

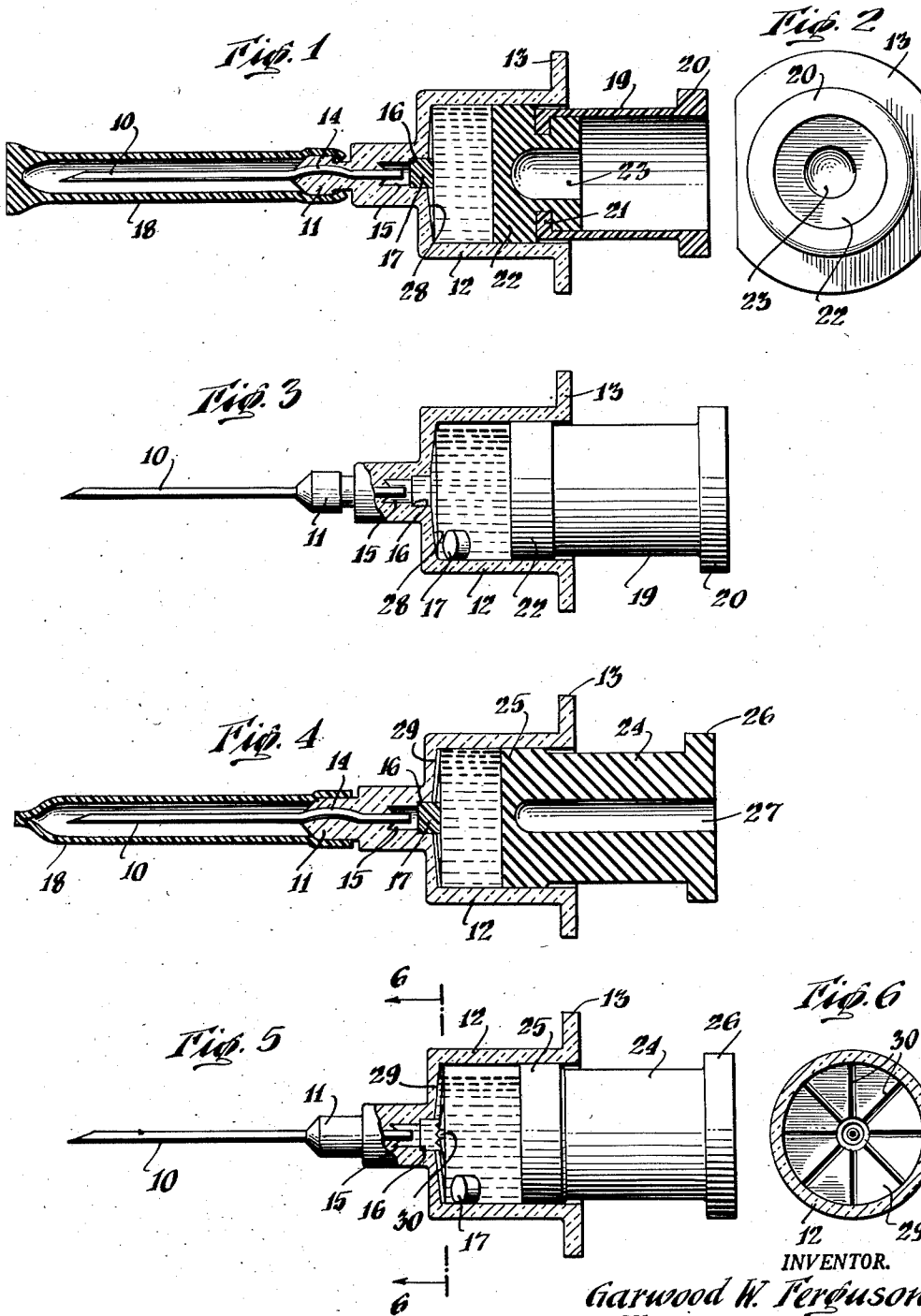
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SYRINGE ASSEMBLY

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SYRINGE ASSEMBLY

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This invention relates to a structurally and functionally improved hypodermic syringe assembly.

