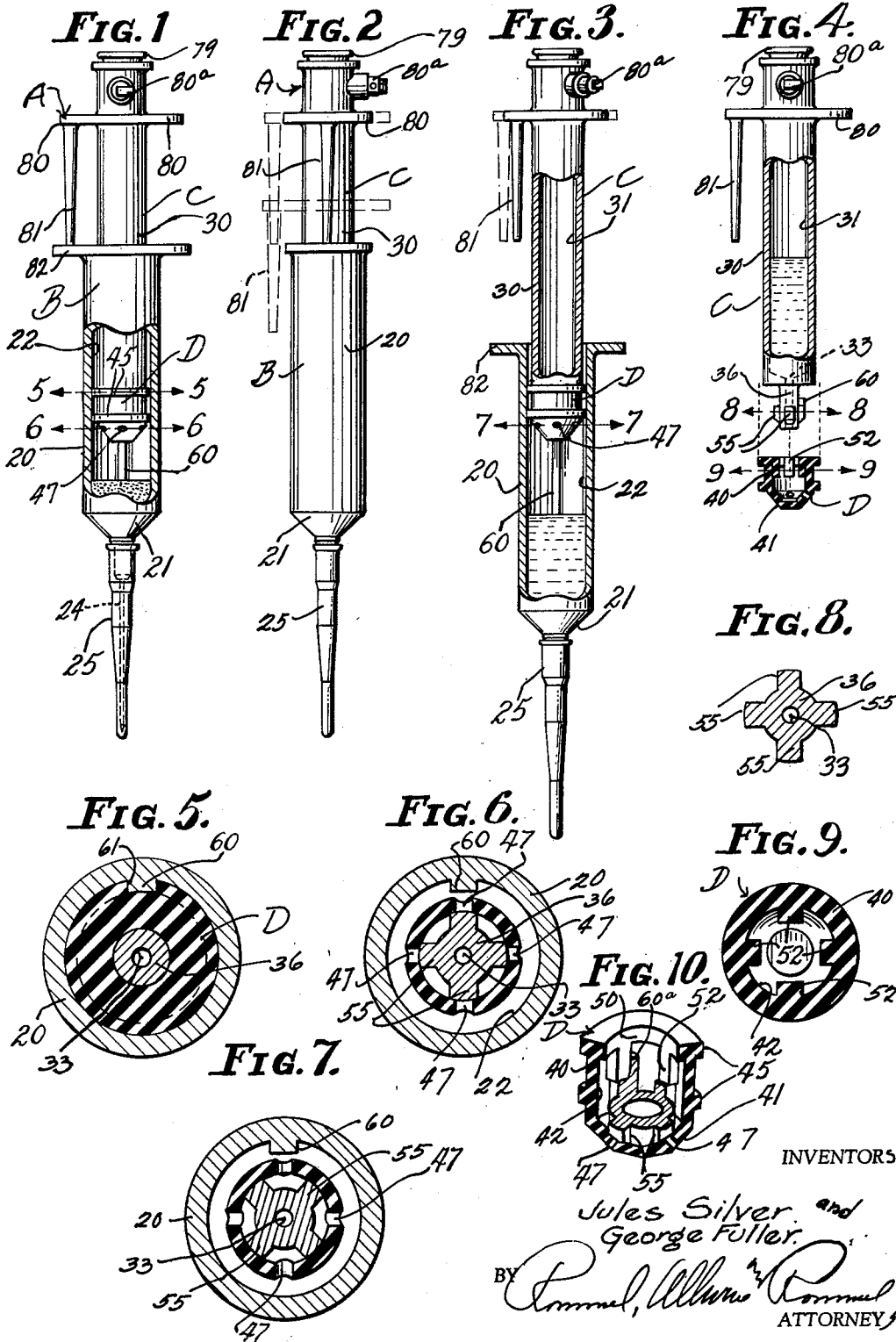


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DISPOSABLE HYPODERMIC SYRINGE

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1

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DISPOSABLE HYPODERMIC SYRINGE

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This invention relates to improvements in disposable hypodermic syringes and has particular reference to improved means for supporting a powdered pharmaceutical and a diluent or solvent therefore under such conditions that syringe may with facility be operated to enable the diluent to dissolve the powder prior to subject injection.

A further object of this invention is the provision of an improved disposable hypodermic syringe presenting certain improvements over the syringes shown in a co-pending application Serial No. 598,437, filed July 17, 1956, and now abandoned, and incorporating also certain other features set forth and described in an application filed concurrently herewith, Serial No. 789,931, filed January 29, 1959.

A further object of this invention is the provision of an improved disposable hypodermic syringe which includes a housing having a plurality of compartments, one of which is adapted to receive a powdered medicament and the other of which is adapted to receive a diluent or solvent for the medicament; the improved syringe including a plunger-like member having a novel type of valve which can, with facility, be manipulated so as to permit or prevent flow of diluent into the medicament.

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

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

FIGURE 1 is a fragmentary side elevation of the improved disposable hypodermic syringe, showing certain parts in section.

