

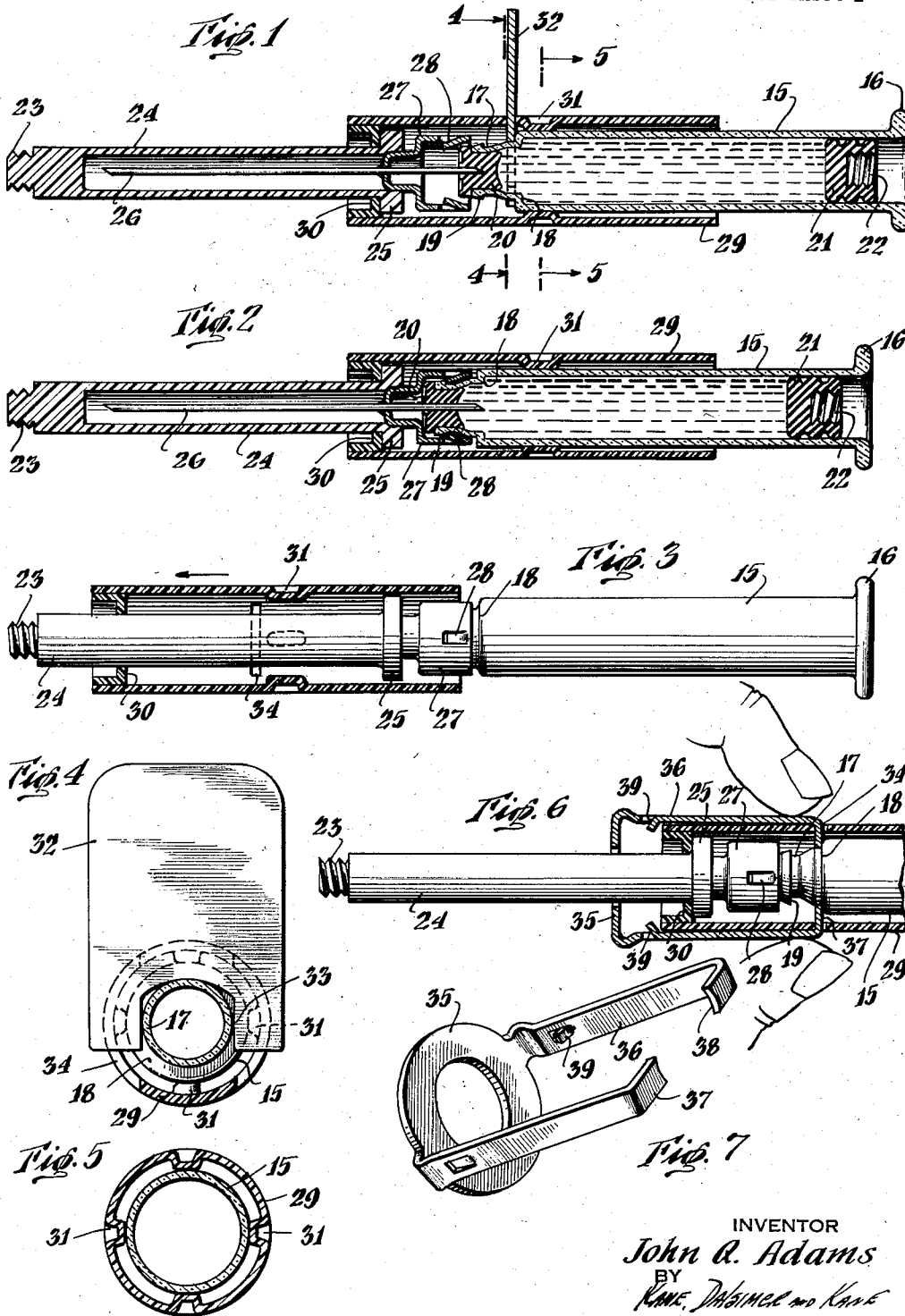
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SYRINGE ASSEMBLY

2,880,723

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2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 8

