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HYPODERMIC SYRINGE

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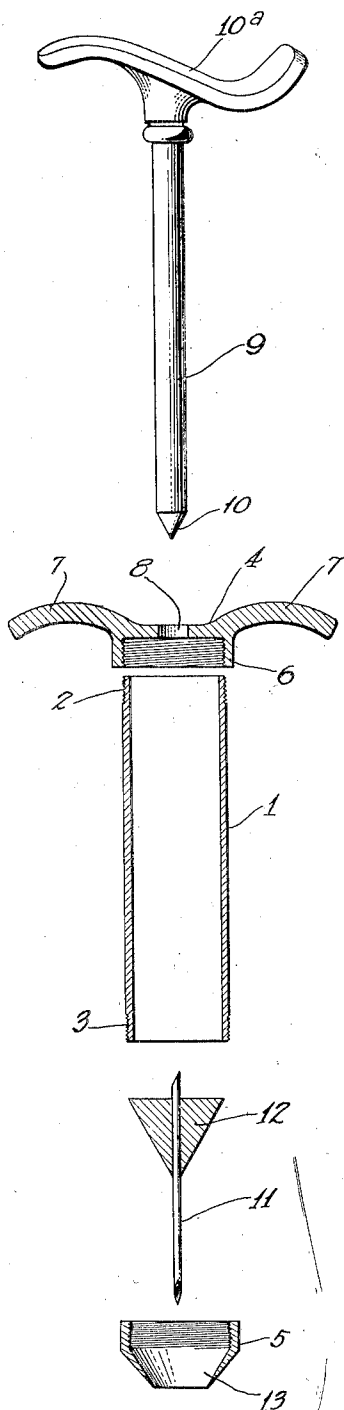


Fig. 1

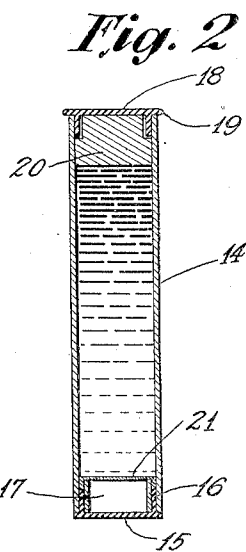


Fig. 2

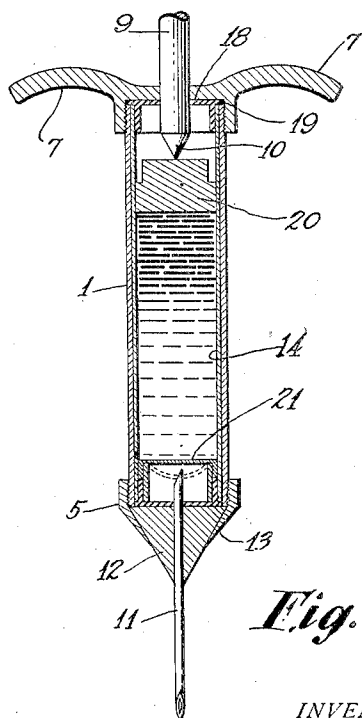


Fig. 3

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HYPODERMIC SYRINGE

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This invention relates to hypodermic syringes, more particularly of the type embodying a cartridge or sealed container of hypodermic fluid as an operable component.

5 The invention aims to provide a practicable and reliable syringe cartridge and injection administering organization embodying the same; and also to provide a syringe and cartridge therefor especially suitable for administering injections of volatile fluids.

10 The accompanying drawings illustrate one practical embodiment of the invention, but the construction therein shown is to be understood as illustrative, only, and not as defining the limits of the invention.

15 Figure 1 shows a syringe embodying this invention dismantled with certain parts shown in section and others in elevation.

20 Figure 2 is a central section of a cartridge adapted to be employed in conjunction with the syringe of Figure 1; and,

Figure 3 is a central section of a syringe with the parts fully assembled, the cartridge in place therein and the syringe ready for an injection.

25 Referring to the drawings, 1 designates a barrel of a syringe which is preferably metallic and while shown as embodying tubular imperforate walls, may be skeletonized if desired. It is in its preferred form substantially uniform in diameter and its opposite ends are exteriorly threaded as shown at 2 and 3, to receive a cap 4 and a thimble 5, respectively. The cap 4 is provided with a depending interiorly threaded flange 6 adapted to screw on to the threaded part 2 of the barrel and is further formed with laterally extending finger pieces 7 to facilitate the manipulation of the syringe.

