Jan. 19, 1954 J. J. HOPFIELD 2,666,545

CONTAINER HAVING A DISTORTABLE FLOW CONTROL MEANS

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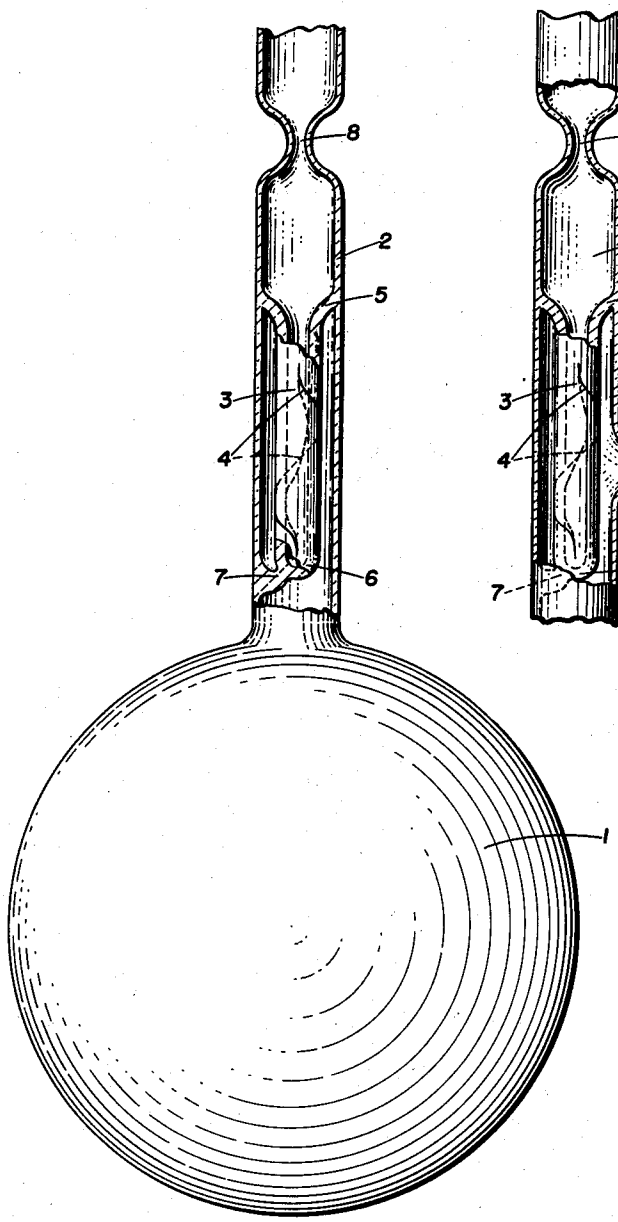


FIG. 1

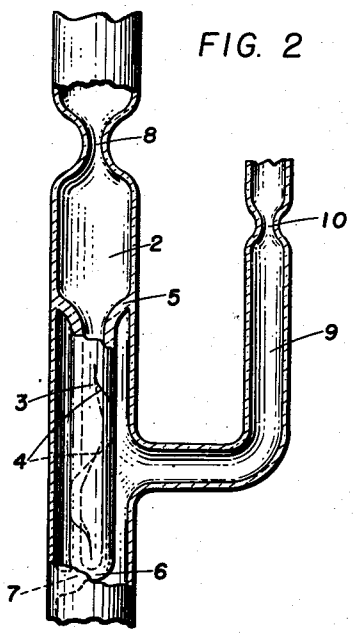


FIG. 2

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CONTAINER HAVING A DISTORTABLE FLOW CONTROL MEANS

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5 Claims. (Cl. 220—2.2)

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The present invention relates to valves and in particular to a unique means for controlling fluid flow from a glass or other container.

Heretofore, attempts to seal a vitreous container by fusion failed when the pressure of the contents exceeded that of the surrounding atmosphere, because the excess pressure invariably blew out the soft vitreous material at the prospective sealing point. The present invention prevents this by providing a region of sub-atmospheric pressure at the place the seal is to be produced, while the contents of the container proper nevertheless are at super-atmospheric pressure.

An object of the invention, therefore, is to provide a container for a gas, said container being of such construction that it may be sealed by fusion of a vitreous portion thereof even when the pressure of the gas in said container is super-atmospheric, and to provide a process for sealing such containers at super-atmospheric pressure.

Another object of the invention is to provide a valve that is simple to operate.

Other objects and many of the attendant advantages of this invention will be appreciated readily as the same becomes understood by reference to the following detailed description, when considered in connection with the accompanying drawings, wherein:

Fig. 1 is a representation of a glass bulb having a stem containing a valve, that may be used in practicing the invention; and

Fig. 2 is a fragmentary representation of a modified form, wherein an additional stem is provided.

