United States Patent [19]

Shields

[11] **3,768,473**

[45] **Oct. 30, 1973**

[54] **SYRINGE DIAPHRAGM WITH BALLOONING DOME**

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[22] Filed: **Mar. 24, 1972**

[21] Appl. No.: **237,962**

[52] **U.S. Cl.** ..... **128/218 NV,** 215/40, 128/272

[51] **Int. Cl.** **A61m 5/28,** A61j 1/06

[58] **Field of Search** ..... 128/215, 216, 218 R, 128/218 NV, 218 M, 218 D, 218 DA, 219, 220, 221, 272, 252; 215/37, 38, 40, 41; 206/DIG. 25

[56] **References Cited**

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Assistant Examiner—J. C. McGowan
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[57] **ABSTRACT**

The filler opening of a hypodermic syringe barrel is closed by a diaphragm clamped to the mouth of the barrel by a closure cap carrying a hypodermic needle pointed at both ends with one end exterior and the opposite end interior of the closure cap and the shape and dimensions of the diaphragm causing the ready ballooning of the diaphragm by pressure in the barrel into the closure cap to be punctured by the hypodermic needle. The diaphragm comprises an annular flange clamped to the mouth of the barrel, a dome shaped portion and an annular wall connecting the flange and the dome shaped portion with the dome shaped portion extending in the closure cap out of contact with the closure cap and the interior point of the hypodermic needle. The end of the barrel opposite the filler opening is closed by a piston adapted to be pushed into the barrel to create internal pressure to balloon the dome shaped portion and annular wall and cause piercing of the dome shaped portion by the interior point of the needle.

7 Claims, 6 Drawing Figures

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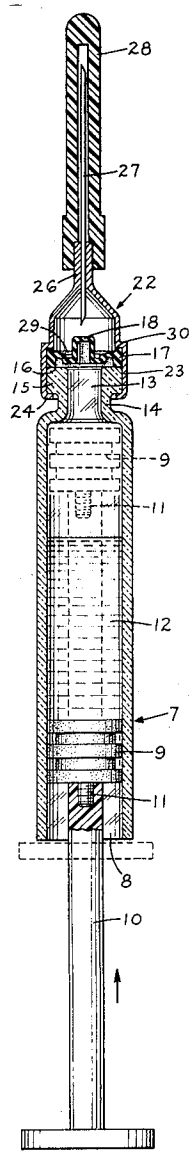


FIG.1.

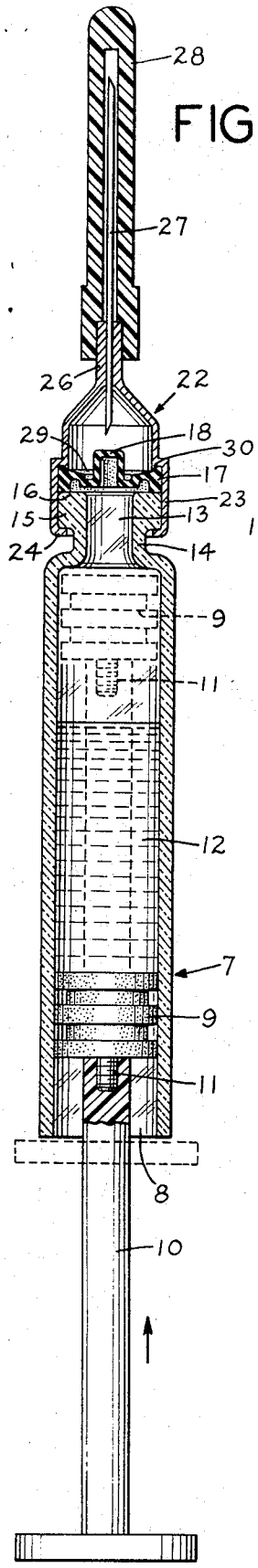


FIG.6.

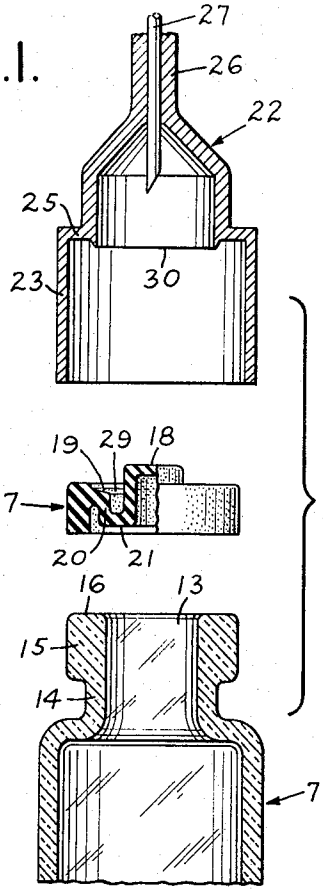


FIG.2.