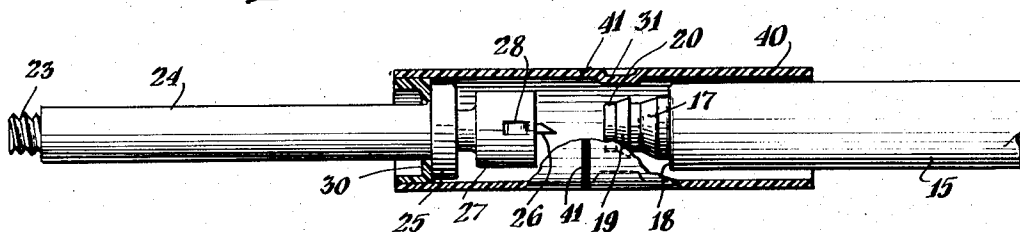


Fig. 9

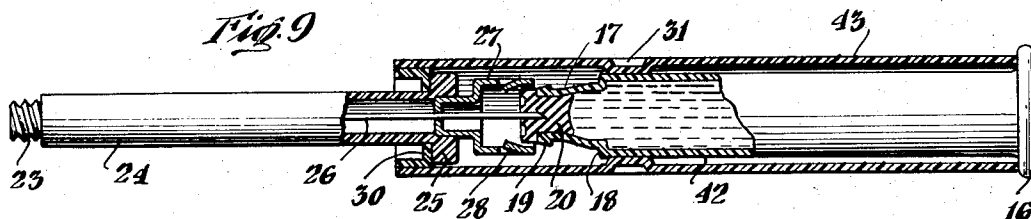


Fig. 10

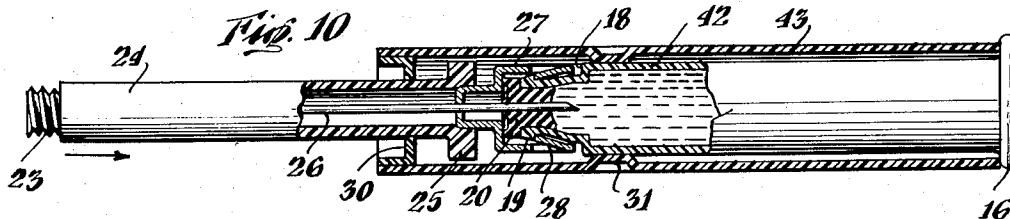


Fig. 12

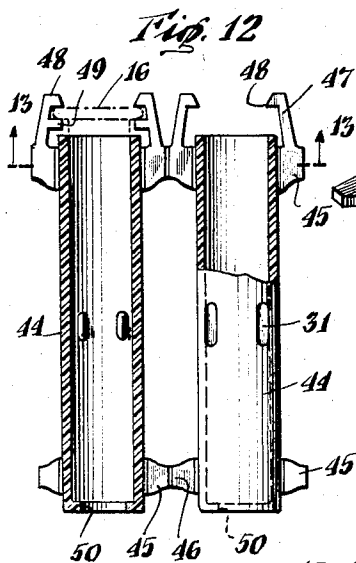


Fig. 11

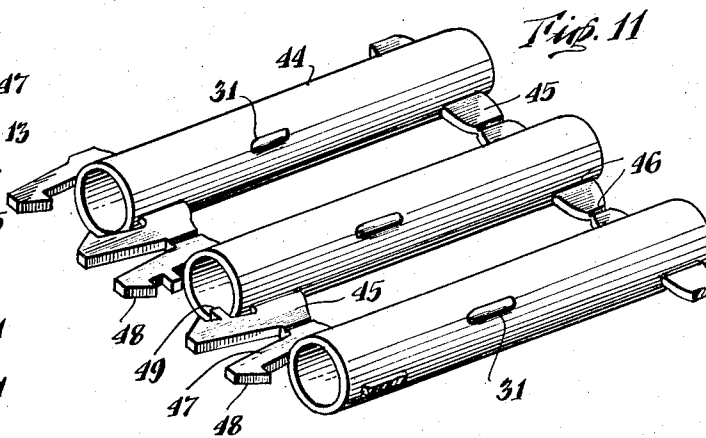
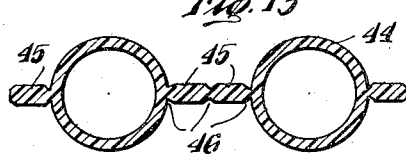


Fig. 13



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SYRINGE ASSEMBLY

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8 Claims. (Cl. 128—215)

This invention relates to a structurally and functionally improved hypodermic syringe assembly. Also, by the present teachings, a novel method of desirably operating that assembly is achieved.

