March 22, 1966 Z. J. LANSKY ETAL 3,241,700

CONTAINER FOR FLUIDS UNDER PRESSURE

Filed Oct. 16, 1963

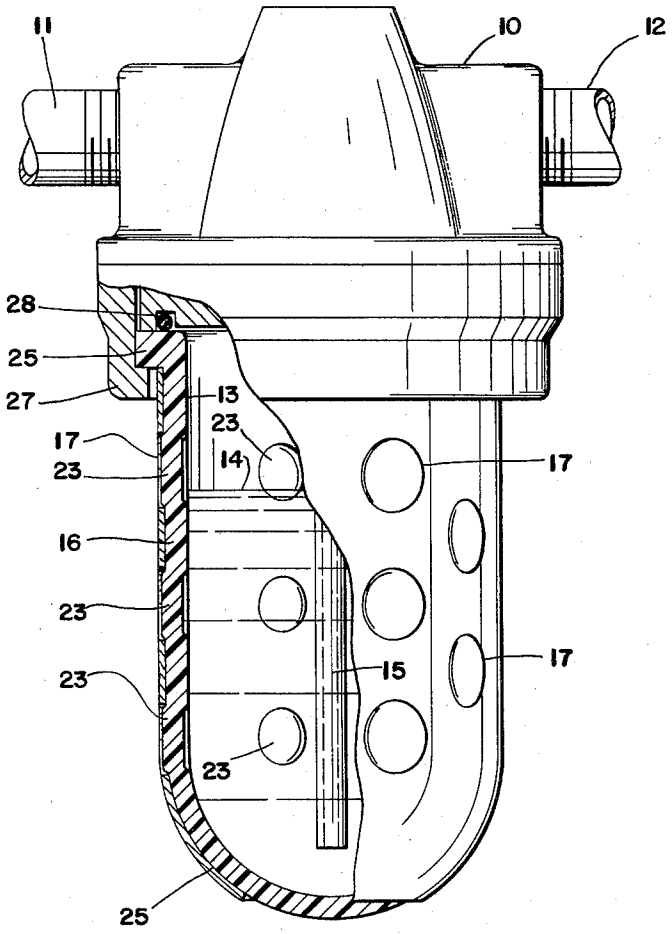


Fig. 1

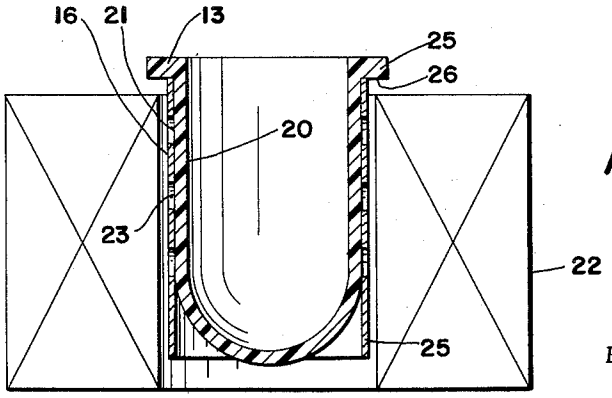


Fig. 2

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3,241,700

Patented Mar. 22, 1966

3,241,700

CONTAINER FOR FLUIDS UNDER PRESSURE

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Filed Oct. 16, 1963, Ser. No. 316,739

1 Claim. (Cl. 220—3)

This invention relates to containers for fluids under pressure and more particularly to transparent bowls for lubricators and filters for use in pneumatic power systems.

In airline lubricators of the general type disclosed in Patent 2,889,009, a liquid lubricant is contained within a transparent bowl which is attached to a body member having connection to a pipe line for delivering air under pressure to a pneumatically operated device. The liquid lubricant is exposed to the air under pressure whereby it is forced through a pick-up tube extending into the bowl and through passages in the body so as to enter the air stream passing through the body in atomized form for lubricating the device being operated. With this arrangement, the bowl containing the lubricant is exposed to the full operating pressure of the system. Since it is desirable to have the bowl of transparent material so that the level of the lubricant is readily visible, it is a common practice to make the bowl of glass or a plastic. However, glass and some of the plastics are fragile and break when accidently struck with an object, or they burst due to excessive internal pressure. Such breakage or bursting of glass or fragile plastics can be dangerous to persons because of flying particles and may also cause shut down of the pneumatic system until the bowl has been replaced.

In recent years, shatter-proof transparent plastics, such as polycarbonates, have come into use for bowls on lubricators of this type. These plastics have sufficient ductility to prevent shattering under impact and ordinarily do not shatter when they burst due to excessive internal pressures. However, these ductile plastics are subject to attack by certain chemicals which may be the base or an additive in the lubricant, as for example, detergent in detergent oils, carbon tetrachloride, and phosphate esters, which chemicals cause tensile stresses to build up within the plastic material. When the bowls are thus subjected to tensile stresses because of chemical attack, their ability to withstand bursting due to internal fluid pressure is greatly reduced and moreover the ductility is impaired so that bursting will cause the bowl to shatter into sharp fragments and thus endanger personnel.

