

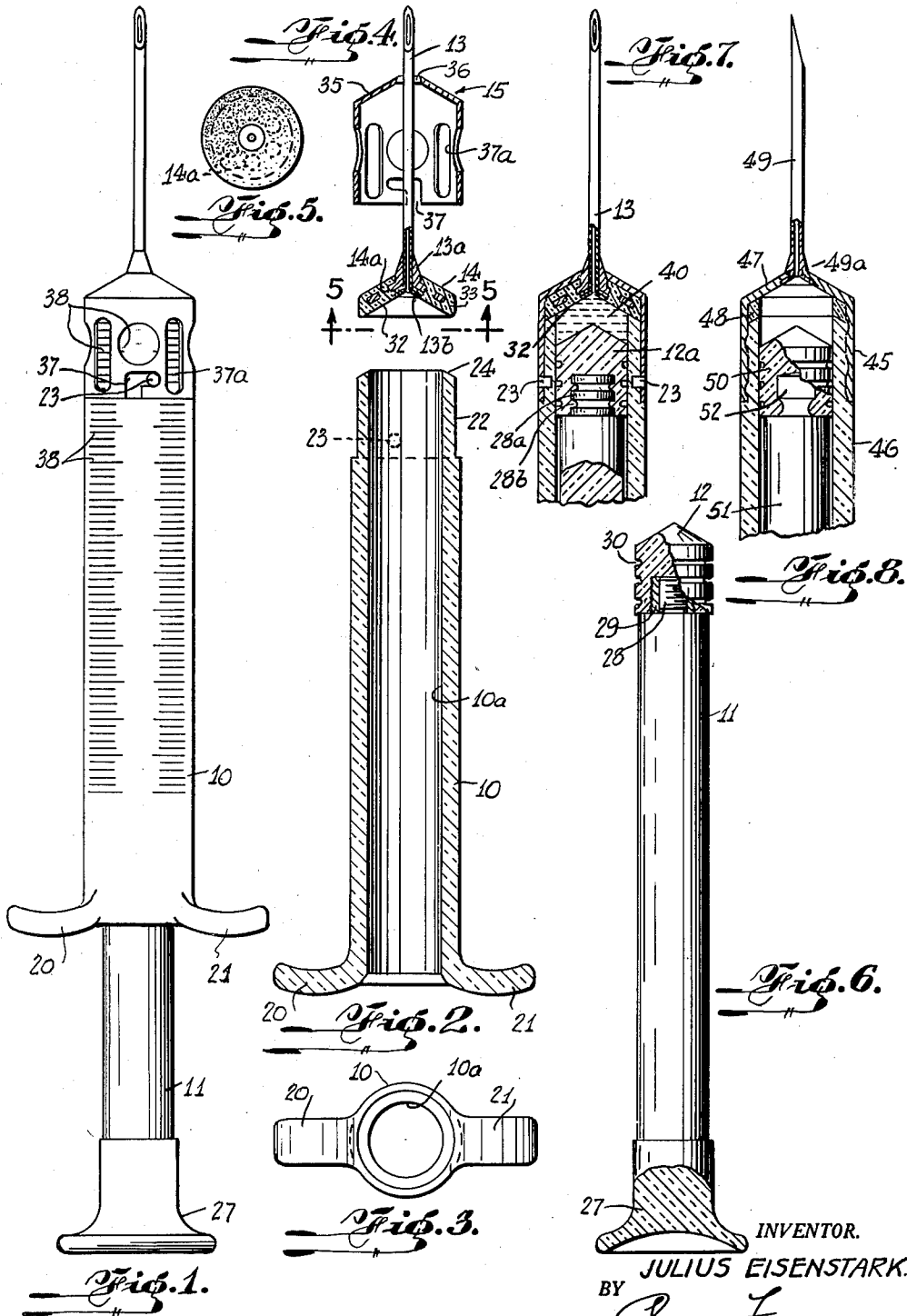
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SYRINGE

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SYRINGE

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1

This invention relates to an improved hypodermic syringe of the type used by physicians, dentists, nurses, research workers and other members of the medical and allied professions.

Hypodermic syringes are exceedingly delicate instruments. They are generally made of glass and they break with disturbing frequency during the process of their manufacture, as well as in use, and especially during the process of sterilizing them. Another disturbing element in their construction is the presence of closed corners which are difficult to reach for cleaning and sterilizing purposes. With all these disadvantages, there is the added factor of high cost resulting from their complex structure and the difficult manufacturing processes which are required to produce them.

The hypodermic syringe comprising the present invention possesses none of these disadvantages. In the first place, it is made of a practically inert plastic material that withstands boiling or steaming in the sterilizer and which is unbreakable under conditions of normal use. In the second place, it is wholly devoid of dead-end or closed corners so common to conventional syringes and so hard to reach.

