United States Patent [19]

Shields

[11] **3,710,794**

[45] **Jan. 16, 1973**

[54] **RECESSED DIAPHRAGM WITH ANNULAR GROOVES FOR HYPODERMIC SYRINGES**

[76] Inventor: **Walter A. Shields,** 38-09 24th St., Jamaica, N.Y. 11101

[22] Filed: **June 16, 1971**

[21] Appl. No.: **153,565**

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

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

[58] **Field of Search**.....128/218 R 128/218 NV, 272, 218 D, 128/218 DA, 218 M, 215, 216; 215/37 R, 38 R, 40, 51; 206/63.4 R

[56] **References Cited**

UNITED STATES PATENTS

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3,089,604	5/1963	Golde et al.	215/40 X
3,308,821	3/1967	Shields	128/218 NV
3,387,609	6/1968	Shields	128/218 NV
3,552,591	1/1971	Wimmer	215/37 R

FOREIGN PATENTS OR APPLICATIONS

741,856	12/1955	Great Britain	215/40
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Primary Examiner—Richard A. Gaudet
Assistant Examiner—J. C. McGowan
Attorney—John A. Seifert

[57] **ABSTRACT**

The filler opening of a hypodermic syringe vial is closed by a diaphragm clamped to the mouth of the vial by a closure cap carrying a hypodermic needle and the flexibility of the diaphragm is increased by annular grooves in the opposite horizontal surfaces of a center disc portion of the diaphragm to facilitate penetration of the diaphragm by the needle.

5 Claims, 3 Drawing Figures

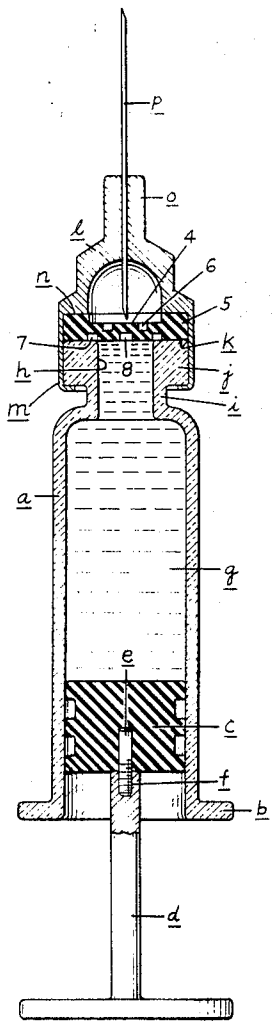


FIG. 2.

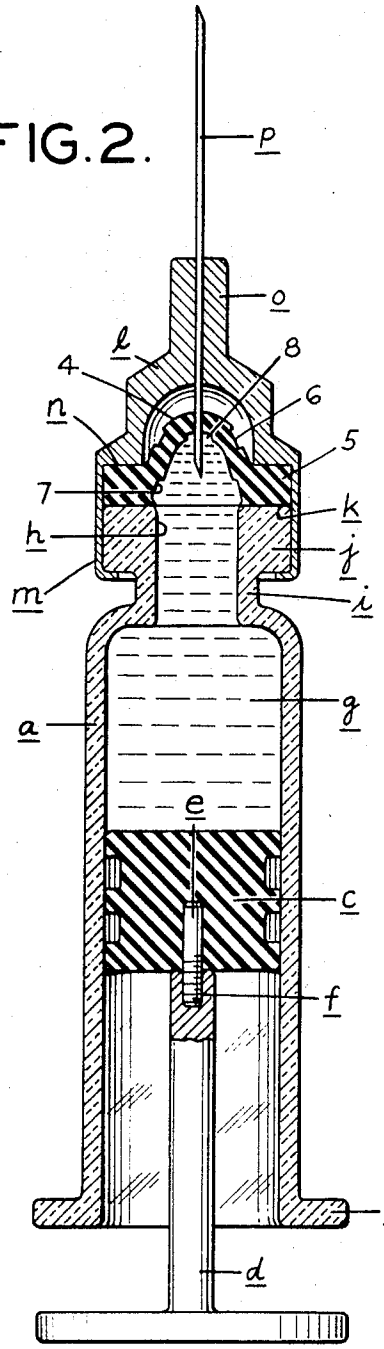


FIG. 3.

