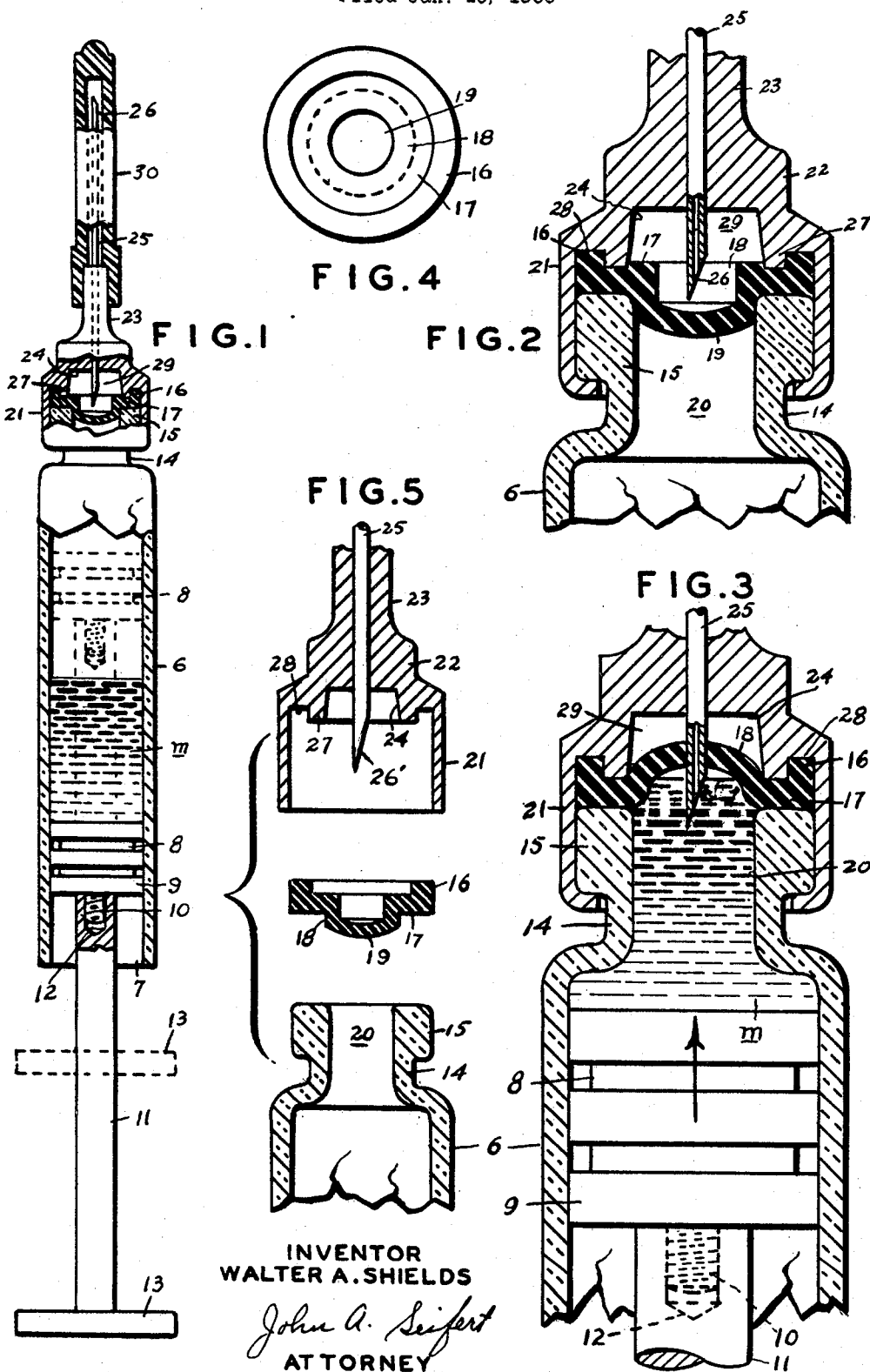


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CLOSURE CAP FOR DISPOSABLE HYPODERMIC SYRINGES

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ABSTRACT OF THE DISCLOSURE

A disposable hypodermic syringe comprising a vial having a beaded mouth and lip and a closure consisting of a diaphragm including a peripheral flange, a flat intermediate portion extending inward and contacting said lip and outer portion engaged in the filler opening.