It is accordingly the principal object of this invention to provide a hypodermic syringe which is made of relatively unbreakable material and which is accessible in all of its parts for cleaning and sterilizing purposes. More particularly, the barrel, neb and plunger are all made of plastic material such as polystyrene (P-8-polystyrene made by Koppers Coke Co.). The barrel, the plunger and the neb are all readily detachable from each other. The barrel is a tubular member without end walls. Even the plunger may have a detachable piston. All of the parts, therefore, are readily accessible for cleaning purposes.

Another important object of this invention is the provision of a hypodermic syringe in which the plunger, and more particularly its piston, is tapered to cone shape and the piston seat is tapered correspondingly. Marked advantages flow from this construction. Principally, this tapered design makes for greater accuracy, especially for injecting medicaments in small amounts. Another important advantage resides in the fact that this design renders the material of which the several parts of the syringe are made, suitable for extrusion processes. Furthermore, the tapered design makes it possible to empty the syringe to a virtually microscopic extent, leaving only that small quantity of medicament which occupies the needle. And finally,

2

this tapered design makes for very fine gradations and correspondingly fine measurements of the dispensed medicament.

A further object of this invention is the provision of a hypodermic syringe of the character described which is virtually leak-proof in all of the areas of contact between its moving parts, irrespective of the viscosity of the medicament or other liquid preparation being dispensed.

A still further object of this invention is the provision of a hypodermic syringe of the character described which is readily demountable for cleaning and other purposes and which is equally as readily reassembled for use. The several parts are so designed that there is little danger of contaminating its inner critical surfaces by handling them following their exposure to heat during the sterilizing process.

Preferred forms of this invention are shown in the accompanying drawing, in which:

Fig. 1 is a side view of a hypodermic syringe made in accordance with the first form of this invention.

Fig. 2 is a longitudinal section through the barrel thereof.

Fig. 3 is a rear end view of said barrel.

Fig. 4 is an exploded view in longitudinal section of the neb and needle holder, the needle itself being shown mounted in said needle holder, partly in section.

Fig. 5 is an end view of the back end of said needle holder, showing the needle mounted therein, said view being in the direction of arrows 5—5 of Fig. 4.

Fig. 6 is a side view, partly in longitudinal section, of the plunger, showing how the piston thereof is mounted thereon.

Fig. 7 is a fragmentary longitudinal section through the hypodermic syringe shown in Fig. 1 and through the parts thereof shown in Figs. 2, 4 and 6, said parts being shown in assembled and operative positions.

Fig. 8 is a view similar to that of Fig. 7 of a hypodermic syringe made in accordance with a second form of this invention, showing a different mounting for the needle, a different method of attaching the piston to the stem of the plunger, and a different method of attaching the neb to the barrel.

A syringe made in accordance with the present invention includes a barrel 10, a plunger 11 having a piston 12, a needle 13 mounted in a needle holder 14 and a neb 15 by which the needle holder is secured to the barrel. As has above been stated, barrel 10 is tubular in shape, and it has

3

no end walls of any kind or construction. At its back end it is provided with a pair of finger pieces 20 and 21, respectively, and it is provided with a reduced portion 22 at its forward end. Projecting outwardly from said reduced end portion 22 and substantially at right angles thereto are pins or bosses 23. The extreme forward or leading edge 24 of the reduced portion of the barrel is tapered to the shape of a truncated cone. The material of which the barrel may be made is preferably a plastic material which does not disintegrate in the presence of sufficient heat to sterilize it or of medicaments it is filled with, and also which is strongly resistant to breakage. Nylon, for example, is highly suitable for the purposes of the present invention. So is polystyrene such as polystyrene-8 of the Koppers-Coke Co., Styron of the Dow Chemical Co., Lustron of Monsanto Plastics Co. and Victron of the Naugatuck Chemical Co.

Plunger 11 may be made of the same or similar material. It comprises a shaft or stem having a button 27 formed at its back end and being reduced at its forward end to a small externally threaded end portion 28. Piston 12 has molded integrally an internal bushing 29 which may be made of metal, and said bushing is internally threaded to receive the externally threaded forward end portion 28 of the plunger. Piston 12 is somewhat larger in diameter than the shaft of the plunger, and its diameter corresponds to the inside diameter 10a of tubular barrel 10. A series of annular grooves 30 is formed in the outer curved wall surface of the piston and a plurality of annular ridges or bands is thereby defined. This makes for a relatively flexible outer wall surface or contact area which engages the inner wall of the barrel. If desired, ring-shaped washers made of synthetic rubber or other suitable material may be mounted in the annular grooves for an enhanced leak-proof seal between the piston and the barrel.

