

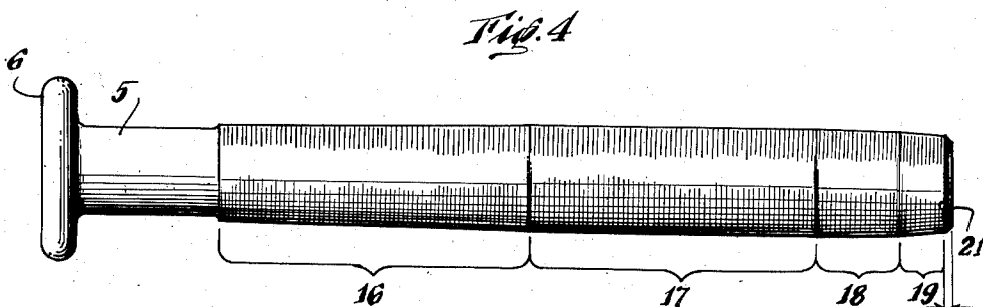
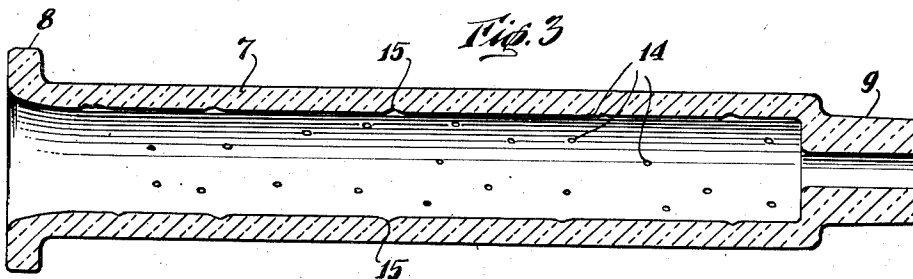
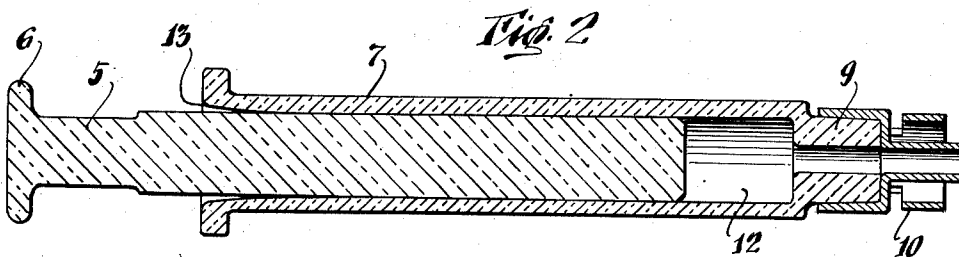
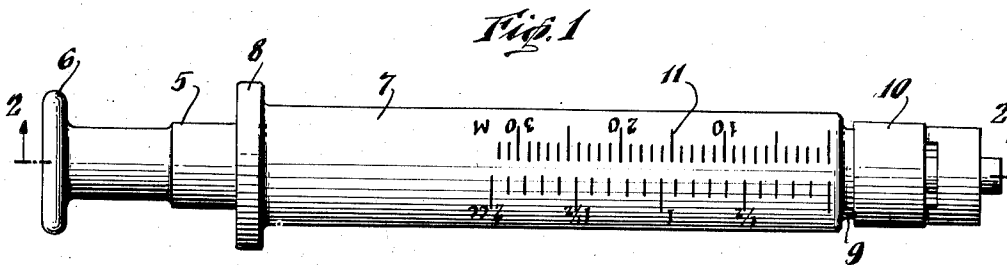
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HYPODERMIC SYRINGE

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2,792,833

HYPODERMIC SYRINGE

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5 Claims. (Cl. 128—218)

This invention relates to a structurally and functionally improved hypodermic syringe; the present application being a continuation in part of our prior application for United States Letters Patent, Serial No. 221,220, filed April 16, 1951, now Patent No. 2,736,992, entitled "Hypodermic Syringe and Method of Making the Same."

By means of the present invention a syringe assembly is produced which will be of the all-glass type and which will have a long effective life despite the fact that it may be subjected to repeated cleaning operations involving the use of detergents, repeated sterilizations and other uses which ordinarily decrease or destroy the usefulness of such an assembly.