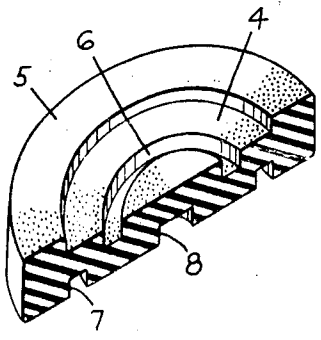
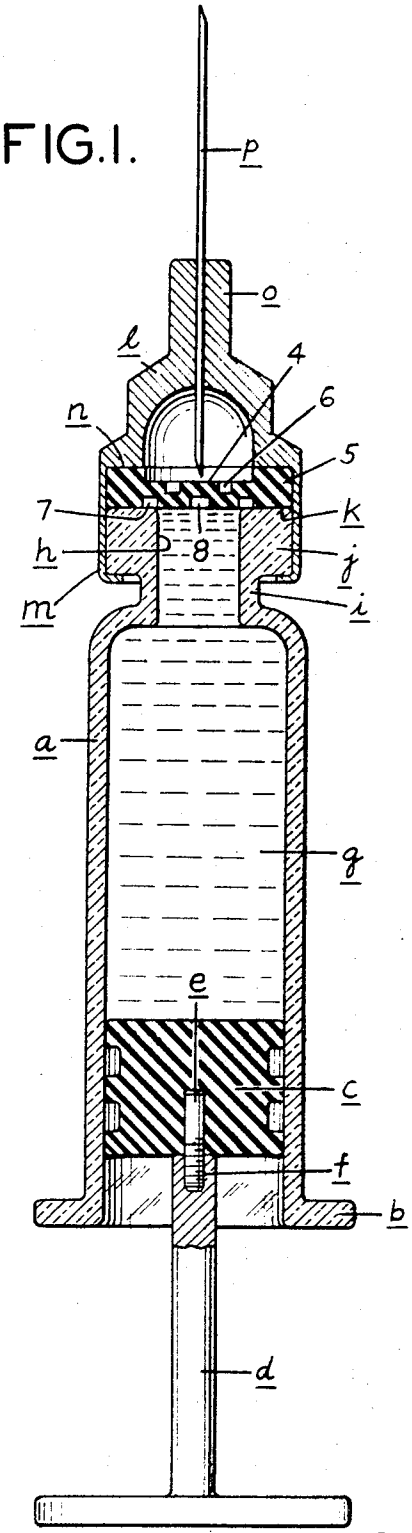


FIG. 1.



INVENTOR
WALTER A. SHIELDS
BY
John A. Seifert
ATTORNEY

RECESSED DIAPHRAGM WITH ANNULAR GROOVES FOR HYPODERMIC SYRINGES

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

The prior art as illustrated by my U.S. Pats. No. 3,308,821 patented Mar. 14, 1967 and U.S. Pat. No. No. 3,387,609 patented June 11, 1968 disclose a molded diaphragm having a rigid peripheral flange to be clamped to the mouth of the vial and a disc portion flexibly connected to the flange.

The present invention reduces the cost of manufacture by forming the diaphragm from a disc having a recess in the center of the outer horizontal surface and an annular groove in said recess, and the inner horizontal surface of the disc having an annular groove of greater diameter than the annular groove in the recess and a recess in the center of both annular grooves whereby the diaphragm is formed with a rigid peripheral flange.

The invention comprises a diaphragm having a rigid peripheral flange adapted to be clamped between a lip of a beaded mouth of a vial and an annular shoulder of a crown of a closure cap carrying a hypodermic needle. The outer horizontal surface of the diaphragm is provided with a recess centrally within the flange and having an annular groove concentric with the center of the recess. The inner horizontal surface of the diaphragm is in the plane of the inner horizontal surface of the flange and provided with an annular groove adapted to be closed by the lip of the vial and a recess in alignment with the axis of the annular groove in the outer horizontal surface of the diaphragm whereby pressure within the vial will readily flex the diaphragm outwardly to be punctured by the hypodermic needle.

In the accompanying drawing:

FIG. 1 is a longitudinal sectional view of a hypodermic syringe sealed by the diaphragm of the present invention in its normal sealing position;

FIG. 2 is a view similar to FIG. 1 showing the vial under internal pressure and the diaphragm flexed and punctured by the hypodermic needle; and

FIG. 3 is a perspective view in cross-section of the diaphragm.