FIGURE 2 is a side elevation of the syringe taken at an angle of 90° with respect to the syringe shown in FIGURE 1.

FIGURE 3 is a sectional side elevation, showing a withdrawn valve supporting plunger of the syringe in position to enable a diluent to admix with the powdered pharmaceutical.

FIGURE 4 is a side elevation, partly in section, showing a plunger-diluent supporting barrel of the syringe; its valve cap being removed therefrom for the purpose of more clearly illustrating the structure of the parts.

FIGURES 5 and 6 are cross sectional views taken substantially on the lines 5—5 and 6—6 respectively, shown in FIGURE 1, and illustrating the positions of the inner and outer barrels of the syringe when the valve is closed in order to support in the lower portion of the outer barrel a powdered pharmaceutical and in the chamber of the inner barrel a diluent or solvent therefore.

FIGURE 7 is a transverse cross sectional view taken substantially on the line 7—7 of FIGURE 3 showing the valve open for permitting the diluent to pass or be drawn from the inner barrel into the outer barrel.

FIGURES 8 and 9 are transverse cross sectional views taken substantially on their respective lines 8—8 and 9—9 shown in FIGURE 4.

FIGURE 10 is a fragmentary perspective sectional view showing the manner in which the parts of the inner barrel are formed to cooperate with the structure of the valve in order that the valve can function either to close off connection between the diluent and outer chambers or to communicate them.

In the drawing, where is shown only a preferred em-

2

bodiment of the invention, the letter A may generally designate the hypodermic syringe. It includes an outer barrel B and an inner plunger-barrel C. The latter is provided with a valve structure D which can be operated by relative turning of the barrels B and C to function as a valve to prevent or permit a solvent admixing with a powdered or dry medicament.

The outer barrel B preferably comprises a barrel body 20 having a lower sloping bottom 21 and a medicament powder chamber 22 therein which is entirely opened at the top thereof. The lower end of the body 20 is provided with means to releasably receive a hypodermic injection needle 24 which is usually sealed and housed within a plastic removable casing 25.

The inner barrel C functions as a plunger and the same has a body 30 with a diluent receiving chamber 31 thereon. The chamber 31 narrows into a bottom passageway 33 at the lower end of the body 30, and the latter is there provided with a reduced extension 36 through which the passageway 33 extends and opens at the bottom of extension 36. It is on this extension 36 that the valve D is received.

A cup shaped valve D, preferably of rubber "Neoprene" or some other resilient material having a 35 durometer includes an annular hollow body wall 40, the bottom wall 41 of which tapers downwardly; the valve thus providing an internal chamber 42. Externally, the body wall 40 is provided with annular sealing ribs 45 which engage the inside of the chamber 22 to seal off the chamber in piston fashion as the plunger 30 is slid along the chamber 22. The tapered bottom wall 41 at the upper portion thereof is provided with four lateral passageways or ducts 47 communicating with the chamber 42 and through which the diluent passes from the diluent chamber 31 to the medicament chamber 22, under circumstances to be subsequently described. The valve body 40 is provided with an internal annular flange 50 at the top thereof which annularly overlies the chamber 42. The body 40 is further provided with integral extensions 52, preferably four in number, below the flange 50 which acts as stops to insure the closed position of the valve under circumstances to be subsequently described.

The lower extension 36 of the plunger-barrel C is preferably provided with four lugs or bosses 55 thereon which, when in alignment with the extensions 52 of the valve, and engaging the same at the ends thereof, as shown in FIGURE 10, will stretch the valve nose tight over the end opening of passageway 33 and thus prevent the fluid in the barrel C from passing into the chamber 22 of the outer barrel. In order to insure that the extensions 52 and 55 may assume this relation, at least one of the extensions 55 is provided with a top stop lug 60a, as shown in FIGURE 10, against which the extensions 52 will hit when the valve is closed.

The chamber of barrel 20 is provided with a key or spline 60 and the ribs 45 of the valve D are provided with key-ways 61 to prevent rotation of the valve D in barrel 20.

Upon turning the barrel 30 so that the extensions 52 and 55 are not in alignment as shown in FIGURE 10, and then withdrawing the plunger C, the passageway 33 through the extension 36 of the barrel 30 will be opened to the ports 47 which will enable the diluent to pass from the diluent chamber 31 into the medicament chamber 22.