It will be noted that the forward end of piston 12 is tapered to the shape of a cone. The angle of this cone corresponds to the angle or taper of peripheral edge 24 of barrel 10. It also corresponds to the taper of piston seat 32 which is formed on the inner or back end of needle holder 14. Consequently, when the needle holder is mounted tightly upon tapered edge 24 of the barrel by the means hereinafter described, a leak-proof seal is provided between said needle holder and said barrel. Also, when the piston is moved into abutment with its said seat 32, every last measurable quantity of liquid is squeezed or pressed out of the barrel and into the needle.

The taper shown in the drawing is approximately 60° removed from the longitudinal axis of the instrument and this should be taken as illustrative and not as limitative of the present invention. A more acute angle would make for greater accuracy and more precise measurements as well as for greater control over the instrument during use. The reason is clear: the more acute the angle or taper, the greater will be the stroke of the plunger to dispense or eject a given quantity of fluid.

Needle 13 is set in needle holder 14 by means of a rubber gasket 33 or the like. The holder proper 14 is perforated as at 14a to enable the rubber to flow into the perforations and to be anchored firmly therein. The top shoulder of holder 14 is also tapered to the extent above indicated with respect to seat 32, peripheral edge 24 of barrel 10 and the forward end of piston

4

12. Neb 15 is a collar-like member which has a tapered top wall 35 having a central opening 36 through which the needle projects when the neb is mounted on the barrel as shown in Fig. 1. It has a bayonet slot 37 which is adapted to engage pins 23 on the barrel to secure said neb to said barrel and hence the needle holder and needle to the barrel. The taper of its top or forward wall 35 again corresponds to the tapered parts above described, and hence when the neb is mounted on the barrel, and a snug fit is provided between its said wall 35 and the top shoulder of needle holder 14 as well as between seat 32 of the needle holder and tapered edge 24 of the barrel. Longitudinally extending openings 37a are provided in the side wall of neb 15 to expose the calibrations 38 which are provided on barrel 10.

Fig. 7 best shows the several parts above described in assembled condition. Piston 12a is shown at a spaced distance from piston seat 32 and the space between said piston and said piston seat is occupied by a liquid 40 which may constitute a medicament or other preparation which is dispensed hypodermically. The reduced end portion 28a is shown with circular grooves 28b to which the piston 12a is molded.

In Fig. 8 neb 45 is threaded internally, and barrel 46 is threaded externally at its reduced end so that the two members may be brought into screw-threaded engagement with each other. Neb 45 has a tapered wall 47 at its forward end and a gasket 48 is mounted between said wall and the tapered peripheral edge of the reduced portion of the barrel. A leak-proof seal is thereby provided. There is no needle holder 14 as such in the second form of the invention, and neb 45 performs the function of holding the needle in place at the end of the barrel. It has a centrally extending opening in its forward tapered wall 47 corresponding to opening 36 in wall 35 of neb 15. Needle 49 is brazed to wall 47 at its said central opening as Fig. 8 clearly shows at 49a. In the first form of this invention, the neb may be made of plastic material or metal, as desired. In the present, second form of the invention, the neb must be made of metal if the needle is to be brazed to it. Another difference between the two forms of this invention resides in the manner in which piston 50 is mounted on plunger 51. In the first form of the invention, there is a screw-threaded engagement between the reduced forward end of the plunger and piston 12. In the second form of the invention, the piston is molded directly upon reduced end portion 52 of plunger 51.

It will be understood that the foregoing is a description of two preferred forms of this invention, and that other forms and modifications of these forms may be had within the broad scope and spirit of the invention as defined in the claims of this application. Changes in taper, changes in material, and other changes are all contemplated within the coverage of the invention.

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

1. A hypodermic syringe comprising a tubular barrel, a plunger slidably mounted in said barrel, a piston having a conically shaped leading end, mounted at the forward end of said plunger, and a tapered piston-seat member mounted at the forward end of said barrel, said piston-seat member having a central opening formed there-

5

in and having a needle secured thereto in said opening, said piston-seat member and the adjacent portion of said needle having a continuous covering of resilient material.

2. A hypodermic syringe comprising an open-ended tubular barrel, a plunger slidably mounted in said barrel, a tapered piston mounted at the forward end of said plunger and having a tapered leading end, a neb removably mounted at the forward end of said barrel, and a needle holder secured to the forward end of the barrel by means of said neb, said needle holder having a needle secured thereto and projecting forwardly therefrom, and having a piston seat formed thereon at its inner end, said piston seat being tapered to correspond to the taper of the piston, and a covering of resilient material enveloping said needle holder and the portion of said needle adjacent thereto.

3. A hypodermic syringe in accordance with claim 2, wherein the neb is demountably secured to the forward end of the barrel by means of a pin which is provided on said barrel and a co-

6

operating bayonet slot which is provided in said neb.

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