It is an object of the invention to furnish a device which may be discarded after a single use. Moreover, this assembly may be furnished in filled condition containing a proper medicament solution in a predetermined volume. Therefore, a self-contained unit will be furnished in accordance with the present teachings and which may be used either by a physician or a layman to provide the desired injection with full assurance that the injection will in all respects be medically correct.

Among further objects of the invention are those of furnishing an assembly which will include relatively few parts each individually simple and rugged in construction and such parts being capable of ready and economical manufacture and association with each other; the syringe moreover being quite compact and occupying a relatively small amount of space aside from the fact that it will be light in weight and not be subject to breakage or other damage.

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

Fig. 1 is a sectional side view of the assembly and showing the same in its initial condition;

Fig. 2 is a rear elevation of the same;

Fig. 3 is a partly sectional side view of the apparatus as shown in Fig. 1 but illustrating the assembly after operations preliminary to injection have been resorted to;

Fig. 4 is a view similar to Fig. 1 but showing an alternative form of structure;

Fig. 5 is a view similar to Fig. 3 but showing the assembly as illustrated in Fig. 4; and

Fig. 6 is a transverse sectional view taken along the lines 6—6 and in the direction of the arrows as indicated in Fig. 5.

In these views, the numeral 10 indicates a hypodermic needle of desired gauge and length which extends through the tip 11 of a syringe barrel 12. The latter preferably has its open rear end portion defined by outstanding flanges or wings 13 which as shown in Fig. 2 may be flattened so that the unit will not roll when placed upon a supporting surface. If necessary, the cannula 10 may be "kinked" as at 14 within the area of the tip so that relative axial movements between these parts is precluded. To the rear of the tip and in advance of the main body portion, of the syringe barrel 12, a chamber or space 15 is provided. The rear end of the cannula extends into this space and projects preferably to a point short of a shoulder 16 conveniently formed therein. This shoulder or ledge provides a seat for a plug 17 maintained out of contact with the needle base.

The syringe barrel 12 and all parts integral therewith is preferably formed of a plastic such as a clear polystyrene, natural nylon, or natural polyethylene. Where nylon or similar material is employed, it may be feasible to dispense with the kink 14 in that a straight

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cannula would be held thereby with sufficient tightness to make it unnecessary to resort to additional anchoring expedients. The cannula in accordance with conventional practice will preferably be formed of stainless steel. A

5 needle-protecting sheath conveniently encloses the needle and may have its outer end heat-sealed. The opposite end is stretched and ensleeved over the surfaces of tip 11. If, as shown, a groove is formed in the tip, it may extend into the same. Otherwise it will lie in contact with the tip surface as in Fig. 4. Sheath 18 may be provided of any desired material such as extruded tubing of a special vinyl compound. Plug 17 is preferably formed of natural or synthetic rubber. Under certain circumstances, it may be feasible to form it of a material such as polyethylene. In any event, the body of this plug should be relatively soft and subject to ready compression.

As shown in Figs. 1 to 3, the plunger may comprise a cylindrical body 19 conveniently formed of a plastic material similar to that providing barrel 12. The outer end of this plunger member is provided with a radially extending flange 20. Adjacent its inner end, it is formed with an inwardly extending flange 21 or equivalent anchoring structure serving to secure a seal 22 against movement with respect to member 19. This seal or head portion is again preferably formed of rubber and as shown, is provided with a recess 23 in its rear face.

In the event it is desired to employ a plunger which will have all parts integral with each other, then the structure as shown in Fig. 4 may be used. The plunger there indicated at 24 is conveniently formed of suitable rubber and has an inner seal portion 25 corresponding to the seal 22. Adjacent its rear end the plunger may be formed with an outwardly extending flange 26. Preferably, it is also provided with a recess 27 in its rear face and corresponding to the recess 23 in the head portion or seal 22. That recess terminates short of the forward face of the seal so that, in effect, a diaphragm portion is provided between these parts.