A primary object of the invention is that of furnishing an assembly which will preferably have "one-time" use and in which the sterility of the parts will be maintained aside from the fact that contained medicament will remain in stable condition for indefinite periods of time.

A further object is that of providing a syringe structure in which the several parts of the assembly will be supported in proper relationship with respect to each other and ready for instantaneous use by the physician or other ultimate user without danger of the parts becoming separated or improperly disposed with respect to each other.

Still another object is that of furnishing structures which may readily be provided by quantity production methods and which may likewise be used in further similar methods in providing a completely filled and properly packaged assembly.

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 an assembly in process of being completed;

Fig. 2 is a similar view of that assembly after it has been subjected to the initial stage of its final manipulation;

Fig. 3 shows in elevation the syringe barrel, needle hub and sheath in process of their withdrawal from the other parts of the assembly and after the operation illustrated in Fig. 2 has been completed;

Figs. 4 and 5 are transverse sectional views taken respectively along the lines 4—4 and 5—5 in the direction of the arrows as indicated in Fig. 1;

Fig. 6 is a fragmentary sectional side view of a form of structure alternative to that illustrated in the preceding views;

Fig. 7 is a perspective view of one of the elements embraced in the assembly as shown in Fig. 6;

Fig. 8 is a partly sectional side view of a further form of assembly in its initial stage;

Fig. 9 is a similar view showing that assembly ready for shipping and storage;

Fig. 10 is a further view illustrative of the manipulation of the parts of the assembly of Fig. 8 by the ultimate user;

Fig. 11 is a perspective view of housing, gauging and supporting units such as may be included in the assembly;

Fig. 12 is a partly sectional side view of the units as illustrated in Fig. 11; and

Fig. 13 is a transverse sectional view taken along the line 13—13 and in the direction of the arrows as indicated in Fig. 12.

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While the present invention has utility in connection with hypodermic syringes of various types, it is in many respects of primary value when incorporating syringe embodying structures such as are shown in the Edward W. Bednarz application for United States Letters Patent, Serial No. 395,394 on Hypodermic Syringe Assembly, filed on December 1, 1953.

As shown in that application, as well as Fig. 1 and other views of the present case, a hypodermic syringe is furnished which is pre-filled and in which the medicament and other parts are maintained free from contamination or other outside factors of disturbance until the apparatus is ready for use. At that time, these parts may be readily and instantaneously manipulated so that proper connections are established and the parts are locked so as to furnish a unitary and stable assembly which may readily be employed by the physician to achieve a hypodermic injection. Thereafter, the entire device may be preferably discarded.

Thus, referring to Figs. 1 to 6 inclusive, as well as 8, 9 and 10, the number 15 indicates the barrel of the syringe. In the first of these groups of figures, this barrel is preferably formed of glass and has its rear end defined by an outwardly extending flange 16. Its forward end is conveniently defined by a reduced neck portion 17. Thus, a shoulder 18 or flange part intervenes the neck portion and the main body of the barrel. Adjacent the outer end of the neck 17 there is provided a detent part which conveniently takes the form of an outstanding flange or ridge 19. The rear of flange end 16 of the barrel is closed by a piston-type stopper 21, while the neck portion 17 is closed by a perforable, headed type stopper 20. Both of these stoppers are formed of natural or synthetic rubber although other materials may be employed.

