July 9, 1963 R. K. McCONNAUGHEY ETAL 3,096,763

HYPODERMIC SYRINGES AND NEEDLE HUBS THEREFOR

Filed July 15, 1959 2 Sheets-Sheet 1

Fig. 1.

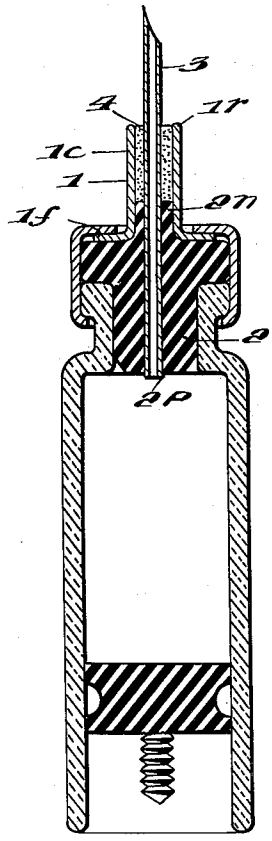


Fig. 2.

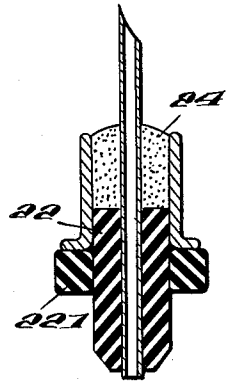


Fig. 5.

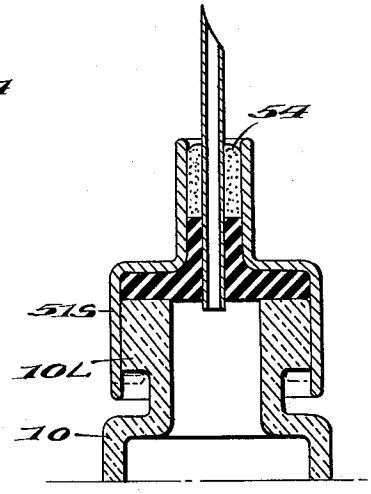


Fig. 3.

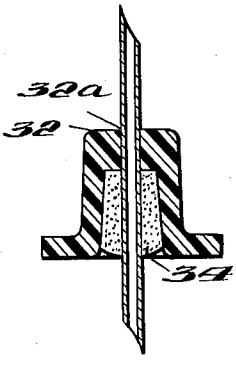


Fig. 6.

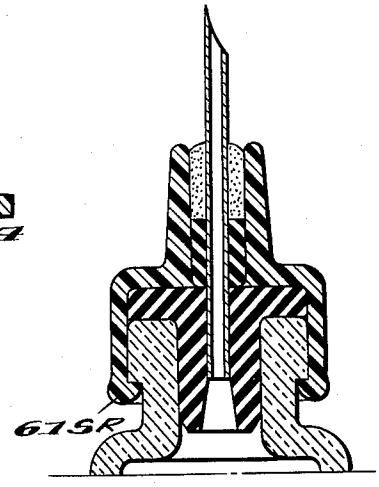
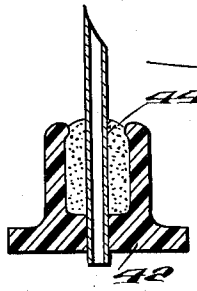


Fig. 4.



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HYPODERMIC SYRINGES AND NEEDLE HUBS THEREFOR

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Fig. 7. Fig. 8. Fig. 9.

