June 16, 1959 T. S. SLOANE 2,890,698

HYPODERMIC SYRINGE AND COLLAPSIBLE CARTRIDGE ASSEMBLY

Filed Jan. 29, 1954

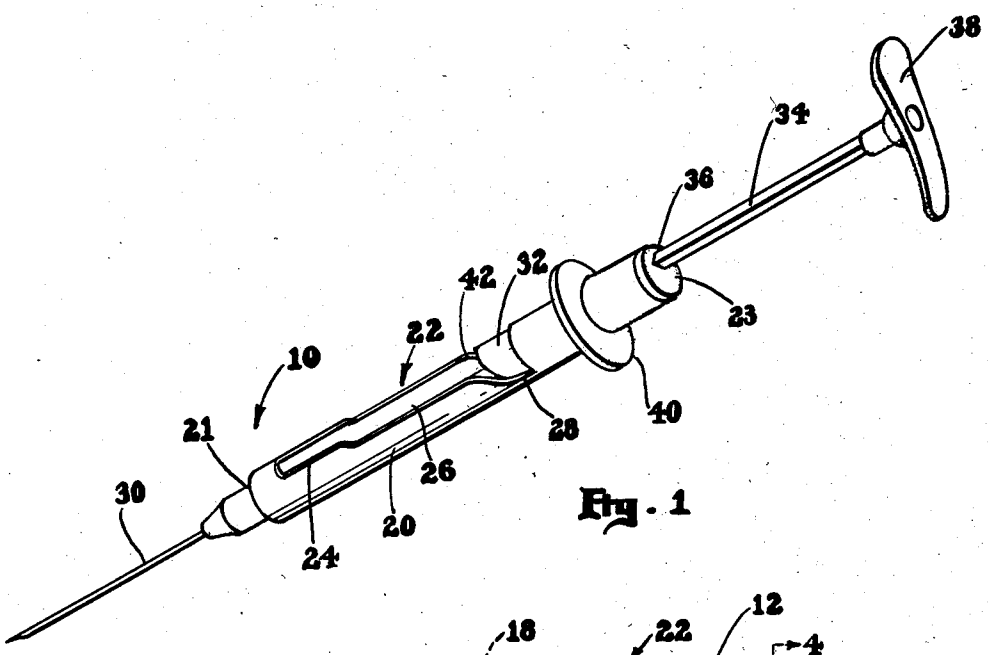


Fig. 1

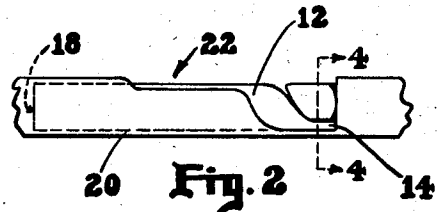


Fig. 2

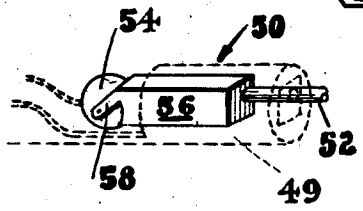


Fig. 5

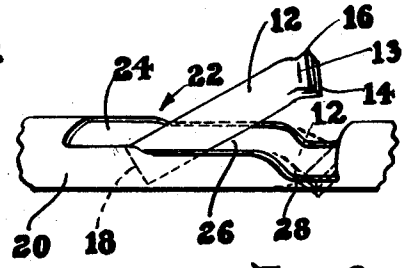


Fig. 3

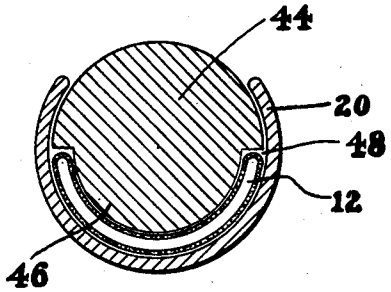


Fig. 4

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United States Patent Office

2,890,698

Patented June 16, 1959

2,890,698

HYPODERMIC SYRINGE AND COLLAPSIBLE CARTRIDGE ASSEMBLY

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Application January 29, 1954, Serial No. 406,913

8 Claims. (Cl. 128—216)

This invention relates to a hypodermic syringe and a puncturable cartridge or ampule containing an injectable solution adapted for use with said syringe.

An object of the present invention is to provide a novel syringe construction and a disposable polyethylene or other suitable plastic cartridge for injecting solutions of a nature similar to local anesthetics.

Another object of the present invention is to provide a cartridge-collapsing device which employs an elongated sled so constructed that it prevents "back-bleeding" of the injectable solution and maintains a continuous pressure on the cartridge in the collapsing operation. "Back-bleeding" in this instance means the leaking of fluid backwards to the rear of the hypodermic syringe instead of forward to an exit through the hypodermic needle.

A further object of the present invention is the provision of a specially constructed and arranged syringe which permits the exhausted cartridges to be removed rapidly and easily.

Another object of the present invention is the provision of a cartridge or ampule for a hypodermic syringe which is sterile, non-porous, chemically inert and maintains solutions therein at the proper sterile and stable level. The aforesaid cartridge is also much less expensive than other containers for solutions presently available and has a comparatively frictionless exterior surface, thus permitting rapid and easy exhaustion of the cartridge together with the ability to remove the same without difficulty from the syringe holder.

