Sept. 4, 1962 J. SILVER ETAL 3,052,240

DISPOSABLE HYPODERMIC SYRINGE

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FIG. 1

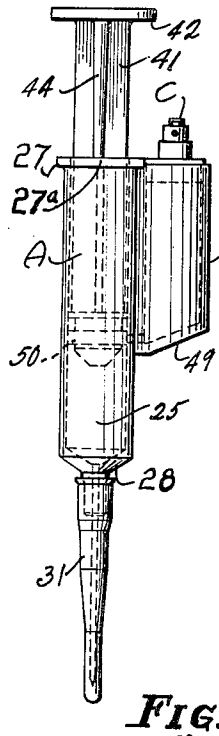


FIG. 2

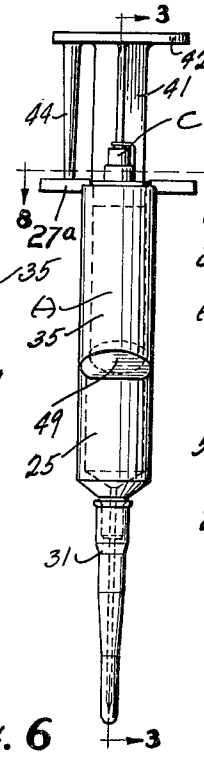


FIG. 3

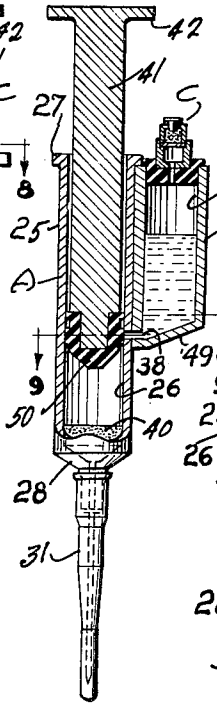


FIG. 4

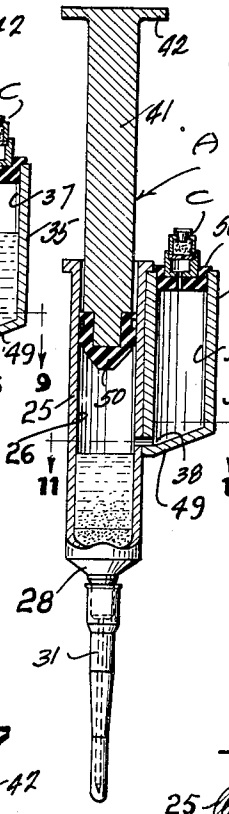


FIG. 5

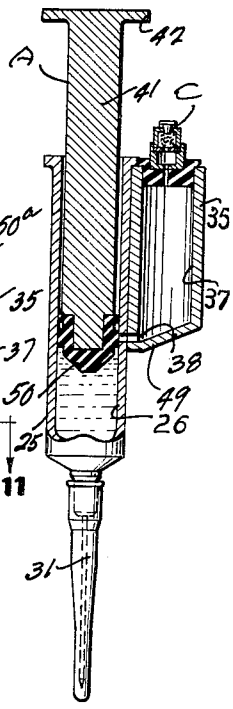


FIG. 6

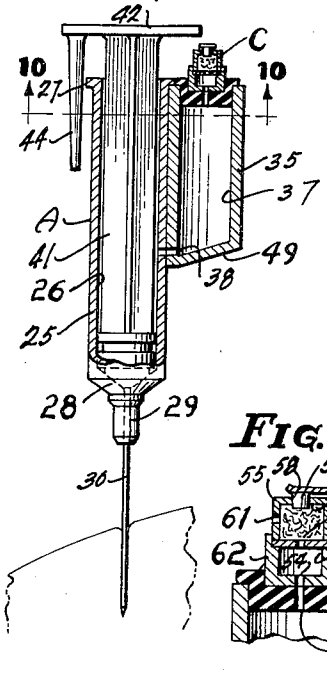


FIG. 7

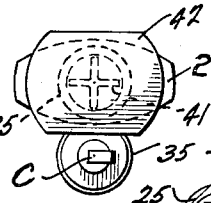


FIG. 9

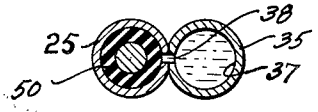


FIG. 11

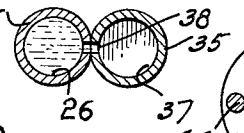


FIG. 10

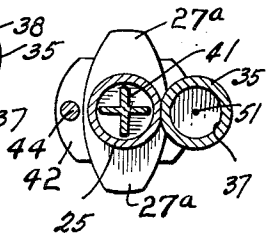


FIG. 8