40 The cap 4 is furthermore provided at its center with an opening 8 of a size permitting a piston stem 9 to be passed therethrough. The lower end of the piston stem is tapered to a sharp point as shown at 10 while the upper end of said stem is provided with the usual saddle 10^a adapted to be received in the palm of the hand, while the fingers of the hand engage the finger piece 7 so that in so far as the operation of the saddle is con-

cerned, it is substantially the same as heretofore.

With the lower end of the barrel 1 a needle is adapted for cooperation. As shown in the drawings, this needle embodies a cannula 11 which, contrary to the usual practice, is pointed at both of its ends and the head 12 of the needle instead of being positioned directly at the upper end of the cannula as is usual is positioned a short distance from the upper end of said cannula so that a sharp pointed end of the cannula projects above the head 12. The head tapers downwardly and is of such diameter that at its upper or base portion it is adapted to seat against the lower end of the barrel 1 to which it may be firmly clamped in position by means of the thimble 5.

The body portion of the thimble 5 is cylindrical and is interiorly threaded to screw upon the threaded portion 3 of the barrel while depending from this body portion is a frusto-conical part 13, which substantially corresponds in its interior taper to the taper of the head 12 with the result that this thimble may be screwed on to the barrel 1 to serve as a union and clamping member and clamp the head 12 to the lower end of the barrel after the manner shown in Figure 3. Tight joints will result in the use of the construction and the needle will be firmly secured to the barrel against lost motion.

Adapted to be received into the barrel 1 is a cartridge which may vary in form but is preferably constituted as shown in Figure 2. It may be constructed of any suitable material, but is shaped in proportion to be received within the barrel and housed therein. The body of the cartridge is preferably in the form of a glass tube 14 of uniform diameter throughout and provided at its top and bottom with suitable closures.

In the preferred form of the construction, the closure at the bottom is in the form of a stopper embodying a relatively thin wall from which projects an annular flange adapted to fit into the tube 14 and hold the wall 15, which forms the closure, firmly in position. I preferably form this stopper of rubber and maintain a tight fit between the

flange 16 and the wall of the tube by positioning within the flange 16 an annular ring 17 of glass or other suitable material which assists in maintaining a tight joint which will preclude leakage between the stopper and tube wall.

The portion 15 of the stopper is however preferably extended to overlies the end of the tube 14 as shown in Figure 2 so that this extended part may serve as a gasket when the cartridge is in place in the barrel 1 of the syringe. The closure at the top of the cartridge is substantially the same as the closure at the bottom. It embodies rubber stoppers 18 substantially identical in form with the other stopper but the extensions at the base of the stopper are made to project over and beyond the wall of the tube as shown at 19. The use of a distending element such as the element 17 in the lower stopper is rendered unnecessary by forming the piston plunger 20 so that it projects into the annular flange of the upper stopper and serves to distend the same and hold it tightly against the wall of the tube. The cartridge is made of such length that when received into the barrel 1, after the needle has been clamped to said barrel, that the extended portion 19 will serve as a gasket between the upper edge of the barrel and the cap 4 in order to produce a tight joint and firmly maintain the cartridge in position.

Under normal conditions the syringe may be dismantled as shown in Figure 1 and thoroughly sterilized, whereupon the needle may be associated with the barrel and thereupon one of the cartridges fully charged and hermetically sealed is introduced into the upper end of the barrel and forced downwardly so that the sharp pointed upper end of the cannula 11 will puncture the bottom stopper in order that the cannula may extend into the interior of the cartridge after the manner shown in Figure 3. The cap 4 is next screwed on to the upper end of the barrel to maintain the parts in assembled relation and the piston stem 9 thereupon introduced through the opening 8 and forced downwardly upon the upper stopper causing said stopper to be punctured in order to permit the lower end of the stem to engage with the upper face of the piston 20.

Continued pressure on the saddle 10^a will cause the piston 20 to be forced downwardly after the manner shown in Figure 3 for the purpose of forcing liquid from the interior of the cartridge through the cannula directly into the tissues of the patient. When the piston 20 has traversed the length of the cartridge, it has dispensed the contents of the cartridge and the cartridge is thereupon removed from the syringe and discarded, a new cartridge containing the desired solution being substituted in the syringe to prepare it for a subsequent injection.