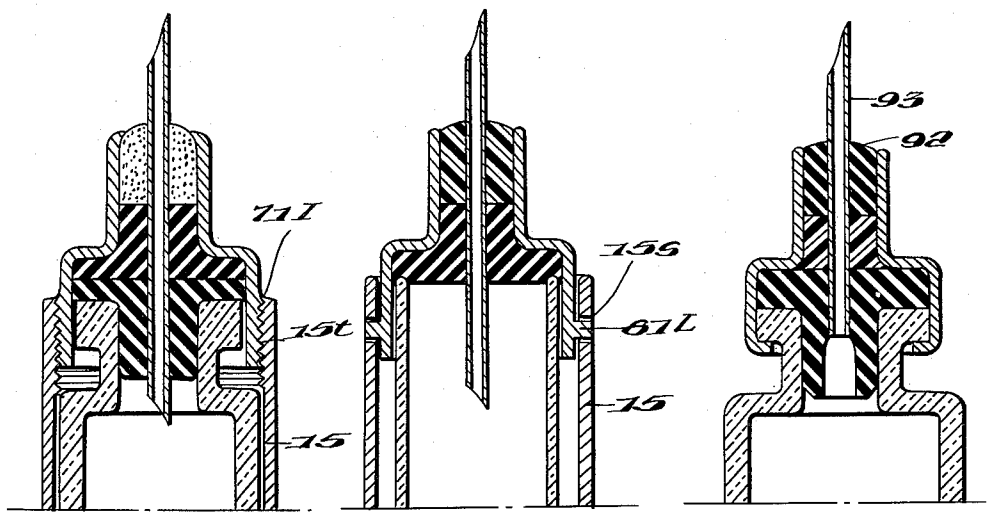
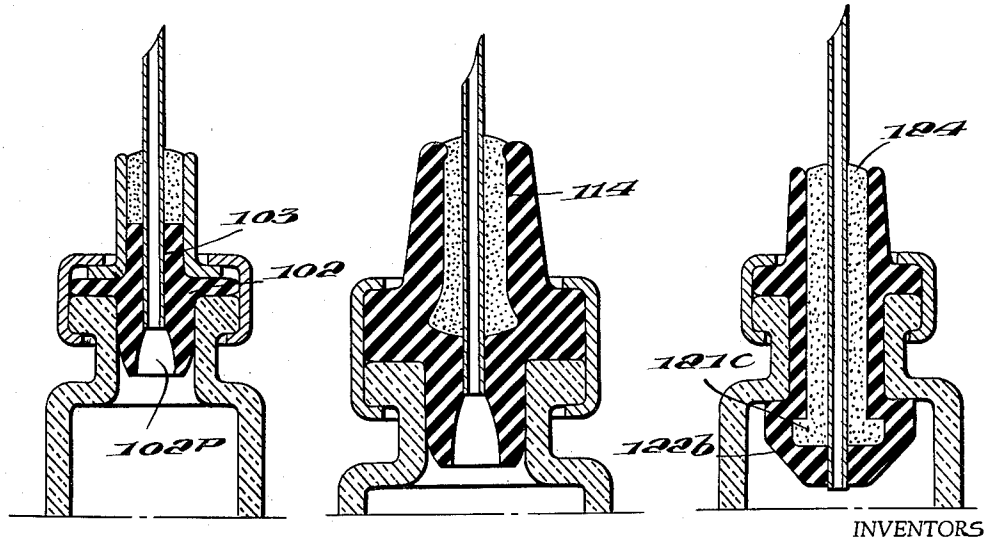


Fig. 10. Fig. 11. Fig. 12.



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HYPODERMIC SYRINGES AND NEEDLE HUBS THEREFOR

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20 Claims. (Cl. 128—221)

This invention relates to the structure of a hub for a hypodermic needle or other cannula, the purpose of which is to facilitate attachment of such a needle or cannula to a cylindrical container, such as the barrel of a disposable hypodermic syringe cartridge; to a method of making such a hub; to means of attaching the resultant composite needle and hub assembly to the container and to hypodermic syringe cartridges utilizing such assemblies.

The object of the invention is to provide a hub made of cheap and readily obtainable components that can be affixed to a cannula and to an elastic stopper or washer, at minimum cost and with a minimum of handling and other processing operations, to form a composite assembly of needle, hub and sealing means that can be cheaply and conveniently affixed to a cylindrical container such as a hypodermic syringe cartridge barrel.