To overcome the effects of chemical attack upon bowls of polycarbonate and like ductile plastics, applicant has devised a perforated metallic shield and a method of applying the same to the bowl so that the bowl is placed under compressive stresses for counteracting tensile stresses resulting from chemical attack and for interlocking the shield and bowl to prevent inadvertent separation thereof.

It is thus an object of the present invention to provide a transparent bowl of polycarbonate or other ductile plastic with a perforated metal shield which permits the interior of the bowl to be viewed and which prestresses the bowl to prevent weakening by chemical attack.

It is another object to provide a bowl and shield of the type described in which the shield is interlocked with the bowl to prevent separation therefrom.

It is another object to provide a method of attaching a perforated metallic shield to a bowl of ductile plastic whereby the bowl is placed under compressive stress and interlocked with the shield to prevent separation.

Other objects of the invention will be apparent from the following description and from the drawings in which:

FIG. 1 is a view, partly in cross section, of a lubricator with a perforated metal shield contracted upon a ductile plastic bowl, and

FIG. 2 is a cross section view of the bowl and shield within a magnetic forming device before contraction of the shield upon the bowl.

An airline lubricator fitted with a plastic bowl in accordance with this invention may include a body member 10 connected to an air supply line 11 and an air delivery line 12 and having a bowl 13 of transparent ductile plastic attached thereto and containing a liquid lubricant 14. The body 10 has passages, not shown, for directing air under pressure from supply line 11 into the interior of the bowl for pressurizing lubricant 14 to force the latter upwardly through pick-up tube 15 to other passages (not shown) for causing it to enter the air in delivery line 12 in atomized form.

A cylindrical metal shield 16 having a plurality of circular perforations 17 is assembled upon the plastic bowl 13 in a manner to impose compressive stresses upon the latter and so that portions of the plastic bowl project into the perforations 17 to lock the bowl and shield against accidental separation.

As shown in FIGURE 2, bowl 13 is initially formed with a cylindrical wall 20 having a smooth outer surface 21. The metallic shield 16 is initially formed in cylindrical shape with an inner diameter that is a close fit over the outer diameter of bowl wall 20 and is preferably no smaller than such diameter. After the metal shield has been slipped over the plastic bowl as shown in FIGURE 2, the parts may be placed within a magnetic forming device indicated at 22 and the latter operated for imposing magnetic force upon shield 21 for contracting the latter in diameter. This magnetic force does not act upon bowl 13.

The metal shield 16, when contracted by the magnetic force, causes contraction of the plastic bowl in the areas between perforations 17 and thus imposes considerable compressive stress on the material of the plastic bowl in these areas. Meanwhile, the plastic material 23 which is opposite each perforation 17 remains substantially at its original diameter or location and thus enters the perforation as the shield is contracted. This effectively interlocks the shield and bowl to prevent displacement of the one from the other.

The magnetic force also causes contraction of the lower end 25 of the metal shield so that it intimately engages the curved lower end of the plastic bowl, as indicated in FIGURE 1.

The upper end of bowl 13 has a flange 25 whose lower face 26 is engageable by a clamp nut 27 for clamping the bowl against the lower end of body 10 with a resilient packing ring 28 providing a seal therebetween.

With shield 16 contracted upon bowl 13 as described, the shield protects the bowl against breakage from being struck by external objects. Also, the bowl is under compressive stress which compensates for tensile stresses imposed upon the bowl material by action of chemicals contained within lubricant 14, and thus the bowl is further able to resist bursting due to internal fluid pressure.

By placing the plastic bowl under an initial compressive stress it is also possible to use a thinner wall thickness than otherwise. Thus, as the bowl is pressurized its wall section goes from compression to a balanced stress and

then into tension, with the ultimate tension stress being much lower than if the bowl had not been placed under initial compression.

We claim:

A receptacle for liquid under pressure comprising a hollow cylindrical container of deformable polycarbonate plastic material, a perforated metal shield surrounding the container in tight contact therewith and having a wall thickness less than one-half the wall thickness of the container and having an inside diameter smaller than the initial outside diameter of the container, the portions of the container opposite the non-perforated portions of the shield being maintained by contact with said shield on a diameter smaller than the initial free state diameter of the container whereby said container portions are under compressive stress, the container portions opposite said perforations extending an appreciable distance into said perforations to lock the shield upon the container and to form a portion of the outer surface of the receptacle.

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