It will be understood that the cartridge provides a hermetically sealed package by which hypodermic fluid such for instance as a sterile solution of narcotic or novocaine may be kept on hand without deteriorating and without liability of contamination by the atmosphere, and that by the use of such cartridge in conjunction with a sterilized needle, through which the fluid is directed into the patient's tissue, the chances of infection are minimized.

Another important feature is the fact that the syringe can be thoroughly sterilized and cleaned. In practice a cloth or suitable wiper may be readily passed through the barrel 1 when the parts are dismantled to effectually clean or clear the same from all deposits of any sort and more particularly those that are invariably found on the interior of the barrels of the well known conventional forms now employed. The use of washers or other leak-preventing devices so common in prior constructions is unnecessary here and consequently the tendency of such washers to collect bacteria and pollute the solutions to be injected is not found in the syringe of this invention.

The invention, as thus far described may be used as a complete article and will give thoroughly satisfactory results particularly when the cartridge is charged with a liquid. I contemplate using, however, in connection with this invention, a blood soluble gas or volatile liquid which I have found will have the effect of pronounced anesthesia and will desensitize the path of the needle as it progresses within the tissues, beginning its desensitizing effect even before the needle perforates the tissue on the very surface where the effect is most painful.

This gas forms the subject matter of another of my inventions, but the present invention is preferably so constituted as to adapt it for use in this connection. To this end I preferably associate with the lower ring 17 and with the upper portion thereof a flexible diaphragm or secondary sealing member 21, which may be of any suitable material, but can conveniently be made of rubber. Under ordinary conditions, this diaphragm will be stretched taut across the upper end of the ring 17 as shown in Fig. 2, and in full lines in Fig. 3. The inwardly projecting portion of the needle is of such length that when the plunger 20 is in its elevated position the sharp point of the needle will be free from contact with the diaphragm 21. However, when the piston is depressed, the contents of the cartridge will be placed under pressure, causing the diaphragm 21 to be temporarily forced downwardly into the concave formation shown in dotted lines in Figure 3, whereby it will be impaled by the needle which will pass through the diaphragm to permit the gas or liquid to escape through the

cannula of the needle and permit the injection to be performed. As soon as the piston stem 9 is retracted, however, through removal of pressure from the saddle 10^a, the diaphragm 21 will spring back into normal position and free from engagement with the needle, whereupon the small perforation which has been made by the needle in said diaphragm will automatically close to prevent undesirable escape of the contents of the cartridge.

This construction which employs the double seal at the outlet end of the cartridge may be used either for gases or liquids to advantage when injections which require less than the full charge of the cartridge are to be made.

In the foregoing detailed description, I have referred to the use of either a liquid, semiliquid or a gas in the cartridge and I consider the invention thoroughly efficient in the injection of any of these materials, whether it be a liquid, semiliquid, gas or other aeriform fluid. It is therefore to be understood that while I have referred in the appended claims to liquids and fluids that these different terms are not to be construed as distinctions but that they are to be understood as full equivalents of one another and without limiting the claims to either one or the other.

Having thus fully described the invention, what I claim as new and desire to secure by Letters Patent is:

1. A hypodermic syringe instrument comprising a cartridge-holding barrel consisting of a straight open-ended tube of substantially uniform bore, a double-pointed needle arranged with its inner end protruding into the barrel to pierce the fore end of a cartridge inserted therein, a conical head rigidly secured on said needle intermediate its ends, the larger end of said head being adjacent to and of sufficient diameter to butt against the fore end of the barrel, a cap engaging said head and screwed to the fore end of the barrel and clamping said head to the barrel, a cap screwed on the opposite end of the barrel provided with an opening, and a plunger rod adapted to pass through said opening for operating the cartridge.

2. A hypodermic syringe embodying a barrel provided at one end with a needle and at its opposite end with means for guiding a piston stem, a piston stem associated with the barrel, a cartridge adapted to be positioned within the barrel and containing a piston and also a liquid beneath the piston, both of the opposite ends of the cartridge being provided with disruptable seals, and means associated with the needle and with the piston stem to disrupt the seals and permit the forcing of the liquid through the needle when the piston is operated by the piston stem.