With a view to providing for a venting of all air from the barrel, the forward inner face of the same may be inclined to a slight extent as indicated at 28 in Figs. 1 and 3. Similarly, the barrel as shown in Figs. 4 and 5 may have its forward inner face inclined. In the latter figures, this has been indicated by the numeral 29 and in these views, the numeral 30 indicates a desirable number of radially extending grooves in the forward face which terminate in line with the chamber or recess accommodating the plug 17.

As will be understood, in use the several parts are cleaned as necessary and in accordance with any desired technique. Thereafter, the needle guards 18 are assembled on the tips 11. The guard and barrel assemblies are sterilized and the plungers and plugs are similarly sterilized. Under aseptic conditions, the plugs 17 are inserted into the recesses so that they lie in contact with the shoulders 16. So positioned each plug will seal its chamber 15 against a flow of fluid into the same. Due to the provision of shoulders 16 the plug will be prevented from being positioned too deeply and tightly within the recess. Also, it will be prevented from contacting the base of the needle. The latter extending beyond the inner recess space, no danger of the barrel material sealing the cannula bore will exist. The barrels are now filled with the injectible product in desired volume. Thereupon the plungers or plunger assemblies are introduced into the barrel to seal the latter.

In such introduction, it will, of course, be necessary to vent the entrapped air. This is preferably accomplished in accordance with the present teachings by piercing the diaphragm portions intervening the bases of re-

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cesses 23 or 27 and the forward faces of the plungers with a hollow needle and then projecting the plunger. To prevent the parts sticking silicone or other suitable lubricant may be applied to the plunger. As shown the plunger should be relatively short and of large diameter. This will assure a rigid unit. If the recess is of small diameter as at 27 any danger of the plunger distorting will be reduced.

In using the apparatus the needle guard is removed. The plunger is withdrawn to a small extent to allow air to enter the cannula and to dislodge plug 17 by thrusting upon its face, which presents an area sufficient to assure this result. In such dislodgment of the plug, care should be exercised so that the plug shifts to a position such as has been indicated in Fig. 3 or Fig. 5. It will of course be understood that the plug provides an effective airtight seal to normally prevent any contact between the contained medicament and the base of the cannula. However, the seal should be of such nature that the aspirating action aforementioned results in a ready displacement of the plug. With the plug sealing off the cannula until the time of use, it is, of course, apparent that no objections will be encountered in connection with the injectible product being in contact with the steel cannula during the storage.

Now, by having the cannula extend upwardly, the operator may expel all air from the barrel by projecting the plunger to a slight extent. Guidance of the air in a manner such that it may be readily expelled is facilitated by the inclined forward face 28 or 29 as well as the grooves 30. The needle may now be injected into the patient whereupon the syringe may be aspirated if desired so that assurance may be had that a vein has not been entered (if such a type of injection is not desired). Thereupon the plunger is projected to inject substantially all medicament contained within the barrel.

In this connection, it will be appreciated that the plug 17 being soft, it will be deformed between the forward face of the plunger and the inner face of the barrel in a manner such that these parts may shift into practically complete face to face contact despite the intervention of this plug. With the withdrawal of the needle, the injection is completed and the syringe assembly may be discarded. As will be understood with the outer end of the plunger being flat, the assembly may be supported in a vertical position upon a surface. Also, due to the flattening of flange 13 the syringe will not roll on that surface. By having the plunger, as in the case of Figs. 4 and 5, formed completely of rubber or, in effect, so formed as in Figs. 1 and 3, an extremely desirable assembly is provided. Such a plunger conforms properly with the bore of the barrel and in the case of the latter being formed of plastic material as heretofore specified, is freely reciprocable through the bore with an effective seal occurring throughout the entire range of the plunger movement. The present assembly including a relatively short barrel, the plunger may also be relatively short. Therefore, axial flexing will not occur as would be the case if an all-rubber plunger of relatively small diameter and large length were present.