The above and other features, objects and advantages of the present invention will be fully understood from the following description considered in connection with the accompanying illustrative drawings.

Fig. 1 is a perspective view of a hypodermic syringe embodying my invention,

Figs. 2 and 3 are other fragmentary perspective views of the hypodermic syringe and its associated flexible cartridge in accordance with the present invention.

Fig. 4 is a cross-sectional view on an enlarged scale taken on the lines 4—4 of Fig. 2, and

Fig. 5 is a fragmentary side-elevation view showing an embodiment which constitutes a modification of my invention.

Referring more particularly to the drawings and especially to Figs. 1–4 my novel hypodermic syringe is referred to generally by the numeral **10**. The syringe **10** is specially constructed to accommodate a flexible thin-walled cartridge **12** for an injectable solution which is preferably made of polyethylene. The filled polyethylene cartridge or ampoule **12** has a flattened end portion **13** which is flared out at **14** and **16** respectively. The cartridge **12** also is provided with a flat, substantially circular front end **18**.

The syringe **10** comprises a preferably tubular barrel **20** having a cut-out area referred to generally by the numeral **22** and which includes a front section **24**, an intermediate section **26**, and a rear section **28** which are

progressively larger in area, said rear section **28** having at least twice the cut-out area of said front section **24**.

The front of barrel **20** has a transverse front wall **21** through which a hollow hypodermic needle **30** passes. A portion of said needle **30** projects into the barrel **20** and communicates with the interior thereof. The back of the barrel **20** is provided with a transverse back wall **23**. A plunger or piston having a sled-like head **32** is adapted to reciprocate in the interior of barrel **20**. This piston has a plunger rod **34** preferably of rectangular cross-section secured thereto at a place radially displaced from the longitudinal axis of the sled **32**. Plunger rod **34** passes through a preferably rectangular opening **36** in back wall **23** and is provided at its end remote from the barrel **20** with a handle or grip **38**. A hilt-like annular cross-piece **40** surrounds the barrel **20** in proximity to the back thereof.

As seen in Fig. 1, the piston **32** is of a special construction which includes an oblique front face **42** and a plunger body composed of two back-to-back semi-cylindrical portions (Fig. 4) of which the outer surface of the upper semi-cylindrical portion **44** is adapted to fit precisely in the adjacent portion of the barrel **20**. The lower semi-cylindrical portion **46** has a reduced cross-section, the outer surface of which is spaced from the adjacent portion of the barrel **20** to thereby form a chamber **48**. This chamber **48** is equivalent in spatial area to the thickness of a collapsed cartridge **12**.

The operation of my device is initiated by inserting the cartridge in cut-out area **22** of the barrel **20** as clearly seen in Fig. 3. Cut-out sections **26** and **28** are large enough to permit the introduction of cartridge **12** into the barrel **20**. However, front cut-out section **24** is not of sufficient size for the insertion of the cartridge therein. This construction permits the cartridge to be automatically centered for the puncturing of cylindrical front end **18** by the needle **30**. Thereafter, the remainder of the cartridge is seated in the barrel **20**. When cartridge **12** is properly seated in the barrel **20** the flared end portions **14** and **16** of the cartridge project laterally from the barrel through the openings in rear section **28** of the cut-out area **22** (Fig. 3). The sled-like piston **32** operated by plunger rod **34** is then pushed forward. The oblique front face **42** of the plunger squeezes and collapses the walls of the cartridge **12** against the internal wall of the barrel **20** (Fig. 4) and the injectable solution in the cartridge is expelled through needle **30**. The cut-out sections **24**, **26** and **28** are so proportioned that the piston **32** is prevented from escaping from the barrel **22** by the walls of the barrel itself, the piston being contained therein. The cut-out arrangement also insures that the sled is maintained in the proper position and that a downward and forward pressure is exerted on the cartridge walls when the sled **32** is moved forward. Plunger rod **34** is non-circular and preferably rectangular in cross-section and conforms to opening **36** in order to be non-rotatable in the barrel **20**. It is secured to the plunger in an off-center position in order to increase the leverage in exerting pressure against the resistance to expulsion by the medicament. It should be noted that the length of the plunger head and the collapsed, tight-fitting cartridge **12** combine to prevent "back-bleeding" of the injectable fluid.

After the contents of the cartridge **12** have been exhausted the piston **32** and plunger rod **34** are moved rearwardly. After the piston has been withdrawn past the rear section **28** of the cut-out area **22**, the flared end portions **14** and **16** of the cartridge **12** may preferably spring out to project laterally from the barrel **20** in rear section **28** of the cut-out area **22**. This phenomenon facilitates the quick and easy removal of the empty cartridge **12** from the barrel **20**.

Referring now more particularly to Fig. 5 in which is illustrated an alternate embodiment of my invention. In this construction, the barrel **49** houses a rectangular plunger **50** and a plunger rod **52**. Plunger **50** includes a preferably spherical ball **54** and a follower **56** of rectangular cross-section. The follower **56** is secured to ball **54** by a clevis **58**. It should be noted that the follower **56** is adapted to fit in barrel **49** with slight clearance, thus the possibility of "back-bleeding" of the injectable solution is virtually eliminated.