3. A hypodermic syringe embodying a barrel, a needle associated with one end of the

barrel and provided with a pointed portion projecting into the barrel, a plunger operable into the barrel from the other end thereof and provided with a sharpened end, in combination with a cartridge adapted to be positioned in the barrel and having therein a piston adapted to act upon liquid contained within the cartridge, and disruptable seals at both of the opposite ends of the cartridge adapted to be broken by the inwardly projecting portion of the needle and the pointed plunger to permit the plunger to act upon the piston for the purpose of discharging the contents of the cartridge through the needle.

4. A hypodermic syringe embodying a barrel, an abutment member embodying means for guiding a plunger and serving to close one end of the barrel, an abutment member carrying a needle and adapted to close the other end of the barrel, in combination with a cartridge, a piston within the cartridge, seals for normally sealing the opposite ends of the cartridge, said seals extending beyond the ends of the barrel whereby they are adapted to be clamped between the barrel and the abutment members and function as gaskets to preclude leakage, and an additional seal positioned within the cartridge and between one end seal and the liquid contents of the cartridge.

5. A hypodermic syringe embodying a barrel, an abutment member embodying means for guiding a plunger and serving to close one end of the barrel, an abutment member carrying a needle and adapted to close the other end of the barrel, in combination with a cartridge, a piston within the cartridge, resilient seals for normally sealing the opposite ends of the cartridge, said seals extending beyond the ends of the barrel, whereby they are adapted to be clamped between the barrel and the abutment members and function as gaskets to preclude leakage, means associated with the abutment member which carries a needle for perforating the adjacent seal, and a plunger associated with the upper abutment for perforating the other seal and operating the piston.

6. A cartridge for use in hypodermic syringes embodying a tubular portion adapted to contain liquid, a piston positioned within one end of the tubular portion and disruptable seals for closing both of the opposite ends of the tubular portion and enclosing the piston.

7. A cartridge for use in hypodermic syringes embodying a tubular portion adapted to contain liquid, a piston positioned within one end of the tubular portion and resilient disruptable seals for closing both of the opposite ends of the tubular portion and enclosing the piston.

8. A cartridge for use in hypodermic syringes embodying a tubular portion adapted to contain liquid, and a disruptable seal at

each end of the tubular portion, and a piston independent of said seals and positioned interiorly of the tubular portion and between one of said seals and the liquid contents of the cartridge.

9. A cartridge for use in hypodermic syringes embodying a tubular portion adapted to contain liquid, and a disruptable seal of resilient material at each end of the tubular portion, and a piston independent of said seals and positioned interiorly of the tubular portion and between one of said seals and the liquid contents of the cartridge.

10. A cartridge for use in hypodermic syringes embodying a tubular portion adapted to contain liquid, and a disruptable seal at each end of the tubular portion, each of said seals embodying a relatively thin disc portion adapted to seal one end of the tubular portion and a tubular flange associated with the disc portion to fit into the tubular portion of the cartridge and maintain the disc portion in position.

11. A cartridge for use in hypodermic syringes embodying a tubular portion adapted to contain liquid, and a disruptable seal at each end of the tubular portion, each of said seals embodying a relatively thin disc portion adapted to seal one end of the tubular portion, and a tubular flange associated with the disc portion to fit into the tubular portion of the cartridge and maintain the disc portion in position, and means positioned within the tubular flange of at least one of the seals for distending said flange and maintaining a tight joint.

12. A hypodermic syringe embodying a rigid barrel, an abutment member embodying means for guiding a plunger and serving to close one end of the barrel, an abutment member carrying a needle and adapted to close the other end of the barrel, in combination with a cartridge, a piston within the cartridge, a seal carried by the cartridge and sealing the piston end thereof, a seal carried by the cartridge for normally sealing the opposite end of the cartridge adjacent the abutment carrying a needle, said seal being adapted to be placed under pressure by said abutment and function as a gasket, means associated with the abutment which carries a needle for perforating the adjacent seal, and a plunger associated with the other end of the barrel abutment for operating the piston.

13. A hypodermic syringe embodying a rigid barrel, a needle associated with the forward end of the barrel and projecting interiorly of the barrel, a cartridge adapted to contain liquid, a piston within the cartridge, a disruptable seal carried by and normally sealing the forward end of the cartridge which seal is adapted to be disrupted by the inwardly extending portion of the needle when said seal is engaged by said extending portion of the needle, a disruptable seal car-

ried by and normally sealing the piston end of the cartridge, and a plunger associated with the other abutment for perforating the last mentioned seal and operating the piston.