The embodiment of the invention is shown in use with a hypodermic syringe comprising a vial *a* having a bottom arranged with a lateral annular flange *b* and closed by a piston *c* adapted to be pushed into the vial *a* by a plunger *d* removably connected to the piston *c* by a stud *e* secured in the piston *c* and having a projecting end portion screw-threaded for removable connection with a screw-threaded recess in the plunger *d*, as indicated at *f*.

The vial *a* is filled with a liquid medicament *g* when the piston *c* is adjacent to the flanged end *b* and the plunger *d* is not attached to the piston *c*. The medicament *g* is filled into the vial *a* through a filler opening *h* in a neck *i* having a beaded mouth *j* arranged with a flat lip *k*.

After filling the vial *a*, the filler opening *h* is closed by a diaphragm consituting the embodiment of the invention and comprising a disc of flexible material, such as rubber, having a center portion of the outer horizontal surface recessed, as at **4**, to form a peripheral flange **5** of a width less than the width of the vial lip *k* in the normal closing position of the diaphragm, as shown in FIG. **1**. The recess **4** is provided with an annular groove **6** concentric of the disc and spaced inwardly of the flange **5**.

The opposite or inner horizontal surface of the disc extends in the horizontal plane of the inner horizontal surface of the flange **5** and is provided with a concentric annular groove **7** adjoining the flange **5** whereby said groove **7** is closed by the vial lip *k* in the normal closing position of the diaphragm, as shown in FIG. **1**. The center of the inner horizontal surface of the disc is provided with a recess **8** of a diameter less than the diameter of the circle formed by the annular recess **6**.

The flange **5** is clamped to the lip *k* with the annular groove **7** closed by said lip *k* by a closure cap **1** having a skirt *m* extended longitudinally of the mouth *j* and crimped under said mouth *j* with an interior annular shoulder *n* abutting the outer horizontal surface of the peripheral flange **5** of the diaphragm. The crown of the closure cap is provided with a tubular protuberance *o* having secured therein a hypodermic needle *p* pointed at both ends.

When the syringe is used, the plunger *d* is attached to the piston *c*, and the air is expelled from the needle *p* by slightly pushing the plunger *d* toward the vial *a*. Then the outer point of the hypodermic needle *p* is inserted under the skin of the patient, and the piston *c* is pushed further into the vial *a* by the plunder *d* to a desired distance depending on the amount of medicament *g* to be injected into the patient whereby internal pressure is created in the vial *a* causing the center portion of the diaphragm to flex outwardly and be punctured by the inner point of the hypodermic needle *p*. The annular grooves **6** and **7** will render the center portion of the diapghram more flexible by reducing the thickness of said center portion and forming hinges between the adjacent corners of the grooves **6** and **7** and the recess **8**. The center recesses **4** and **8** will facilitate the penetration of the diaphragm by the inner point of the hypodermic needle *p*. The peripheral flange **5** will form a liquid tight seal between the closure cap *l* and the vial mouth *j*.

Having thus described my invention, I claim:

1. A hypodermic 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 having the inner horizontal surface engaging said lip, a center disc integral with the flange and having the outer horizontal surface extending in a plane below the outer horizontal surface of the flange and the inner horizontal surface of the disc extending in the plane of the inner horizontal surface of the flange, and annular grooves in both surfaces of the disc to increase the flexibility of said disc, a closure cap having a depending skirt crimped to the beaded mouth and a crown having an annular shoulder abutting the flange against the lip of the mouth of the vial, and a double pointed hypodermic needle carried by the crown of the closure cap.

2. A hypodermic syringe as claimed in claim **1**, wherein the outer horizontal surface of the disc is provided with an annular groove spaced from the flange and the center of the disc.

3. A hypodermic syringe as claimed in claim **1**, wherein the inner horizontal surface of the disc is provided with an annular groove adjacent the flange and closed by the lip of the mouth of the vial.

4. A hypodermic syringe as claimed in claim 1, wherein the inner horizontal surface of the disc is provided with a recess in the center of the disc.

5. A hypodermic syringe as claimed in claim 4, wherein said needle is carried in vertical alignment with the recess in the center of the disc to facilitate penetration of the disc by the needle during the flexing movement of the disc toward the needle caused by internal pressure in the vial.

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