A further object is that of furnishing an apparatus of this nature in which there will be substantially no danger of effective leakage occurring between the barrel and plunger even although highly fluid medicaments are employed.

An additional object is that of providing a syringe assembly which may be produced at a relatively nominal figure and which will meet all standards of the medical profession.

With these and other objects in mind reference is had to the attached sheet of drawings illustrating one practical embodiment of the invention and in which:

Fig. 1 is a side elevation of the syringe;

Fig. 2 is a sectional side view of the assembly taken along the line 2—2 and in the direction of the arrows as indicated in Fig. 1;

Fig. 3 is a sectional side view of the barrel portion with parts of the same shown in greatly exaggerated form; and

Fig. 4 is a side elevation of the plunger with the characteristics of the latter again illustrated in an exaggerated manner.

Referring primarily to Figs. 1 and 2, the numeral 5 indicates the plunger which in the usual manner may be provided with a rear or actuating portion 6 in the form of a thumb contacting surface. The body of this plunger extends into the bore of a barrel 7. The latter, in accordance with conventional design is conveniently provided adjacent its open rear end with an outstanding flange portion 8 of suitable configuration. Its forward end preferably terminates in a tip 9 upon which any suitable fitting 10 may be secured so as to mount a needle. The face of the barrel receives indicia 11. The latter includes sub-divisions indicative, for example, of cubic centimeters and minims. These sub-divisions serve to register with the forward end of the plunger so that a physician will be aware of the dosage which is being injected.

Both the plunger and the barrel are formed of a suitable glass composition and the barrel is constructed in accordance with the teachings of the afore-identified application. The bore 12 of the barrel is unground. Therefore, to all practical intents, the body of the barrel may be clear so that the interior of the bore is readily visible if the barrel be formed of a composition such that a

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transparent unit results. The only optical obstruction will be the possibility of air bubbles which, due to the shrinking of the barrel and the fact that it is not ground, will not provide objectionable "air lines." As shown especially in Fig. 2, the barrel bore adjacent its rear or open end is preferably flared to a slight extent as indicated at 13. Such flaring will be located wholly beyond the part of the bore which receives the medicament; the sealing fit between the plunger and bore occurring at points forwardly of this flaring.

In accordance with the present teachings, those particles which extend inwardly of the bore face prior to the conclusion of the manufacturing operation will have been removed. This removal will preferably have been effected by selecting a plunger of proper size, applying a suitable abrasive to the parts and introducing the plunger into the bore. With such introduction and continued relative movements of the parts occurring, any minute or discrete particles extending into the bore will be severed from the barrel body. Thereafter, the barrel bore will be cleaned and all abrasive and particles of material removed therefrom. Consequently, and as shown in a greatly exaggerated manner in Fig. 3, areas 14 in the nature of "islands" will be present on the barrel surface.

These will almost always be microscopic in size. Accordingly, for all practical purposes, the barrel may be considered as clear and will certainly appear so to the unassisted human eye. In certain instances, the base surfaces remaining after removal of the particles will be flush with the plane of the bore. An abrasive having been employed, it may impart to these minute areas a satiny finish. Where, of course, the particles are broken off so that slight cavities 15 exist, no such finish will be imparted. Again, it will be understood in Fig. 3 that the area of the cavities and their depth has, for purposes of illustration, been greatly exaggerated. Certain similar depressions of a shallow nature may occur in the barrel bore as a consequence of the manufacturing method which is involved. In any event, none of these areas will have any detrimental effect on the sealing characteristics of the assembly, and the barrel will, in effect, present an unground face in which the relatively hard "chill" surface is uninterrupted.

The plunger involves a ground surface preferably achieved by the action of a centerless grinder. This provides for a "Micro-finish." That is one involving lines of grind extending transversely to the plunger axis and embracing peaks and valleys differing only minutely in height (for example, three to twenty .00001"). Grinding might, in theory, be limited to the bearing surface of the plunger and the parts adjacent thereto. As a practical matter such grinding extends preferably throughout the entire major portion of the plunger as shown in Fig. 4. That plunger is divided into zones 16 to 20 inclusive. The rear zone 16 is tapered in the direction of the actuating portion 6 to a slight extent (for example .0002"). The bearing portion 17 is as nearly truly cylindrical as possible. It extends through approximately fifty percent of the effective plunger surface. Zone 18, forwardly of that bearing portion may taper towards the forward plunger and by approximately .0005". Zone 19, beyond zone 18, may taper in the same direction by approximately .004". The extreme outer end zone 20 may have a length of around 1/32" and be tapered to extend at an angle of thirty degrees with respect to the plunger axis.