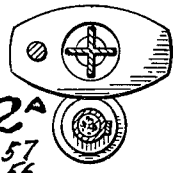
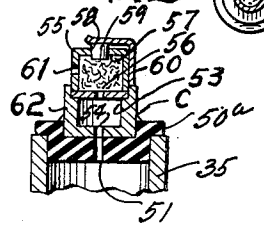


FIG. 12A



INVENTORS
Jules Silver and
George Fuller.

BY Rommel, Allison & Rommel
ATTORNEYS

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FIG. 14

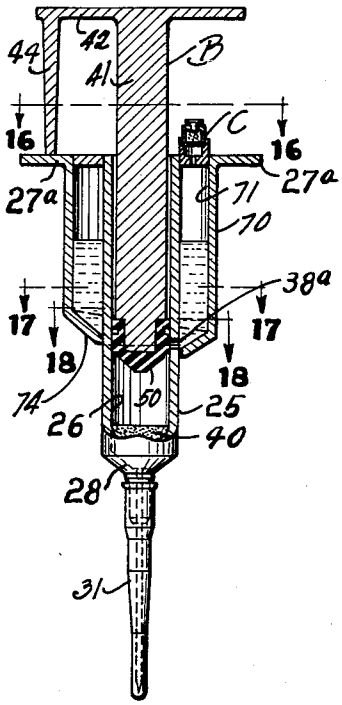


FIG. 12

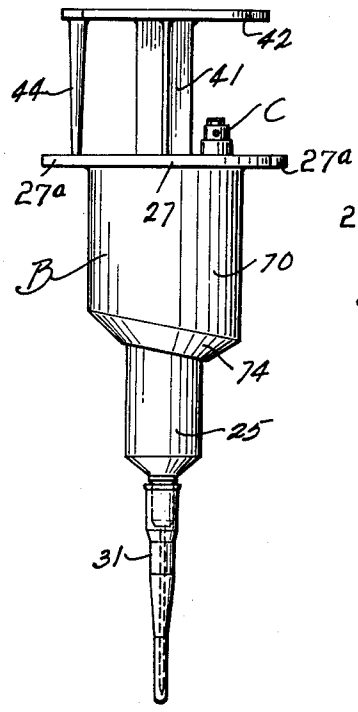


FIG. 13

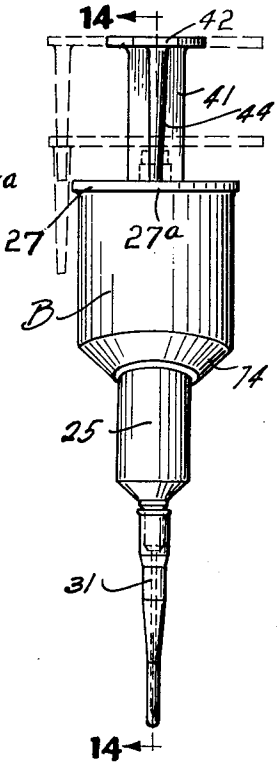


FIG. 15

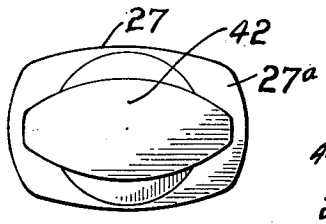


FIG. 16

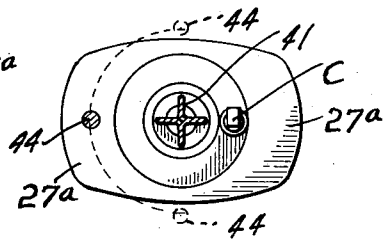


FIG. 17

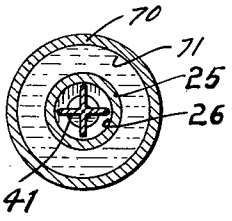
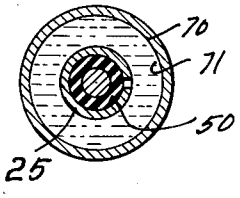


FIG. 18



INVENTOR

Jules Silver and
George Fuller.