Thus, among others, the several objects of the invention as aforementioned are achieved. Obviously numerous changes in construction and rearrangement of the parts might be resorted to without departing from the spirit of the invention as defined by the claims:

I claim:

1. A syringe comprising in combination a barrel, an assembly forming a part of said barrel and including an end wall secured thereto and a bored tip to fixedly support a needle, the bore of said tip being free of obstruction and increasing in cross sectional area within said assembly to provide a chamber which opens into said barrel, solely a plug extending across said chamber to seal the interior of said barrel from said bore and a piston disposed within and retractable with respect to

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said barrel to draw air through said bore to press against the face of said plug and displace the same from said chamber into said barrel.

2. A syringe comprising in combination a barrel, an assembly forming a part of said barrel and including an end wall secured thereto and a bored tip to fixedly support a needle, the bore of said tip being free of obstruction and increasing in cross sectional area within said assembly to provide a chamber having an enlarged rear portion, a shoulder defining said portion which opens into said barrel, solely a plug extending across said chamber and bearing against said shoulder to seal the interior of said barrel from said bore and a piston disposed within and retractable with respect to said barrel to draw air through said bore to press against the face of said plug and displace the same from said chamber into said barrel.

3. A syringe comprising in combination a barrel, an assembly forming a part of said barrel and including an end wall secured thereto and a bored tip to fixedly support a needle, the bore of said tip being free of obstruction and increasing in cross sectional area within said assembly to provide a chamber which opens into said barrel, solely a plug extending across said chamber to seal the interior of said barrel from said bore, a piston disposed within and retractable with respect to said barrel to draw air through said bore to press against the face of said plug and displace the same from said chamber into said barrel and said plug being formed of yieldable material such that it may be compressed between said piston and said end wall.

4. A syringe comprising in combination a barrel, an assembly forming a part of said barrel and including an end wall secured thereto and a bored tip to fixedly support a needle, the bore of said tip being free of obstruction and increasing in cross sectional area within said assembly to provide a chamber which opens into said barrel, solely a plug extending across said chamber to seal the interior of said barrel from said bore, a piston disposed within and retractable with respect to said barrel to draw air through said bore to press against the face of said plug and displace the same from said chamber into said barrel and the inner face of said end wall being inclined toward said tip.

5. A syringe comprising in combination a barrel, an assembly forming a part of said barrel and including an end wall secured thereto and a bored tip to fixedly support a needle, the bore of said tip being free of obstruction and increasing in cross sectional area within said assembly to provide a chamber which opens into said barrel, solely a plug extending across said chamber to seal the interior of said barrel from said bore, a piston disposed within and retractable with respect to said barrel to draw air through said bore to press against the face of said plug and displace the same from said chamber into said barrel and the inner face of said end wall being formed with grooves.

6. A syringe comprising in combination a barrel, an assembly forming a part of said barrel and including an end wall secured thereto and a bored tip to fixedly support a needle, the bore of said tip being free of obstruction and increasing in cross sectional area within said assembly to provide a chamber which opens into said barrel, solely a plug extending across said chamber to seal the interior of said barrel from said bore, a piston disposed within and retractable with respect to said barrel to draw air through said bore to press against the face of said plug and displace the same from said chamber into said barrel and a needle extending into the bore of said tip to a point short of said plug.

7. A syringe comprising in combination a barrel formed of plastic material and presenting a bore, a plunger extendable into said bore and projecting beyond the same, both said barrel and plunger embracing relatively short lengths and large diameters, the inner end of said plunger

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being in sealing contact with the bore surface, the entire body of said plunger being formed of rubber and said plunger being formed with a recess extending from its outer end through to a point short of its inner end to provide a pierceable diaphragm portion.

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