provided to control the inlet or outlet 41, this valve seating upwardly against a suitable seat, and provided with a threaded or otherwise suitably formed stem which couples with a nut 44 or other suitable backing off device. The member 44 is rotatably mounted so that when turned in one direction, it will back the valve 42 off its seat and open the passage-way to the inlet or outlet 41, and when turned in the other direction will seat the valve.

The valve 42 is provided with a relatively long projecting tail 45 which traverses the passage 40 in the valve body, and is in alignment and in close proximity to the valve stem 33 of the valve 34, so that when the valve 42 is opened in the manner just described, the tail 45 will strike the stem 33 of the relief valve and force it, together with the main valve 31 downwardly, opening the main valve and permitting flow from the container to the interior of the valve 39.

It will be observed that there is sufficient clearance between the tail 45 of the valve 42 and the stem 33 of the relief valve so that if excessive pressure should be developed in the container when the valve 39 is in place, the relief valve 34 can still function and permit excess pressure to escape to the interior of the valve 35.

In order that that excess pressure may be relieved, if, while the valve 39 is in position, the relief valve 34 operates to bleed off the abnormal pressure, I provide an escape passage 46 in a suitably threaded nipple, which nipple is capped by a cap member 47 having a sealing disk 48, normally covering the passages 49 leading to atmosphere, in a manner similar to that described in connection with the sealing cap for the plug shown in Fig. 2.

From this, it will be observed that an ar-
rangement is provided which will permit the use of my plug with the usual control valve, and that the valved plug will function properly both to permit the filling of the container or drawing off of gas from the container, and also to relieve excessive pressures in the container, even though the control valve is in place.

Such changes as involve merely the exercise of mechanical skill and the adoption of expedients other than those herein shown to carry out my invention may be made without departing from the range thereof.

I claim:

1. A safety plug for sealing containers, comprising, in combination, a member adapted to engage an opening in a container and having a passage therethrough, a valve in said passage normally closed by pressure in said container and having an aperture therethrough, and destructible means closing said valve aperture.

2. A safety plug for sealing containers, comprising, in combination, a member adapted to engage an opening in a container and having a passage therethrough, a valve in said passage normally closed by pressure in said container and having an aperture therethrough, and means breakable under pressure closing said valve aperture.

3. A safety plug for sealing containers comprising, in combination, a member adapted to engage an opening in a container and having a passage therethrough, a valve in said passage normally closed by pressure in said container, a closure cap for said member having a vertical passage and a lateral passage delivering to atmosphere, and destructible means normally closing a passage in said cap.

4. A safety plug for sealing containers comprising, in combination, a member adapted to engage an aperture in a container and having a passage therethrough, a pressure closed valve for said passage normally closed by pressure in said container, a closure cap for said member having a vertical and a lateral passage delivering to atmosphere, and means breakable under pressure normally closing said vertical passage.

5. A safety plug for sealing containers comprising, in combination, a member adapted to engage an aperture in a container and having a passage therethrough, a valve for said passage having a port, means breakable under pressure normally closing said port, a closure cap for said member having a vertical passage and a lateral passage delivering to atmosphere, and means breakable under pressure normally closing said vertical passage.

6. Sealing means for containers comprising a part having a passage therethrough; a valve for said passage adapted to be closed by pressure in the container and provided with a port, means closing said port against normal container pressure, and means destructible under excessive container pressure closing the passage in said part outward beyond the valve.

7. Sealing means for containers comprising a part having a passage therethrough; a valve for said passage adapted to be closed by pressure in the container and provided with a port, means closing said port against normal container pressure, and a cap having a sealing diaphragm destructible under excessive container pressure closing the said passage outward beyond the valve.

8. A safety plug for sealing containers comprising in combination, a member adapted to engage an opening in a container, upper and lower chambers in the opposed ends of said member, a passage connecting said chambers, a valve having an aperture therethrough positioned in said lower chamber, said valve provided with a stem extending within the upper chamber when the valve is in the closed position, means normally closing the aperture in said valve, and means opening said aperture under excessive pressure in the container.

9. A safety plug for sealing containers comprising in combination a member adapted to engage an opening in a container and having a passage therethrough, a pressure closed valve normally closing said passage and adapted to be rendered inoperative under excessive container pressure, and means destructible under excessive container pressure closing said passage outwardly beyond said valve.

10. A safety plug for sealing containers comprising in combination a member adapted to engage an opening in a container and provided with outer and inner chambers connected by a passage, a pressure closed valve normally closing said passage against normal container pressure and adapted to be rendered inoperative under excessive container pressure, and a closure for the outer chamber destructible under excessive container pressure.

11. A safety plug for sealing containers comprising in combination a member adapted to engage an opening in a container and provided with an interiorly threaded outer chamber, an inner chamber and a passage connecting said chambers, a pressure closed valve normally closing said passage against normal container pressure and adapted to be rendered inoperative under excessive container pressure, and a closure for the outer chamber destructible under excessive container pressure.

12. Sealing means for containers comprising a part having a passage therethrough; a valve for said passage adapted to be normally closed by pressure in the container; and means destructible under ex-
cessive container pressure closing the passage in said part outward beyond the valve.
13. Sealing means for containers comprising in combination; a member adapted to engage an opening in a container and having a chamber to receive part of a control valve; a valve in said member normally closed by pressure in said container, and said pressure closed valve having a stem extending into said chamber when said valve is in closed position for engagement with said part of said control valve upon insertion of same into said chamber.
14. A safety plug for containers comprising in combination; a member adapted to engage an opening in a container and having a passage therethrough, destructible means closing said passage, and a valve in said passage adapted to be normally closed by pressure in said container and having provision for opening under abnormal pressure.
15. A safety plug for sealing containers comprising in combination; a member adapted to engage an opening in a container and provided with outer and inner chambers connected by a passage, said inner chamber having interior screw threads, a pressure closed valve normally closed by pressure in said container and arranged in said inner chamber, destructible means closing said outer chamber, and a perforated disk engaging the threads of the inner chamber for retaining the valve within said inner chamber.
In testimony whereof I have hereunto set my hand.

CHARLES T. FORD.