BY Pennie, Allen & Pennie

ATTORNEYS

United States Patent Office 3,052,240 Patented Sept. 4, 1962

3,052,240

DISPOSABLE HYPODERMIC SYRINGE

Jules Silver, North Franklin, and George Fuller, Hampton, Conn.; said Fuller assignor to said Silver

Filed Jan. 29, 1959, Ser. No. 789,931
5 Claims. (Cl. 128—218)

This invention relates to improvements in disposable hypodermic syringes with which it is intended to use a dry, desiccated or lyophilized vaccine or pharmaceutical and a diluent or solvent therefor.

In a co-pending application Serial No. 398,437, filed July 17, 1956, and now abandoned, is shown a disposable hypodermic syringe for use with a medicament and a diluent and means for the facile mixture of the two prior to injection. It is a purpose of the present invention to provide a disposable hypodermic syringe having improved means for maintaining the dry powder or medicament under vacuum seal, and the medicament and diluent under control so that the same may be properly admixed at the time of use in an efficient and positive manner.

A further object of this invention is the provision of a disposable hypodermic syringe including chambers adapted to separately receive a dry medicament and a solvent therefor; separate chambers being provided for the same with improved means for controlling the mixture of the solvent and medicament, at the time of use; the details of the improved syringe being fool-proof and constructed so as to maintain the solvent and the medicament in proper condition for extended periods of time.

Other objects and advantages of this invention will be apparent during the course of the following detailed description.

In the accompanying drawings, forming a part of this specification, and wherein similar reference characters designate corresponding parts throughout the several views:

FIGURE 1 is a side elevation of one form of the improved disposable hypodermic syringe.

FIGURE 2 is a side elevation taken at 90° with respect to FIGURE 1, showing other details of the improved syringe.

FIGURE 3 is a vertical cross sectional view taken through the hypodermic syringe substantially on the line 3—3 of FIGURE 2, showing the means for maintaining a dry vaccine or medicament under vacuum seal and maintaining its solvent or a diluent in position so that the two ingredients can be mixed at the desired time.

FIGURE 4 is a view similar to FIGURE 3, but with the plunger or piston withdrawn for the mixing of the diluent and medicament.

FIGURE 5 is a view similar to FIGURES 3 and 4, but with the piston or plunger in position for exhausting air from above the mixed pharmaceutical, in order that there will be no liability of air injection into the subject.

FIGURE 6 is a vertical cross sectional view taken through the chambers of the hypodermic syringe showing the position of the parts after injection of the pharmaceutical into the subject.

FIGURE 7 is a plan view of the details shown in FIGURE 2.

FIGURES 8 and 9 are cross sectional views taken substantially on the lines 8—8 and 9—9 of FIGURES 2 and 3 respectively.

FIGURE 10 is a cross sectional view taken substantially on the line 10—10 of FIGURE 6.

FIGURE 11 is a cross sectional view taken substantially on the line 11—11 of FIGURE 4.

FIGURE 12[a] is a vertical cross sectional view taken through an air vent provided for the diluent receiving chamber of the syringe.

FIGURE 12 is a side elevation of a modified form of improved disposable hypodermic syringe.

FIGURE 13 is a front elevation of the syringe of FIGURE 12.

FIGURE 14 is a vertical cross sectional view taken through the details of the syringe of FIGURE 13, substantially on the line 14—14 of FIGURE 13, and showing the parts of the syringe in an inoperative position.

FIGURE 15 is a plan view of the syringe of FIGURE 14.

FIGURES 16, 17 and 18 are transverse cross sectional views taken substantially on their respective lines, shown in FIGURE 14.