As will appear from the following description and drawings, the basic structure of the invention consists of:

(1) A generally cylindrical, thin-walled shell, which may be made of metal, plastic, rubber or other rigid material that can be shaped on a screw machine, stamped, drawn, molded, extruded or otherwise formed, such shell having an axially disposed central cylindrical passage or cavity and being shaped to whatever external form is required to accommodate the particular means of attachment to a barrel of glass or other suitable material.

(2) A hypodermic needle or other cannula.

(3) Means of holding the cannula axially centered in the shell and projecting longitudinally through an beyond the ends of the cylindrical passage or cavity during assembly.

(4) A suitable material which can be introduced, preferably in liquid, semi-liquid, paste, or powdered form, into the space within such cylindrical cavity that surrounds the cannula and there hardened to bind the cannula and shell together and hold the needle or cannula rigidly in position in the hub thus formed. Any material available in fluent form, such as a liquid, paste or powder which hardens after a curing period (such as epoxy resins, plastic materials, plastic metals, and other self-hardening fluent materials) may be used. Such materials are referred to generally in this application as "adhesives" or "adhesive materials." For purposes of illustration some of the drawings show such material as adhesive and some as plastic resins. The use of these symbols in the drawings is not intended to limit the materials that may be used without deviating from the teachings of the invention.

The principal basic variants of the invention consist of different means or structures for holding the cannula in position while the adhesive is placed into the cavity in the shell surrounding the cannula and until the adhesive hardens to bind the cannula into the component structure formed by (1) the shell, (2) the cannula and (3) the adhesive and, (4) an elastic plug or stopper where such a plug or stopper is used to hold the cannula in place.

Without departing from the spirit of the invention, the external form of the shell may be varied without limit to adapt it to varying means or methods of attachment to the container or to a case or holder surrounding the container. Some of the forms illustrated are adapted primarily to attachment to a cylindrical cartridge barrel of

typical form, having an annular groove adjacent one end which forms a neck and a lip at that end, the attachment being accomplished by a connector which engages the rearward-facing shoulder formed by the rear face of the lip. Others of the forms illustrated are adapted to attachment, by means of threads in one case and a bayonet catch in another, to a sheath or case surrounding a cylindrical barrel.

These forms are, however, merely illustrative. The invention is not limited to any particular means or method of attachment of the hub to the container but is adaptable, through changes in its external form, to widely varied means of attachment of the hub to the container.

The nature of the invention will be more readily apparent from the accompanying drawings.

FIGURE 1 shows a disposable needle-attached hypodermic syringe cartridge having a necked, cylindrical barrel with a plunger piston reciprocally mounted therein and utilizing a form of hub in which the cannula is held in position in the shell by a flanged elastic stopper with a forward projecting nib which extends into the central passage or cavity from the rear face of the shell.

FIGURE 2 shows a form of the invention in which the cannula is held in position in the shell by a cylindrical elastic plug which extends into the central passage in the shell from the rear face of the shell. The drawing also shows a separate elastic sealing ring used with this form.

FIGURE 3 shows a form in which the cannula is held in position in the shell by a wall of the material of which the shell is made, located at the forward end of the passage.

FIGURE 4 shows a form in which the cannula is held in position in the shell by a wall of the material of which the shell is made, located at the rear end of the passage.

FIGURE 5 shows a form in which the shell has a cylindrical skirt portion adapted to serve as a connector member for attaching the composite needle assembly to a necked cartridge barrel by crimping or rolling the rim of the skirt into the neck of the barrel. This figure also shows a flanged elastic plug which extends into the passage in the shell but not into the neck of the barrel.

FIGURE 6 shows a form in which the skirt of the hub has its rim turned inward to form a snap-on cap, adapted to attachment to a cylindrical cartridge barrel having an annular groove at one end, forming a lip. This figure also shows a cylindrical elastic plug in the passage of the shell that does not extend into the passage in the neck of the barrel, where a separate sealing means is used, as shown.

FIGURE 7 shows a form in which the skirt of the hub has threads adapted to mate with threads on a sheath or syringe holder surrounding a medicament cartridge.