Referring first to Fig. 1, there is shown a glass bulb having a tubular stem 2 sealed thereto, as indicated. Built into this stem is a special valve which consists of a preferably glass tube 3 having a normally closed helical crack 4 through its wall. This inner tube 3 is sealed to the outer tube 2 at 5 as shown, and the closed tip 6 of the tube 3 is secured to the tube 2 by fusing it to a glass projection 7 extending inwardly from said tube 2. A constriction 8 may be provided in the tubular stem 2 at the location of the intended seal.

It will be understood that, normally, in a glass tube a crack, that extends generally lengthwise of the tube and terminates at both ends in uncracked glass, will have negligible leakage unless the tube is twisted or otherwise stressed in such way that the crack is caused to open.

In the present instance, the crack 4 is arbitrarily "left-hand" helicoidal in nature, and is

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formed in the tube 3 which is secured at both its ends to the outer stem 2. The glass-blower makes the device with a torsional stress intentionally built into said stem, which stem normally pre-stresses the tube 3 in the direction of the left-hand twist of the helicoid, that is, looking down toward bulb 1 from the upper end of Fig. 1, the upper end of the tube 3 is stressed clockwise. This tends to hold the crack tightly closed.

To open the valve, a counterclockwise stress is applied to the outer end of stem 2. This operation may be accomplished by securing clamps to the stem adjacent its ends to apply the properly directed twisting moment thereto, namely, opposite to the closing direction above explained.

The procedure in filling and sealing the vessel 1 is that first the inner tube 3 is stressed by twisting the outer stem to open the helicoidal crack 4, thus establishing communication with the interior of the vessel 1 through said stem 2. While the crack 4 is thus held open, any air or gas initially in the vessel 1 may be exhausted through the stem, and thereupon the desired gaseous contents may be introduced through the crack, until the intended super-atmospheric pressure is attained in the vessel 1. The twisting stress is then removed from the stem 2, thus causing crack 4 to close. This substantially seals the vessel 1 from the portion of its stem 2 beyond the valve tube 3, even if a minute leak still remains.

The portion of the stem 2 containing the constriction 8 may now be evacuated to a sub-atmospheric pressure, and the constriction 8 sealed immediately by fusion, in the conventional way. It then is immaterial if leakage continues through crack 4, since the final seal has already been made at 8.

A slight modification may be made in the glass vessel, and the procedure changed accordingly, to speed the exhaustion and filling. This arrangement is shown in Fig. 2 and consists in providing an additional tube 9, communicating with the interior of vessel 1. Through this tube the original gas may be exhausted much more rapidly than would be possible through the crack 4, and if desired the new gaseous contents could be introduced rapidly through the same tube 9, up to a point just below atmospheric pressure, whereupon the constriction at 10 could be sealed by fusion, and further gas introduced through the crack 4 until the desired final pressure is reached.

This modified procedure will save considerable time, particularly if many vessels are to be exhausted and filled. The auxiliary stem 9 may,

of course, be disposed at any desired location, either on the stem 2 or directly on the vessel 1, as convenience and the purpose of the vessel may dictate.

While a glass vessel is disclosed, it is to be understood that other materials may be used, such as silica. The term vitreous is used in the claims to embrace all such glass-like materials, that become plastic upon heating and may be sealed by fusion.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. A one-piece gas container, made entirely of vitreous material capable of withstanding internal super-atmospheric pressure, said container having a tubular stem affording a passage thereinto, a valve likewise made of vitreous material located in said stem and completely enclosed thereby, said valve comprising a tube having a helicoidal crack therein that may be opened by forcible twisting of said tube, the inner end of said tube being sealed, and being fused to an adjacent portion of the tubular stem, the other end of said tube being open and sealed hermetically to the surrounding portion of the tubular stem, throughout the entire periphery of said tube, said valve being initially internally stressed in the sense to close the crack, whereby it may be opened by stressing it in the opposite sense by correspondingly twisting the tubular stem.

2. A gas container as defined in claim 1, having additionally a side tube communicating with the tubular stem, between the hermetic seal and the container.

3. A container made of vitreous material, said container having a hollow stem affording a passage thereinto, a valve likewise made of vitreous material, located in said stem and completely enclosed thereby, said valve comprising a wall portion having substantial length along the longitudinal axis of the stem and having its ends sealed within said stem and obstructing passage therethrough, said wall portion having a helicoidal crack therein that may be opened by forcible distortion of said stem, said crack extending in longitudinal relationship with respect to the stem and being initially internally stressed in the sense to close the crack whereby it may be opened by stressing it in the opposite sense by correspondingly distorting the hollow stem, for permitting fluid flow through the valve.

4. A container as defined in claim 3, having additionally a hollow side tube communicating through a portion of the stem with the container.

5. A fluid container having a hollow stem affording a passage thereinto, a valve located in said stem and completely enclosed thereby, said valve comprising a tube having a helicoidal crack therein that may be opened by forcibly twisting said tube, one end of said tube being closed and secured to an adjacent portion of said stem, the other end of said tube being open and sealed to the surrounding portion of the stem throughout the entire periphery of said tube, said valve being initially internally stressed in the sense to close the crack, whereby it may be opened by stressing it in the opposite sense by correspondingly twisting the stem.

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