In the drawings, wherein are shown several different forms of the invention, the letter A may generally designate the form shown in FIGURE 1, and B the form of invention shown in FIGURE 12.

In the form of invention shown in FIGURE 1, there is provided a main barrel **25**, preferably of cylindrical formation, having a chamber or compartment or passageway **26** therealong. At the top, the same is annularly flanged at **27** providing long finger grips **27[a]**, and at the bottom thereof, it has a sloping bottom wall **28**, terminating in an apertured nipple **29** wherein is adapted to be inserted the hypodermic needle **30**. A plastic sealing cap **31** is adapted to fit in air-tight relation upon the nipple **29** for the purpose of housing the needle **30**. Preferably the materials of the hypodermic syringe are inexpensive plastic. To the barrel tube **25** is connected an eccentric tubular receptacle **35**, extending from the upper end thereof to a location below the midway point thereof; this receptacle **35** having a compartment or chamber **37** therein. A duct or passageway **38** communicates the extreme bottom of the chamber **37** with an intermediate portion of the passageway or chamber **26**. The chamber **26** is adapted to receive the dry pharmaceutical or medicament **40**. The bottom **49** of the receptacle portion **35** is sloped downwardly toward the duct **38** to insure drainage of all diluent into the syringe barrel **25**.

A piston-like plunger **41** is slidably disposed in the chamber **26**, having an upper palm engaging flanged end **42**, which is rather broad and preferably flat at the top. This plunger **41** is of T-shaped cross section or it could be cylindrical. The flange **42** is provided with a depending stop extension **44** integral or rigidly connected therewith, which depends downwardly and is adapted to engage the top surface of one of the flange extensions **27[a]** in order to close the passageway **38** by means of a nipple or cap **50**, which is connected upon the lower reduced end of the plunger **41**. This nipple is of rubber, "neoprene" or similar material not capable of being affected by either the medicament or its solvent, and is preferably of 35 durometer. It is in the shape of an inverted cap and has annular spaced ribs thereon, as shown in the drawings, of a size to snugly but slidably engage the internal walls of the chamber **26** and provide a leak-proof fit. The bottom of the nipple is preferably tapered to facilitate its insertion in the passageway **26**. It will be noted from FIGURE 3 that the nipple closes off the passageway **38** and thus holds the diluent or solvent in the chamber **37**. This is the normal position of the disposable hypodermic syringe, prior to use, and under such circumstances, the pharmaceutical **40** is maintained under vacuum in the compartment **26** below the nipple. In this position, the extension **44** will engage a flange **27[a]** in the position shown in FIGURE 2 and the plunger **41** cannot be further depressed.

The diluent chamber **37** opens at the top thereof and detachably receives a resilient cap **50[a]**, shown best in FIGURE 12[a]; the same having a small axial passageway **51** therethrough. A small container **52** is secured

by adhesive or by other means upon the cap 50a, and it has an air chamber 53 therein and a bottom passageway 54 aligning with the passageway 51. This receptacle 52 may indeed form part of the cover 50a, but the air chamber 53 is important. The receptacle 52, on the top thereof, is provided with another receptacle or box 55 having a bottom passageway 56 therein communicating with the chamber 53. The compartment 57 of this box 55 is adapted to receive sterilized cotton and at the top (or side) thereof it has vent opening 58 within which seats a detachable plug 59, normally held closed by means of a tab 60 secured to the box 55 for holding it in place.

The receptacle 52 forms an air block to prevent the diluent from readily passing from the compartment 37 into the compartment 53, and the openings 54 and 56 are so small that due to surface tension the diluent will not enter the body of the sterilized cotton nor pass into the container 55 even when the syringe is placed in horizontal position.