A feature of this application, which is set forth in a concurrently filed application Serial No. 789,931, filed January 29, 1959 includes the provision of a flange 80 upon the barrel body 30 having an extension 81 depending therefrom which is adapted to engage one of two finger grips 82 laterally flanged upon the barrel 20, to limit the depressed movement of the barrel 30 into the

passageway 22 of the barrel 20 to the position shown in FIGURE 1. In this position, the valve D is of course closed. Since the diluent has been placed in the chamber 31 by the manufacturer and the dry powder under vacuum as shown in FIGURE 1 is in the passageway 22 below the valve D, the latter under these circumstances will not permit the diluent to enter the passageway 22. Merely by turning the barrel C to the position shown in dot and dash lines in FIGURE 2, the valve D will be placed in position so that upon pulling out of the barrel C, the valve D will be moved slightly along the extension 36, which is permitted, since the extensions 52 and 55 are not then in alignment, and this will uncover the passageway 33 of the extension 36 to the ports 47. Withdrawal of the barrel C will then create further suction and pull all of the liquid into the chamber 22 and admix with the medicament therein. The valve D is then closed by turning the barrel C for 45° in the barrel B or resistance of valve D in the body B to lateral motion will close opening 33 on straight forward movement of plunger C and the needle is ready for injection into the subject. As a part of this invention, a vent valve structure 80a is provided, which is of the same structure as that set forth in my concurrently filed application above mentioned, and merely permits filtered air to enter the diluent chamber 31 as the plunger C is withdrawn from the barrel B.

The inner barrel is opened at the top and provided with a manually removable stopper 79.

On valve D the ports 47 always being open allow for equalization of pressure on both inner and outer walls of D, in the event chamber 22 is loaded under vacuum. This thereby greatly reduces the possibility of the vacuum in chamber 22 causing leakage in storage due to tendency of valve D to be sucked from seal over passageway 33.

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. In a hypodermic syringe, the combination of an outer barrel having a chamber therein provided at its lower end with a sealed hypodermic needle and opened at its upper end, a plunger type barrel having a chamber therein with a discharge opening at its extreme bottom and slidably disposed axially within the chamber of the outer barrel, a cup shaped rubber like valve head mounted on the lower end of the plunger type barrel having a slidable but non-rotatable piston fit within the chamber of the outer barrel, said piston head having lateral port means therein and an imperforate bottom wall, and means on the lower end of the plunger type barrel and disposed within the rubber type valve head adapted to stretch the imperforate lower wall of the valve head over the discharge opening of said plunger type barrel whereby to close off communication of said chamber of the plunger type barrel with the chamber of the outer barrel, said last mentioned means upon relative rotation of the plunger type barrel in the outer barrel chamber being rendered ineffective to stretch said wall and thus permit opening of the discharge opening of the plunger to the port means of said valve head when the plunger type barrel is then withdrawn slightly within the outer barrel.

2. A hypodermic syringe structure as defined in claim 1 in which the upper portion of the plunger type barrel is provided with vent means to its chamber.

3. In a hypodermic syringe, the combination of an outer barrel having a chamber therein and provided with a normally sealed hypodermic needle, a plunger type barrel having a chamber therein slidably disposed

axially within the chamber of the outer barrel, said plunger barrel having a lower discharge opening communicating with the chamber of the outer barrel, a rubber-like cup shaped valve head having a movable sliding piston fit within the chamber of the outer barrel and being longitudinally slidably mounted upon said plunger barrel at the lower end thereof over said lower discharge opening, said valve head having lateral port means therethrough, and means on the plunger barrel to control the opening and closing of said lower discharge opening with respect to said port means through rotation of the inner barrel within the outer barrel relative to said valve head.

4. In a hypodermic syringe, the combination of an outer barrel having a chamber therein and provided with a sealed hypodermic needle, a plunger type barrel having a chamber therein and a discharge opening at the lower end thereof and being slidably disposed for axial movement within the chamber of the outer barrel, a rubber-like cup shaped valve head mounted on the inner end of the plunger type barrel over said discharge opening, said valve head having a splined piston fit within the chamber of the outer barrel to render it non-rotatable within said chamber of the outer barrel, the rubber-like valve head mounted on the lower end of said plunger barrel for relative longitudinal sliding movement with respect thereto, said valve head having port means therein and means provided thereon normally closing off the discharge opening of the plunger barrel until the plunger barrel is rotated within the chamber of the outer barrel and relative to the piston head whereby upon a withdrawal movement of the plunger barrel in the chamber of the outer barrel the plunger barrel will be moved axially relative to the piston valve to open the discharge opening to said port means.

5. The hypodermic syringe as defined in claim 4 in which the lower end of the plunger barrel and the inside of the valve head are provided with extensions which are normally in end engagement and alignment to hold the discharge opening out of communication with the port means but which upon rotation of the plunger barrel relative to the valve head will be placed out of alignment to enable withdrawal movement of the plunger barrel to a slight degree with respect to the valve head to place said discharge opening in communication with said port means.

6. A hypodermic syringe as described in claim 4 in which the plunger barrel is provided with an external longitudinal extension thereon and in which the outer barrel is provided with an external lateral extension thereon which the longitudinal extension will engage to limit too far inserting movement of the plunger barrel into the chamber of the outer barrel, said lateral extension of the outer barrel being of such width that upon relative rotation of the plunger barrel within the outer barrel for placing the valve head in position for slidable movement on the inner end of the plunger valve said plunger valve may then be telescoped within the chamber of the outer barrel without interference by engagement of the longitudinal extension with said lateral extension of the outer barrel.

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