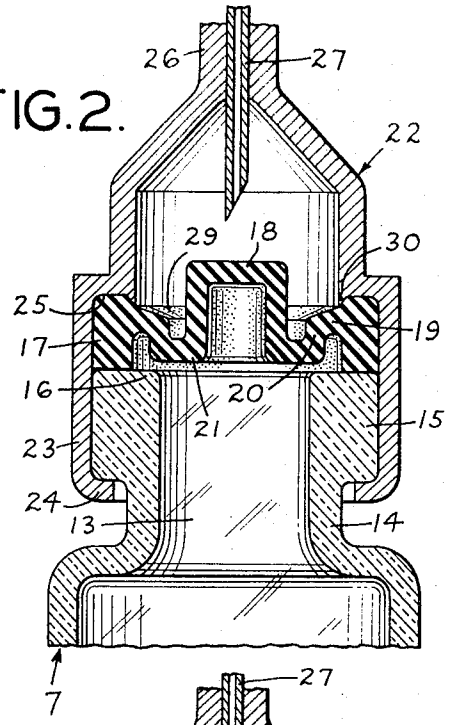
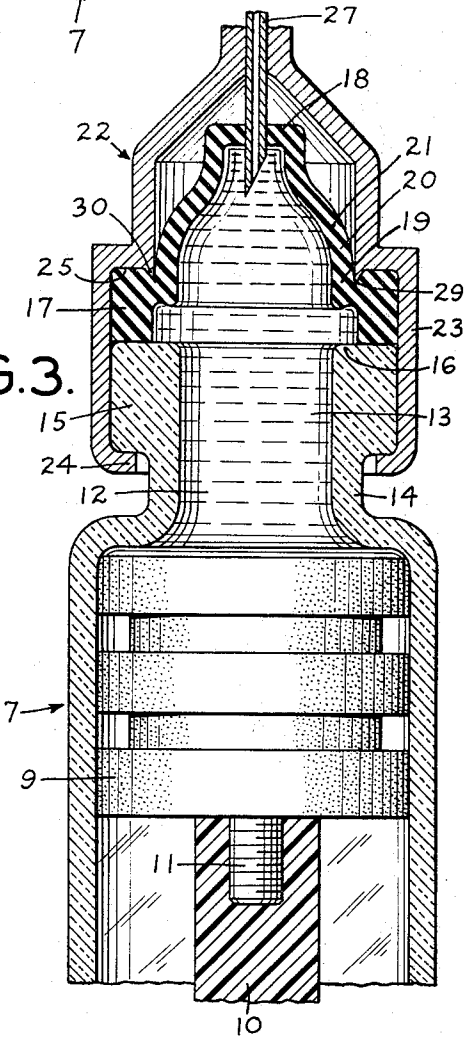


FIG.3.



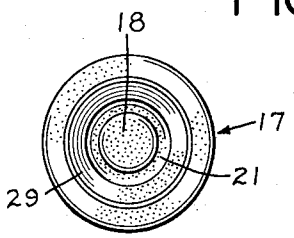


FIG.4.

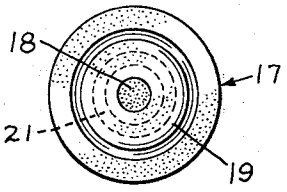


FIG.5.

SYRINGE DIAPHRAGM WITH BALLOONING DOME

The field of invention is medicators including devices of the hypodermic injector type using a piston.

The prior art as illustrated by my U.S. Pats. No. 3,308,821 patented Mar. 14, 1967 and U.S. Pat. No. 3,387,609 patented June 11, 1968 shows a molded diaphragm having a peripheral portion clamped to the mouth of the barrel and a dome shaped portion extended into the mouth of the barrel.

The present invention provides a diaphragm which is more readily flexed into piercing engagement with the hypodermic needle.

The invention comprises a diaphragm having a rigid peripheral flange adapted to be clamped between the lip of a beaded mouth of a hypodermic syringe barrel and an annular shoulder of a crown of a closure cap carrying a double pointed hypodermic needle. The center portion of the diaphragm is of dome shape and connected to the flange by an annular portion extending in a sinuous path and of the same thickness as the center portion and approximately one-third the thickness of the flange. The center and connecting portions of the diaphragm are ballooned into the crown of the closure cap by pressure in the hypodermic syringe barrel to be pierced by the inner point of the hypodermic needle.

In the accompanying drawing:

FIG. 1 is a sectional view of a hypodermic syringe showing the diaphragm in normal sealing position;

FIG 2 is a sectional view, on an enlarged scale, of the filler opening sealed by the present diaphragm;

FIG. 3 is a view similar to FIG. 2 showing the diaphragm ballooning into piercing engagement with the inner point of the hypodermic needle;

FIG. 4 is a top plan view of the diaphragm;

FIG. 5 is a bottom plan view of the diaphragm; and

FIG. 6 is an exploded view of the closure cap, diaphragm and the filler opening of the hypodermic syringe barrel.

The embodiment of the invention is shown in use with a hypodermic syringe comprising a barrel 7 having a uniform open end 8, FIG. 1, closed by a piston 9 adapted to be pushed into the barrel 7 by a plunger 10 removably connected to the piston 9 by a stud secured in the piston 9 and having a projecting end portion screw-threaded in the plunger 10, as indicated at 11.