By providing the initial tapered area 20 the plunger may be readily introduced into the flared end 13 of the barrel. Incident to the tapering embraced in areas 19 and 18 it is found that the plunger rides freely within the barrel bore. Also, no objectionable sharp edge or shoulder exists in these areas. The area of the bearing surface 17 is adequate to assure a straight guided movement of the plunger and a very desirable sealing action. The taper

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incorporated in area 16 provides a free action of the parts even when they are subjected to strains such that minute distortions of the assembly occurs.

It has been found that by employing a barrel having a bore which is smooth and presents the characteristics of unground glass and using that barrel in conjunction with a ground plunger an extremely desirable assembly is furnished. The parts have no tendencies to bind with respect to each other. Also, by having the bearing portion 17 of the plunger embrace an overall length of the nature specified, a very proper seal results. This seal will not alone prevent "s squirt backs," but under continued use, involving repeated cleanings and sterilizations of the assembly, the seal will remain effective. In this connection it will be understood that due to the unground finish of the bore, chemicals will not attack the surface of the latter. Also, with regards to the bearing portion of the plunger, such changes as occur on the surface incident to sterilization, the use of detergents, etc., will not detrimentally affect that surface during the life of the assembly due to the enlarged area of the seal. Therefore, an apparatus is produced which may be satisfactorily employed for a far greater number of injections than has heretofore been possible in connection with all-glass syringes. As previously brought out, the barrel is in effect clear so that the physician may view the medicament within the same. In order that there shall be no error in connection with the amount of plunger projection, the outer end of the latter may be provided with an indicating mark or line 21 produced for example—under the action of heat—by an ion exchange within end 20. As is obvious, by resorting to such an expedient, no uncertainty will occur in determining precisely the position of the inner plunger end within the barrel bore.

Thus, among others, the several objects of the invention are shown. Obviously, numerous changes in the structure and rearrangements of the parts might be resorted to without departing from the spirit of the invention as defined in the claims.

We claim:

1. A hypodermic syringe assembly including in combination and in its ultimate form a glass piston body comprising a barrel-entering portion and an actuating portion, said barrel-entering portion having an area of uniform diameter and presenting a ground surface throughout its effective length, a glass barrel having a bore containing said entering portion, such bore presenting a smooth, chill surface throughout its length and said surface being interrupted solely by spaced island areas, the spacing being such that said barrel is—in effect—transparent.

2. A hypodermic syringe assembly including in combination and in its ultimate form a glass piston body com-

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prising a barrel-entering portion and an actuating portion, said barrel-entering portion having an area of uniform diameter and presenting a ground surface throughout its effective length, a glass barrel having a bore containing said entering portion, such bore presenting a smooth surface throughout its length, and said surfaces being interrupted solely by island areas spaced from each other to an extent such that said barrel is—in effect—transparent.

3. A hypodermic syringe assembly including in combination a plunger comprising a bore-entering body portion, the face of said portion being ground to present a sealing surface extending between ten and fifty percent of its entire length, a barrel containing within its bore said plunger portion, said bore being of constant diameter throughout its operative length, a smooth face defining the inner surface of said bore to slidably contact said plunger throughout its ground face, said face being unbroken except for spaced islands, the spacing being such that said barrel is—in effect—transparent.

4. A hypodermic syringe barrel presenting a plunger-receiving bore, said bore being of constant diameter throughout its operative length, a smooth face defining said bore and said face being unbroken except for spaced islands and the spacing of said islands being such that said barrel is—in effect—transparent.

5. A plunger for use in a hypodermic syringe assembly, said plunger comprising a body circular in cross section and the effective length of which is to enter the bore of a barrel, a cylindrical bearing portion of substantially constant diameter disposed intermediate the ends of the plunger body and providing approximately fifty percent of the over-all length of such body, such plunger being tapered rearwardly of said bearing portion and also tapered forwardly of the same, the zone of the latter tapering being defined by surfaces extending at increasing angles towards the plunger axis in the direction of the outer end of the same.

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