To effect a shifting of piston 21 within the bore of barrel 15, a suitable actuator is employed. To connect with this actuator, stopper 21 may be provided with a threaded recess 22 which receives a correspondingly threaded extension 23 of the actuator 24 which is in the form of a needle sheath preferably of suitable plastic. This sheath has at its inner end an outwardly extending flange portion 25. In its initial position, it receives within its bore the outer end of a hypodermic needle 26, which is mounted by a hub 27 defining a bore such that it may receive the reduced neck portion 17 of the barrel. Inwardly extending pawls 28 are conveniently formed integrally with the skirt of hub 27; these pawls providing the second part of the detent structure as hereinafter described. The inner end of the cannula 26 may be pointed and extends beyond the edge of the skirt of hub 27.

As shown, particularly in Fig. 1, the interior of barrel 15 (after suitable sterilization and the mounting of at least one of the stoppers 20—21) is filled with medicament. This medicament is sealed against all exterior influences by the mounting of the second stopper. Sheath 24, overriding the reduced and outer end of hub 27 and being in sealing contact with the same, maintains the sterility of the outer end of needle 26. The inner end of that cannula is likewise maintained in sterile condition by being embedded in the body of stopper 20. However, it does not penetrate that stopper at this stage. Therefore, no deleterious contact will occur between the inner end of the needle and the packaged medicament. These positions of the parts are maintained until the assembly is to be used in providing an injection.

At that time, all a physician or technician has to do is to move the barrel 15 inwardly with respect to the needle assembly to render the unit operative. As a consequence of such movement, the inner end of the

cannula penetrates stopper 20 and communication is established with the interior of the barrel. The needle assembly is, in effect, supported against objectionable movement in that hub 27 overrides the reduced neck portion 17 and pawls 28 slide past flange 19 or an equivalent detent structure to thus lock the parts against separation. As will be appreciated under these circumstances, the needle hub will not have objectionable movements with respect to the outer barrel end, because of the detent structure and the fact that the inner face of the hub bears against the head of stopper 20, as in Fig. 2. Now by removing sheath 24 and coupling portion 23 of the latter with the surfaces of recess 22 in piston stopper 21, that stopper may be shifted to cause either an aspirating or expelling action. So connected, the assembly will properly function as a hypodermic syringe.

As will be understood with the parts positioned as in Fig. 1, care has to be exercised (if the needle assembly is otherwise unsupported) in avoiding an accidental detachment and complete separation of the needle from the barrel portion of the syringe. Also, difficulty has been experienced incident to undesired thrusts causing a telescoping of the needle hub over the forward end of the barrel to thus establish premature connection between the bore of the cannula and interior of the barrel. Moreover in providing the assembly with the parts disposed as in Fig. 1, great care has had to be exercised in assuring an embedding of the inner cannula end into stopper 20, to maintain sterility, without causing that part of the needle to actually penetrate the stopper at the time of its initial assembly. These difficulties are overcome by the present teachings.

More particularly as shown in Figs. 1 to 4, a sleeve 29, preferably formed of plastic, encloses the forward end of the syringe barrel 15 and the rear end of the needle assembly as well as the zone of overlap of these parts. This sleeve may be substantially larger than the exterior diameter of barrel 15 and its forward end may be partially closed by an inwardly extending flange defining a diameter less than that of the base portion 25 of sheath 24. This flange, as shown, may be furnished by a separate collar portion 30 fixed against movement within the bore of sleeve 29. To center the barrel 15 within that bore, indentations or projections 31 may be included in sleeve 29 at points substantially midway of the ends of the latter. The inner surfaces of these projections define contact zones of a yielding nature against which the outer face of barrel 15 bears. The latter is accordingly guided in its movements through the sleeve and the guidance results in the head portion of stopper 20 having its central area aligned with the axis of the needle assembly.

As will, of course, be understood, barrel 15 is filled with medicament and has its ends sealed as aforescribed. Sleeve 29 receives sheath 24 and the needle assembly with the parts of the latter properly sterilized. These parts are also positioned so that sealing contact is established between the sheath and the nose or forward portion of the hub. With collar 30 defining an aperture such that sheath 24 is slidably mounted, needle 26 will also be in alignment with the axis of the assembly. Therefore, the inner end of the needle will align with the central surface zone of stopper 20.