FIGURE 8 shows a form in which the skirt of the hub has laterally projecting lugs, adapted to fasten the needle and hub by a bayonet catch attachment to a sheath or syringe holder surrounding a medicament cartridge.

FIGURE 9 shows a form in which the elastic plug holding the needle in position in the shell is inserted into the forward end of the passage in the shell.

FIGURE 10 shows a form in which a hub of substantially the form shown in FIGURE 1 is used but in which the needle does not extend entirely through the elastic plug.

FIGURE 11 shows a form in which the shell and stopper are made in one piece of elastic material. It has an outwardly directed annular flange intermediate its ends, with a tubular nib projecting forward from the flange, and a stopper shaft projecting rearward. The needle extends into the stopper shaft and projects forward axially through the center of the passage in the tubular nib. Adhesive material in the passage in the nib surrounding

the needle holds the needle firmly in place in the hub and, when hardened, stiffens the hub.

FIGURE 12 shows a form generally similar to FIGURE 11 in which the passage in the hub extends almost to the bottom of the stopper where it is widened, so that when the adhesive material in the passage surrounding the needle hardens, it forms an outwardly directed annular bead near the bottom of the stopper. The outside diameter of the stopper where it surrounds the bead is also widened, forming an elastic annular bead, which when the adhesive has hardened in the passage locks the combination hub and stopper in the neck of the cartridge as shown in the drawing.

As previously stated, the forms of the invention shown in these drawings are merely illustrative and, as will be evident to anyone familiar with the art, may be varied in form without departing from the spirit of the invention.

The invention is perhaps most readily described by reference to FIGURE 1. The shell **1** is formed of any suitable material. For example, it may be shaped on a screw machine or stamped, drawn, molded, extruded or otherwise formed from metal, any of various plastic materials, rubber or other material capable of being formed into the required shape. It consists of a cylindrical portion **1***c* with an outwardly directed flange **1***f* at one end, and preferably, though not necessarily, with the rim **1***r* at the other end turned slightly inward, as shown in FIGURE 4. The generally cylindrical portion **1***c* of the shell may, if preferred, be tapered inward toward the forward end. An elastic plug **2** (which, as shown in FIGURE 1, may be a flanged stopper with a forward projecting nib, **2***n*, and which preferably, though not necessarily may have a preformed central passage, **2***p*) is inserted from the flanged end of the shell so that the nib extends part way through the passage in the shell. The cannula **3** is inserted into the plug in a manner which approximately centers the cannula axially in the cylindrical portion of the shell where it is held by the plug, one end of the cannula projecting beyond the forward end of the shell. The rear end of the needle may project through the stopper plug as shown in FIGURE 1, beyond it as shown in FIGURES 7 and 8 or part way through it as shown in FIGURES 6 and 10, in which latter case the rear end of the cannula communicates with a preformed passage in the rear end of the stopper plug.

With the cannula thus held axially in the shell, a suitable adhesive material **4** which hardens after a brief drying or curing period such, for example, as an epoxy resin, is introduced by any suitable method, such as injection or pouring, into the forward end of the passage in the shell surrounding the cannula. The adhesive substance may be in liquid form or may be semi-solid or powdered. In case a powdered substance is used, a suitable solvent, catalytic agent or hardening or binding agent may be introduced subsequently if requisite. The structure, thus formed, is then permitted to cure or harden in the manner and to the extent required by the particular adhesive substance used. When it has hardened the cannula is held firmly fixed within the shell in the position indicated in the drawing and the entire assembly forms a composite structure of needle, hub and elastic stopper, suitable for attachment by well-known means to a cylindrical container. FIGURE 1 shows a disposable hypodermic syringe cartridge wherein a hub of this structure is affixed to a necked cylindrical barrel in which a plunger piston is reciprocally mounted.