While I have shown and described preferred embodiments of my invention, it will be understood that the latter may be embodied otherwise than as herein specifically illustrated or described and that in the illustrated embodiment certain changes in the details of construction and in the arrangement of parts may be made without departing from the underlying idea or principle of the invention within the scope of the appended claims.

What I claim is:

1. The combination comprising a hypodermic syringe and a collapsible cartridge containing an injectable solution, said syringe including a barrel having an elongated cut-out portion, one end of which has at least twice the cut-out area of the other end of said portion, a sled-like plunger mounted by and reciprocable within said barrel, and a hypodermic needle secured to one end of said barrel, said cartridge lying in the barrel bore between said needle and plunger and having a flattened end part inserted in said one end of said cut-out portion whereby when said plunger is moved axially in one direction in said barrel the contents of said cartridge is exhausted through said needle.

2. The combination comprising a hypodermic syringe and a flexible cartridge containing an injectable solution, said syringe including a barrel having an elongated cut-out portion, one end of which has a greater cut-out area than the other end, a plunger having an inclined face mounted by and reciprocable within said barrel, a plunger rod secured to said plunger at a point radially displaced from the longitudinal axis thereof, and a hypodermic needle secured to one end of said barrel, said cartridge lying in the barrel bore between said needle and plunger and having a flattened end part which is adapted to be inserted in said one end of said barrel whereby when said plunger is moved axially in one direction in said barrel the contents of said cartridge are exhausted through said needle.

3. In a hypodermic syringe the combination comprising a holder having an elongated cut-out portion, one end of which has at least twice the cut-out area of the other end of said portion, a puncturable plastic cartridge containing an injectable solution removably held within said holder, a plunger having an oblique front face and a plunger rod of rectangular cross-section in said holder, and a hypodermic needle secured to one end of said barrel and adapted to puncture said cartridge, said cartridge having a flattened end part disposed in said one end of said cut-out portion and having part thereof projecting laterally from said holder, the contents of said cartridge being exhausted through said needle when said plunger is moved axially in one direction in said holder.

4. A hypodermic syringe for expelling an injectable solution into human or animal tissue comprising a barrel having an elongated cut-out portion, one end of which has at least twice the cut-out area of the other end thereof, a sled-like plunger and a plunger rod fixed thereto mounted by and disposed within said barrel, said plunger having an oblique front face, and a hypodermic needle secured to the front of said barrel.

5. A hypodermic syringe for expelling an injectable solution into human or animal tissue comprising a barrel having an elongated cut-out portion, one end of which has at least twice the cut-out area of the other end thereof, a sled-like plunger having a top semi-cylindrical part and a bottom semi-cylindrical part, said top part having a greater cross-sectional area than said bottom part, a plunger rod of rectangular cross-section secured to said plunger rod at a point radially displaced from the longitudinal axis of said plunger, both said plunger and plunger rod being mounted by said barrel to reciprocate within the bore of the latter, and a hypodermic needle secured to one end of said barrel in communication with said bore.

6. The combination comprising a hypodermic syringe and a puncturable polyethylene cartridge containing an injectable solution, said syringe including a tubular holder having an elongated cut-out portion, one end of which has twice the cut-out area of the other end, a sled-like plunger having a top semi-cylindrical part and a bottom semi-cylindrical part, said top part having a greater cross-sectional area than said bottom part, a plunger rod secured to said plunger, both said plunger and plunger rod being mounted by said holder and reciprocable therein, and a hypodermic needle secured to one end of said barrel in communication with the interior of the holder, said cartridge having a flattened end part disposed in said one end of said cut-out portion whereby when said plunger is moved axially in one direction in said holder the contents of said cartridge are expelled through said needle.

7. A hypodermic syringe assembly, including, in combination, a bored holder, said holder being formed with an opening in its wall providing communication with its bore, a collapsible medicament-containing ampule disposed within such bore and laterally movable through such opening, a needle mounted by said holder in line with said bore, a plunger supported by said holder and reciprocable within and along a path parallel to the axis thereof, said plunger having an ampule-contacting face, and the latter being inclined in a forward direction across the bore axis to provide a surface camming against the ampule and collapsing the latter into contact with the adjacent bore surface.

8. A hypodermic syringe assembly as specified in claim 7, said plunger including a side face directly engageable with the bore surface and a contiguous side face spaced from such surface to provide a cavity receiving the collapsed ampule as the plunger is projected.

References Cited in the file of this patent

UNITED STATES PATENTS

401,950	Haussmann	Apr. 23, 1889
818,000	Stevenson	Apr. 17, 1906
967,413	McCain	Aug. 16, 1910
1,222,814	Storz	Apr. 17, 1917
1,718,601	Smith	June 25, 1929
2,147,616	Chaput	Feb. 14, 1939
2,625,157	Lockhart	Jan. 13, 1953
2,745,403	Goldberg	May 15, 1956