In use, the assembly is held in a natural, vertical or slanting direction with the needle end pointed down. The operator removes the plug 59 from the opening 58. With the syringe held firmly at the barrel 25, the plunger 41 is pulled outwardly. This uncovers the passageway 38 and permits the diluent to rush into the chamber 26 below the nipple 50 until the diluent chamber is empty. Of course the removal of the plug 59 permits air to pass through the vent opening 58 and through the sterilized cotton into the chamber 37. The diluent enters the chamber 26 and dissolves the pharmaceutical powder. The syringe is still held in position with the needle pointing downward and then the plunger is pushed downward and the nipple 50 returned to the position shown in FIGURE 5. This action discharges the excess air from the barrel through the passageway 38 and through the vent at the top of the chamber 37. Note that the passageway 38 is now blocked. The plastic needle cover 31 is then removed and the plunger 41 is then turned for 90° in either direction. This places the extension 44 out of the path of the longer flange extensions 27a. The plunger 41 can then be depressed for expressing residual air in the syringe. The needle end is thrust through the body skin into the surrounding tissues. The plunger 41 is then fully depressed for injecting the solution until the barrel chamber 26 is emptied (see FIGURE 6).

Referring to the form of invention B, it will be noted that the same differs from the form of invention A in that the receptacle 70 is concentric with the barrel 25 instead of being eccentric as in the case of the receptacle 35 for the form of invention A. The receptacle 70 defines an annular chamber 71 therein and the wall of the barrel 25 is provided with a passageway 38a communicating the chambers 26 and 71. The bottom wall 74 of the concentric receptacle 70 slopes with a taper downwardly from a location diametrically opposed to the duct 38a to the duct side of the receptacle 25, so that the lowermost portion of the bottom surface of the bottom wall 74 is directly at the duct 38a. Thus, even with the assemblage B at an angle, during use thereof, all of the diluent will flow from the chamber 71 into the chamber 26.

Insofar as possible, similar reference characters describing the parts of the form of invention A correspond to like parts in connection with the form of invention B. It will be noted that the top wall of the receptacle 70 is formed with the finger engaging extensions 27a and the top wall is provided with a venting assemblage C with is of the same construction as the venting assemblage C shown in FIGURE 12a for the form of invention A.

Various changes in the shape, size and arrangement of parts may be made to the form of invention herein shown and described, without departing from the spirit of the invention or scope of the claims.

We claim:

1. A hypodermic syringe comprising a tubular shaped housing having a chamber therein and a subject inserting apertured needle secured at the end of the housing provided with means to releasably seal the aperture thereof, a manually operated plunger slidably in the housing chamber having a slidable sealing piston head in contact with the walls of the chamber, a receptacle mounted on the tubular housing having a chamber therein located laterally of the housing, said housing and said receptacle having a duct which communicates the bottom of the chamber of the receptacle with the intermediate portion of the chamber of the housing, said plunger being capable of movement lengthwise of the chamber of the housing whereby the piston may be located so as to seal off the duct or moved to a position above the duct or to a position below the duct, and motion limiting means carried by both the plunger and the housing which in one position of the plunger with respect to the housing will limit the downward movement of the plunger in the chamber of the tubular housing so as to seal off said duct at said piston head, the plunger being rotatable so that the limiting means thereof may bypass the limiting means of the housing upon a predetermined degree of turning of the plunger with respect to the housing whereby the piston head may then be moved to a location below said duct, the chamber of the housing below said duct being provided with a medicament and the chamber of the receptacle means being provided with a solvent.

2. A hypodermic syringe as set forth in claim 1 wherein the receptacle at the top thereof is provided with a filtered vent to permit air to pass into the chamber of the receptacle and enable flow of the solvent through the duct to the chamber of the housing when the piston is withdrawn to lift the piston head above the duct thereby creating a vacuum which will enable such flow of the solvent to the chamber of the housing and admixture with the medicament.

3. A hypodermic syringe as described in claim 1 wherein the motion limiting means of the plunger comprises a depending stop extension connected at the top of the plunger and located laterally therefrom in substantial parallelism therewith, and the motion limiting means of the housing comprises a lateral flange located at the top of the barrel for only a portion of the circumference thereof.

4. A hypodermic syringe as defined in claim 1 in which the receptacle is laterally disposed to one side only of the housing and is provided with a bottom wall which slopes laterally from its most outermost side downwardly towards the housing to a location immediately below the duct.

5. A hypodermic syringe as described in claim 1 wherein the receptacle comprises a cylindrical shaped hollow body surrounding the housing at the upper portion thereof provided with a bottom wall which slopes both circumferentially and laterally towards the housing to a lowermost location immediately below the said duct.

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