Now in order to assure a projection of the barrel with respect to the needle assembly in a manner such that the inner end of the cannula is embedded within and sealed by stopper 20, while at the same time there is no danger of that cannula end penetrating the stopper, a stop structure is employed. This conveniently takes the form of a plate 32 provided with leg portions 33. The distance between the inner edges of the latter is more than that of the reduced neck portion 17. The inner edge zones of these legs straddle sleeve 29 and pass through slots 34 formed in the same so as to enter the bore of the sleeve. Therefore, with the needle and sheath

mounted as aforescribed, an operator or machine may ram the filled barrel into the sleeve. With the stop or gauge in position, one need have no fear that the parts will not be properly related to each other. More particularly, the shoulder portion 18 of the barrel will have its inward movement arrested by coming into contact with the face of plate 32. At the zone of arrest, precisely the proper degree of penetration of the inner end of the needle into stopper 20 will have occurred. This will be with the flange or base portion 25 of the sheath 24 resting against the inner face of collar or end wall 30. Thereafter, the plate 32 may be removed and the entire assembly will be maintained in packaged condition and ready for instantaneous use. That use will only require a grasping of sleeve 29, a projection of barrel 15 so that the detent parts 19 and 28 interengage, a withdrawal of the assembly from sleeve 29 and a coupling of sheath 24 with piston 22 if this form of actuator is employed.

As will be understood in connection with the assembly just described and illustrated in Figs. 1 to 5, inclusive, the parts are grouped together in the manner shown in Fig. 1 and after withdrawal of the gauge or stop plate 32, remain in the several positions which they have assumed until the apparatus is to be used. As will be apparent there will be no danger of the needle accidentally establishing communication with the medicament within the barrel bore. That medicament will thus be maintained free from contamination and additionally, will be maintained in sterile and stable condition due to the seals provided by stoppers 20 and 21. Likewise, the entire needle assembly, including the sheath interior, will be maintained in sterile condition. The sleeve 29 will act as a packaging and coupling unit such that the danger of any accidental separation occurring between the needle assembly and the barrel will be precluded. This, of course, is in addition to any further packaging which an individual assembly or a series of the same may be subjected to.

In lieu of plate 32, which is removed at the time the package is provided, as in Fig. 1, a stop-engaging plate or fixture may be employed which remains as part of the assembly until the apparatus is employed in connection with the hypodermic injection. Such a stop structure has been shown especially in Figs. 6 and 7. In these views, the same reference numerals as heretofore employed designate parts which may be considered as identical with correspondingly designated parts in earlier portions of the specification. However, there is applied to the sleeve 29, a fixture which may include a ring-shaped body 35 of metal and the inner diameter of which is adequate to permit the passage of sheath 24. Legs or arms 36 extend from the ring 35 at preferably diametrically opposite points and terminate in foot portions 37 extending toward each other and conveniently having curved edges 38. Inwardly struck lugs 39 are provided as part of legs 36 and are spaced a distance less than the diameter of sleeve 29. These inturned portions will therefore—as in Fig. 6—function as gauge stops to limit the inward movement of the fixture with respect to sleeve 29. Foot portions 37 will thereafter align and, upon the application of pressure, pass through the openings 34 in that sleeve and be spaced a distance such that they will conveniently engage with their rounded edges 38, the similarly contoured surface of barrel 15 adjacent the shoulder or flange 18.

As will be apparent in this form and in others where a glass barrel is employed, the distance between flange 18 and the barrel tip will be substantially constant in a series of units. Otherwise stated, this dimension will not vary to an extent such that the depth of stopper 20 will fail to receive and completely embed the inner end zone of the needle. At the same time, this end will not be caused to penetrate entirely through stopper 20.

This stop fixture will serve the same purpose as plate

32 in that it will arrest the inward movement of barrel 15 at a point short of that at which the inner end of needle 26 would have completely penetrated stopper 20. At the same time in the packaging operation (whether by machine or by hand) it will have been feasible to have projected the parts to a point where the inner end of the needle is embedded within the body of and sealed by this perforable stopper. Of course, the fixture will remain in association with the package assembly until the syringe is ready for use. At that time, the physician or other ultimate user will simply bend arms 36 so that the entire stop fixture may be removed from sleeve 29 and discarded. Thereupon, by projecting the barrel within the sleeve, a positive and final coupling occurs between that barrel and the needle assembly. Now by simply removing the sleeve 29 and attaching an actuator to the piston 21, a hypodermic injection may be accomplished.