14. A cartridge for use in hypodermic syringes embodying a tubular portion adapted to contain a fluid, a disruptable seal positioned adjacent the outlet end of the cartridge, and a diaphragm positioned within the tubular portion adjacent the disruptable seal and spaced therefrom, whereby said seal may be disrupted without releasing the contents of the cartridge.

15. A cartridge for use in hypodermic syringes embodying a tubular portion adapted to contain a fluid, a disruptable seal positioned adjacent the outlet end of the cartridge, and a rubber diaphragm positioned within the tubular portion adjacent the disruptable seal and spaced therefrom, whereby said seal may be disrupted without releasing the contents of the cartridge.

16. A cartridge for use in hypodermic syringes embodying a tubular portion adapted to contain a fluid, a disruptable seal positioned adjacent the outlet end of the cartridge, and a diaphragm positioned within the tubular portion adjacent the disruptable seal and spaced therefrom, whereby said seal may be disrupted without releasing the contents of the cartridge, and a disruptable seal at the opposite end of the tubular portion.

17. A cartridge for use in hypodermic syringes embodying a tubular portion adapted to contain a fluid, a disruptable seal positioned adjacent the outlet end of the cartridge, and a diaphragm positioned within the tubular portion adjacent the disruptable seal and spaced therefrom, whereby said seal may be disrupted without releasing the contents of the cartridge, and a disruptable seal at the opposite end of the tubular portion, and a piston positioned within the tubular portion and adjacent the latter disruptable seal.

18. A hypodermic syringe embodying a rigid barrel, a needle associated with the forward end of the barrel and projecting inwardly thereof, a cartridge positioned within the barrel, a disruptable seal adjacent the forward end of the cartridge adapted to be disrupted by the inwardly projecting portion of the needle when the syringe and cartridge are assembled, a diaphragm positioned within the cartridge at a point where it will normally be free from engagement with said portion of the needle, said diaphragm being adapted to be forced against the needle, when pressure is applied to the contents of the cartridge to cause the needle to penetrate the diaphragm and permit the exit of such material through the needle, a piston within the cartridge to impart pressure to the liquid, and a plunger mounted on the barrel to operate the piston.

19. A syringe cartridge comprising a sealed fluid-containing tube pierceable by a needle and contractible in interior volume for ejecting the fluid contents through the needle and embodying means to prevent escape of fluid through the needle until the cartridge is so interiorly contracted.

20. A hypodermic syringe embodying a tubular container, a disruptable seal upon one end of said container, a hypodermic needle associated with said disruptable seal, and a diaphragm positioned within the tubular container adjacent the disruptable seal and spaced therefrom, whereby said disruptable seal may be disrupted without releasing the contents of the tubular container.

21. A syringe cartridge comprising a sealed fluid-containing tube pierceable at its fore end by a needle and having a piston plug and rear seal, the said seal formed to provide an inwardly extending wall, and the said piston plug comprising a portion fitted in the tube and a portion of reduced diameter fitted in said annular wall and holding the same in tight contact with the interior of the tube.

22. A syringe cartridge embodying a tube having a sealing stopper formed to provide an inwardly extending annular wall, and a distending element fitted in said annular wall and holding the same in tight contact with the interior of the tube.

23. A syringe cartridge comprising a sealed fluid-containing tube embodying a sealing closure adapted to be pierced by a needle, a piston plug by which to eject the fluid contents through the needle, and an elastic diaphragm between the fluid and said pierceable closure normally in position to be clear of the needle and adapted by pressure of the fluid when the piston plug is operated to be forced against and impaled upon the needle to permit escape of the fluid there-through and to reflex when the pressure is discontinued to shut off the communication between the fluid and the needle.

24. A syringe cartridge comprising a sealed fluid-containing tube embodying a sealing closure to be pierced by a needle, a piston plug by which to eject the fluid contents through the needle, and a fluid confining wall spaced from said pierceable sealing closure adapted to be moved against and impaled upon the needle by pressure of the fluid when the piston plug is operated.

In testimony whereof I have signed the foregoing specification.

IRVING KULIK.