The diaphragm is retained by a closure cap having a depending skirt crimped to said beaded mouth and has an inner annular crown with surfaces abutting the flange and intermediate portion against the mouth of the vial.

This invention relates to a disposable syringe embodying a vial containing a liquid medicament, a hypodermic needle secured in one end of the vial and a plunger closing the opposite end of the vial and operative to expel the liquid medicament from the vial through the hypodermic needle.

It is an object of the present invention to improve the diaphragm and closure cap of my co-pending application for patent filed Mar. 23, 1964, under Ser. No. 353,666, whereby the closure cap and diaphragm co-operate to prevent material of the diaphragm buckling which will prevent its proper functioning when the plunger is actuated to expel the liquid medicament and the diaphragm is flexed to be punctured by the hypodermic needle.

Other objects and advantages of the invention will be set forth in the detailed description of the invention.

In the drawing accompanying and forming a part of this application:

FIGURE 1 is my new improved disposable syringe partly in section in shipping or storage condition and showing in broken lines the medicament discharging position of the plunger;

FIGURE 2 is a fragmentary sectional view in elevation and on an enlarged scale of my improved closure cap and diaphragm with the diaphragm in vial sealing position;

FIGURE 3 is a view similar to FIGURE 2 showing the plunger in medicament discharging position and the diaphragm punctured by the hypodermic needle to permit discharge of the medicament through the hypodermic needle;

FIGURE 4 is a top plan view of the diaphragm; and

FIGURE 5 is an exploded view in section of the closure cap, diaphragm and filler mouth of the vial.

The embodiment of the invention is used in conjunction with a vial 6 of transparent material, such as glass or the like, having both ends open and the opening in one end being substantially of the same diameter as the diameter of the vial, as shown at 7 in FIGURE 1, and closed by a plunger 8 of resilient material, such as rubber, and having liquid-sealing rings 9 to contact the inner surface of the vial and permit sliding movement of the plunger 8 in the vial 6. The plunger 8 is provided with a screw-threaded stud 10 projecting from the exposed end of said plunger and into the open end 7, as shown in FIGURE 1, for connecting the plunger 8 with a manipulating member comprising a rod 11 having a screw-threaded recess 12 in one end for engagement with said screw-threaded stud 10 and a manipulating knob 13 at the op-

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posite end. The manipulating member is not attached to the plunger when the syringe is shipped or stored.

After the plunger 8, without the manipulating member 11-13 attached thereto, is properly positioned in the open end 7 of the vial 6, said vial is filled with a liquid medicament *m* through the opposite end of the vial. Said opposite end of the vial is provided with a neck portion 14 having a beaded mouth 15. The neck portion 14 is provided with a filler opening 20 which is sealed by a diaphragm of resilient and penetrable material, such as rubber or composition, and comprising an annular peripheral flange 16 extending vertically from a flat intermediate annular portion 17 having the inner circumference connected to a depressed portion 18 arranged with a concavo-convex bottom wall 19. The diaphragm is applied to the beaded mouth 15 with the undersurface of the flange 16 and the flat portion 17 contacting the lip of said mouth and the depressed portion 18 extending into and sealing the filler opening 20 of the vial.

The diaphragm is clamped to the mouth 15 by a closure cap of metal or other suitable material having an annular skirt 21 depending from a crown 22 arranged with a tubular portion 23 having a bore extending through the crown to a central cavity 24 in the closure cap. A hypodermic needle 25 having two penetrating ends 26 and 26' is mounted in the bore of the tubular portion 23 with one penetrating end 26 projecting exteriorly of the tubular portion 23 and the other penetrating end 26' extended beyond the cavity 24. An annular ridge 27 circumscribes the cavity 24 and is spaced from the skirt 21 to form an annular groove 28 for the reception of the annular flange 16 of the diaphragm. The closure cap is secured to the beaded mouth 15 by crimping the skirt 21 under said beaded mouth with the ridge 27 compressing the flat diaphragm portion 17 against the lip of the beaded mouth 15. The diaphragm depressed portion 18 and the closure cap cavity 24 form a sealed compartment 29 for the inner penetrating end 26' of the needle 25.