The barrel 7 is filled with a liquid medicament 12 when the piston 9 is adjacent to the open end 8 and the plunger 10 is not attached to the piston 9. The medicament 12 is filled into the barrel 7 through a filler opening 13 in a neck 14 having a beaded mouth 15 arranged with a flat lip 16.

After filling the barrel 7 with a desired amount of liquid medicament 12, the filler opening is sealed by a diaphragm constituting the embodiment of the invention and comprising an annular flange 17 and dome shaped center portion 18 connected to the flange 17 by an annular wall having a section 19 extending laterally from the inner circumference of the flange 17 and into a vertical section 20 spaced from and parallel to the flange 17 and the dome shaped center portion 18. The vertical section 20 terminates in a horizontal section 21 connected to the bottom of the dome shaped center portion 18 and extended in a plane parallel to and spaced above the plane of the vial lip 16 and intermediate the top and bottom of the flange 17, as shown in FIGS. 1 and 2.

The flange 17 is clamped to the barrel lip 16 with the horizontal section 21 and the dome shaped center portion 18 spaced above the lip 16 and the filler opening 13. This is accomplished by a closure cap 22 having a skirt 23 extended longitudinally of the mouth 15 and crimped under the bead of said mouth 15, as at 24, with an interior annular shoulder 25 abutting the top of the flange 17. The crown of the closure cap 22 is provided with a tubular protuberance 26 having secured therein a hypodermic needle 27 pointed at both ends with the portion of the needle projecting exteriorly from the protuberance 26 being enclosed by a sheath 28 mounted on the protuberance 26, as shown in FIG. 1.

When the syringe is used, the plunger 10 is attached to the piston 9 and the sheath 28 is removed from the protuberance 26 and the needle 27, and the air is expelled from the needle 27 by slightly pushing the plunger 10 toward the barrel 7, which will create internal pressure in the barrel causing the connecting wall sections 19–21 and the dome shaped center portion 18 to balloon ouwardly into the crown of the closure cap 22 and forcefully contacting the dome shaped center portion 18 with the inner point of the needle 27 so that said inner point will puncture center portion 18. Then the outer point of the needle 27 is inserted under the skin of the patient and the piston 11 is pushed further into the barrel 7 by the plunger 10 to a desired distance depending on the prescribed dosage of medicament 12 to be administered to the patient through the punctured diaphragm and the needle. To facilitate the ballooning of the connecting wall sections 19<21 and the center portion 18, the outer or upper face of the lateral section 19 is bevelled or slopes downwardly to the vertical section 20, as shown at 29, so that the lateral section 19 will flow along the crown of the closure cap 22, as shown in FIG. 3.

To improve the seal between the barrel lip 16, the diaphragm 17–21 and the closure cap 22, the shoulder 25 of the closure cap 22 is provided with a bevelled annular projection 30 to impinge the juncture between the flange 17 and the bevelled face 29, as shown in FIGS. 1, 2, and 3.

Having thus described my invention, I claim:

1. A hypodermic syringe including a barrel having a filler opening at one end arranged with a beaded mouth having a lip, a piston closing the opposite end of the barrel, a diaphragm closing said filler opening and comprising an annular flange engaging said lip, a dome shaped portion, and an annular wall connecting the flange and the dome shaped portion, a closure cap having a depending skirt crimped to the beaded mouth and a crown having an integral annular shoulder abutting the flange against the lip, and a hypodermic needle secured in the crown of he closure cap in vertical alignment with the dome shaped portion and having theopposite ends pointed and extended exteriorly and interiorly of said crown the closed end of said dome shaped portion of the diaphragm extending into said crown out of contact with the interior point of the needle and the crown of the closure cap whereby slight piston movement will create internal pressure in the barrel causing the dome portion to balloon into the crown so thatthe inner point of the needle will puncture the dome portion.

2. A hypodermic syringe as claimed in claim 1, wherein the annular connecting wall of the diaphragm comprises a vertical section connected to the flange

and a horizontal section connected to the dome shaped portion.

3. A hypodermic syringe as claimed in claim 2, wherein the horizontal section extends in a horizontal plane intermediate the top and bottom surfaces of the flange.

4. A hypodermic syringe as claimed in claim 2, wherein the horizontal section of the annular connecting wall extends in a plane above the plane of the lip.

5. A hypodermic syringe as claimed in claim 1, wherein the annular connecting wall of the diaphragm forms with the flange an annular groove in the lower face of the diaphragm and said annular connecting wall of the diaphragm forms with the dome shaped portion an annular groove in the upper face of the diaphragm.

6. A hypodermic syringe as claimed in claim 1, wherein the thickness of the dome shaped portion and of the annular connecting wall is approximately one-third the thickness of the flange of the diaphragm.

7. A hypodermic syringe as claimed in claim 2, wherein the vertical section of the annular connecting wall is connected to the flange by an annular section extending laterally from the flange and provided with an upper bevelled face to facilitate ballooning the dome whaped portion and the annular connecting wall into the crown of the closure cap.

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