According to the present teachings, it is not essential to employ stop plates or members such as 32 or the foot portions or plates 37. In lieu thereof, and as shown in Fig. 8, a sleeve 40 may be employed which will have the general characteristics of those heretofore described in connection with sleeve 29. Conveniently, a sighting line or mark 41 may be incorporated in the sleeve at the point or plane defined by openings 34 in the earlier views. This line or mark may serve as a stop indication to an operator projecting barrel 15 into sleeve 40. In other words, with the needle assembly positioned adjacent the flange 30 as shown in this figure, a projection of the barrel to a point where its flange 18 aligns with mark 41, will assure the operator that barrel 15 is properly centered by the indentations 31 and that the inner end of the needle 26 has embedded itself within and been sealed by the body of stopper 20. At the same time, the needle will not have penetrated the stopper. In fact, by employing in an automatic apparatus a selenium cell which will limit the projection of one or a series of barrels into sleeves 40 as, for example, by flange portions 18 intersecting a light beam directed to that cell, an obvious control might be furnished to limit or arrest further projection of the barrels. In this case, the line or mark 41 might or might not be employed.

As afore brought out, the barrels 15 are preferably formed of a material such as glass. Having in mind that the length of a series of successive units formed of such material will vary substantially in the over-all barrel lengths, the stop or arrest expedient has been resorted to in connection with the forward barrel ends i.e. preferably the zone short of flange 18. Under these circumstances, sleeve 29 has been sufficiently limited in length such that the rear end of the barrel extends beyond the adjacent end of the sleeve to a substantial extent. However, if the barrels be formed of a material and/or according to techniques which assure uniform over-all lengths of a series of such barrels, then a different structure may be resorted to as, for example, in Figs. 9 and 10.

In those views, the numerals 42 indicate barrels formed, for example, of plastic and according to any acceptable technique such that successive barrels will have the same length. Otherwise, the structure of the syringe assembly may be identical with that heretofore described, for which reason the same reference numerals have been employed. Also, in Figs. 9 and 10, numerals 43 indicate sleeves corresponding generally to the sleeves 29 in the earlier views. However, sleeves 43 have a length such that with the needle assembly properly disposed in contact with and anchored by, the collar or flange 30, the barrel 42 may be introduced into the sleeve bore to a point where its rear flange 16 engages with the adjacent edge defining the sleeve end. Under these circumstances, the over-all space within the sleeve will assure that the inner end of the cannula or needle has embedded itself centrally into stopper 20 and is sealed thereby, but in no instance has penetrated that stopper. As will be apparent with an assembly such as this, all parts are again properly sup-

ported and protected against contamination as well as accidental separation.

When the ultimate user desires to employ the syringe, then all that is necessary is for him to grasp sleeve 43 and the adjacent flange portion 16 of barrel 42 to prevent relative movements between these parts. Thereupon, by exerting axial pressure in an inward direction against sheath 24, he will shift the needle assembly from the position shown in Fig. 9 to that illustrated in Fig. 10. Such inward movement will cause a telescoping of needle hub 27 over the head of stopper 20, reduced neck portion 17 and the flange or detent 19 thereof. Therefore, the latter will serve—in cooperation with the pawls 28—to lock the parts in position. Of course, in lieu of grasping the sleeve and end of the barrel with the hand, the entire assembly may be placed in a vertical position upon a supporting surface and with flange 16 in direct contact with that surface. Thereupon, by exerting a downward thrust on the sheath, the same result will be achieved.

Regardless of the length embodied in sleeves such as 29, 40 or 43, these sleeves may be coupled to each other to provide a series of assemblies which are, in effect, integral with each other and which may be separated individually from the group as the need arises. This has been shown in Figs. 11, 12 and 13. In those views, a somewhat exaggerated spacing between the individual sleeves has been resorted to for the purpose of clarity. In any event, it will be seen that the numeral 44 indicates the sleeves preferably formed of plastic and connected to each other by tab portions 45 which may be integral with each other and formed with lines of weakening 46. These lines conveniently occur at points substantially midway between the sleeves as well as at the zone where the base portion of the tabs or extensions connect to the sleeves.