When the syringe is stored or shipped, the outer penetrating end 26 of the needle 25 is protected by a shield 30 mounted on the tubular portion 23 of the closure cap, as shown in FIGURE 1.

When it is desired to use the syringe, the shield 30 is removed and the manipulating member 11-13 is attached to the plunger.

When the plunger 8 is pushed into the vial 6, the pressure created by the liquid medicament *m* will flex the depressed portion 18 into the cavity 24 and cause the penetrating end 26' of the needle 25 to penetrate said depressed portion and permit the discharge of the liquid medicament through the needle 25.

The diaphragm flange 16 and the closure cap ridge 27 co-operate to anchor the peripheral portion of the diaphragm to the lip of the beaded mouth 15 and prevent the material of the depressed portion 18 from buckling and assure the depressed portion to be in proper shape to be reversed or flexed by the hydraulic pressure of the liquid medicament caused by the inward movement of the plunger 8.

Having thus described my invention, I claim:

1. A disposable syringe comprising a vial having a filler opening arranged with a beaded mouth having a lip, a diaphragm closing said filler opening and including a peripheral flange, a flat intermediate annular portion extended inwardly from the lower section of the flange, the bottom surfaces of the flange and intermediate portion contacting the lip of the mouth of the vial and a center portion connected to the bottom of the inner circumference of the intermediate portion and engaged in the filler opening of the vial, and a closure cap having a depending skirt crimped to the beaded mouth of the vial and a crown arranged with inner surfaces abutting the flange

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and intermediate portion against the lip of the mouth of the vial.

2. A disposable syringe comprising a vial having a filler opening arranged with a beaded mouth having a lip, a diaphragm of flexible material having a flange extending from the upper surface of the peripheral portion of the diaphragm, a horizontal intermediate annular portion and a central depressed portion extended from the intermediate annular portion in a direction opposite to the direction in which the flange extends from the peripheral portion of the diaphragm, the diaphragm being positioned on the lip of the beaded mouth with the flange extending upward and the depressed portion sealing the filler opening, and a closure cap having a depending skirt crimped under the beaded mouth and a crown provided with an annular ridge spaced from the skirt to form an annular groove for the reception of the diaphragm flange with said ridge compressing the horizontal intermediate annular portion of the diaphragm at a point spaced outwardly from the central depressed portion to permit a flexing movement of said central depressed portion toward the crown of the closure cap.

3. A disposable syringe comprising a vial having a filler opening arranged with a beaded mouth having a lip, a diaphragm of flexible material closing the filler opening and including an annular flange extending from the peripheral portion of the diaphragm, a flat intermediate annular portion extending inwardly from the flange and a central depressed portion extended from the inner circumference of the intermediate portion and having a concavo-convex bottom wall, the diaphragm being positioned on the lip of the mouth of the vial with the flange extending upwardly, the flat portion engaging the lip of the mouth of the vial and

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the depressed portion extending into the filler opening, and a closure cap having an annular depending skirt crimped under the beaded mouth of the vial and a crown having an annular ridge spaced inwardly from the skirt to engage the flat portion of the diaphragm in contiguous relation with the flange of the diaphragm and a central cavity within the ridge and forming a sealed compartment with the depressed portion of the diaphragm, and a hypodermic needle carried by the closure cap with one end projected exteriorly of the closure cap and the opposite end positioned within said compartment adjacent to the depressed portion of the diaphragm, whereby said depressed portion is punctured by said end of the needle during the upward flexing movement of the depressed portion caused by pressure within the vial.

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