In any event, it is apparent that by simply attempting to flex an end unit of the series with respect to the remainder, severance will occur along the lines of weakening 46. Adjacent one end of the sleeves, lugs 45 are extended to provide legs 47 terminating in foot portions 48 which, in effect, provide inwardly extending pawl parts. As shown in the left-hand portion of Fig. 12, the pawls or detent parts 48 will overlie the sleeves and be spaced a distance such that the end flange 16 of the syringe barrel may be thrust between them without causing breakage of the legs 47. Foot portions 48 will override and snap into position beyond the flange 16 to thus act as retaining elements to prevent an accidental displacement of the syringe assembly from the sleeves 44. Where extensions 49 are also employed, these will prevent too great an inward movement of the syringe assembly into the sleeves. In any event, flange portions 50 corresponding to collar 30, act as stop and confining elements adjacent to the opposite ends of the sleeves which thus securely hold the assemblies.

Thus, among others, the several objects of the invention as specifically aforementioned are achieved. It is obvious that changes in construction may be resorted to and the steps of the method may be varied without departing from the spirit of the invention as defined by the claims.

I claim:

1. A hypodermic syringe including in combination a needle and hub assembly, a barrel assembly separate from said first-named assembly, a sleeve enclosing parts of said assemblies and retaining them against accidental movements with respect to and adjacent each other, at least one of said assemblies being axially shiftable with respect to the other and also with respect to the sleeve, means functioning during such shifting to lock said assemblies against separation whereby they are withdrawable as a unit from said sleeve and means associated with said sleeve whereby in the introduction of both assemblies into the same, an operation of said locking means will be prevented.

2. A hypodermic syringe assembly, including, in com-

bination, a barrel having an outlet end, a perforable seal for that end, a hollow needle, a hub secured to said needle and engaging the outlet end of the barrel to retain the adjacent needle end at a position in line with said seal, a sheath enclosing the opposite end and the body of said needle, a flange forming a part of said sheath and bearing against said hub, a sleeve, a fixed and perforated end wall therefor through which said sheath projects, and said sleeve slidably enclosing said barrel and the flange of said sheath.

3. A hypodermic syringe assembly as specified in claim 2, and cooperating means on the outlet end of said barrel and said hub to lock the latter against detachment from said barrel as said barrel and hub are shifted axially and inwardly with respect to each other.

4. A hypodermic syringe assembly as specified in claim 2, and said sheath having a friction fit with said hub.

5. A hypodermic syringe assembly as specified in claim 2, and means associated with said sleeve whereby introduction of the barrel into the same may be arrested at a predetermined point and prior to perforating said seal.

6. A syringe structure, including, an combination, separate barrel and needle assemblies, means forming a part of said assemblies and functioning upon relative movements of the same occurring to operatively connect them, assembly-supporting means providing a coupling common and individual to such assemblies to maintain the same in operative relationship prior to the occurrence of such relative movements, said supporting means being formed with an opening and a stop member carried by said supporting means within said opening and engageable with said barrel assembly to arrest movement of the latter with respect to said needle assembly at a predetermined point.

7. A syringe structure according to claim 6 and said stop member extending through said opening and removably mounted by said supporting means.

8. A hypodermic syringe assembly including in combination a barrel, a piston reciprocable therein, said barrel having a forward end, a removable seal closing such end, a hypodermic needle having an inner end to penetrate such seal, a hub connected to said needle and slidably disposed adjacent the forward end of said barrel, a sheath enclosing the outer needle end and engaging said hub, a sleeve slidably mounting and surrounding the forward end zone of said barrel, said sleeve enclosing and fixedly supporting the hub and sheath to maintain the inner needle end adjacent such seal and a stop member extending into said sleeve to engage said sheath and prevent movement of the latter, said hub and needle in a forward direction.

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