The form shown in FIGURE 2 differs only in that the plug **22**, inserted into the rear of the passage, which holds the needle in position while the adhesive **24** is introduced and hardens, is not flanged. This form may be used with a separate ring washer **221** to provide an end seal, as is indicated in the drawing in FIGURE 2. The rear end of the plug may, if preferred, but need not, project into the neck **10***n* of the barrel.

The form shown in FIGURE 3 differs from those previously illustrated in that no separate elastic plug is used to hold the cannula in position until the adhesive hardens. Instead, the forward end of the passage is closed by a wall **32** of the material of which the shell is made, which may be rubber, plastic or metal, or any other substance that can be formed into the required shape. This wall is pierced by a centrally located hole **32***a* of approximately the same diameter as the cannula to be used, or slightly smaller if the material of which the shell is made is elastic. The cannula extends through the hole and is held in position by the wall **32** while the adhesive material **34** is being added, and is hardening.

The form shown in FIGURE 4 is similar to that shown in FIGURE 3 and functions similarly, except that the supporting wall **42** of material closing the passage through the shell is at the rear end instead of the forward end of the passage. Accordingly, the adhesive **44** is introduced at the forward end of the shell.

In the form shown in FIGURE 5 the means of holding the cannula in position during assembly and through introduction and hardening of the adhesive **54** may be any one of those shown in the first four figures or any variation of those means, but the shell, instead of being merely flanged, has a skirt portion **51S** adapted to function as a connector to fasten the needle and hub assembly to a necked container by crimping, rolling or otherwise turning the rim of the skirted portion inward around the rear shoulder of the lip **10L** of the container **10**.

The form shown in FIGURE 6 is similar to that shown in FIGURE 5 except that in FIGURE 6 the skirted portion of the shell is formed of springy material and its rim **61SR** has an inturned bead, adapted to permit the hub to serve as a snap-on cap, the bead locking behind the rearward-facing shoulder of the lip of a necked and flanged container **10** to hold the cannula assembly firmly in position attached to the container.

The form shown in FIGURE 7 differs from those previously described only in that it illustrates one of many possible adaptations of the invention to provide for different means of attaching the composite needle, hub and stopper assembly. In this case the means consist of threads **71I** on the skirt of the hub adapted to mate with threads **15***t* of a surrounding sheath, case or holder **15**.

The form shown in FIGURE 8 has lugs **81L** on the rim of the hub skirt adapted to fit into slots **15***s* in the rim of a holder **15** surrounding the container and to fasten the needle-hub assembly to such holder by a bayonet catch. This figure illustrates a form of the invention in which the needle projects rearward beyond the stopper.

FIGURE 9 shows, attached to a disposable hypodermic syringe cartridge, a variant in which the elastic plug **92** holding the cannula **93** in position is inserted from the forward end of the passage in the shell. The adhesive is introduced from the rear and a separate flanged stopper seals the neck of the container.

FIGURE 10 shows a variant of the form of FIGURE 1 in which the rear end of the cannula **103** does not project entirely through the shaft of the stopper **102** but merely projects into the stopper sufficiently to hold the cannula in position and communicates with a preformed passage **102***p* in the rear segment of the stopper.

FIGURE 11 shows a variant of the form shown in FIGURES 3 and 4 wherein the shell and the stopper are made in one piece, of elastic material, and the structure relies upon the hardened adhesive **114** to provide the requisite stiffness in the hub.

FIGURE 12 shows a variant of the form shown in FIGURE 11, wherein the cavity surrounding the cannula, into which the adhesive material **124** is placed, extends into the shaft of the stopper portion, and has a widened portion **121***c* near the base of the cavity, surrounded by an external bead **122***b* of elastic material so as to form a locking bead behind the shoulder formed by the neck of the cartridge.

The following claims are made:

1. A hub having a hypodermic needle permanently affixed thereto and means adapted to provide for attachment of said hub to one end of a generally cylindrical container and for sealing the junction of said hub and said container, said hub consisting of a generally cylindrical shell having a central longitudinal passage, a cylindrical plug of elastic material extending into the rearward end of said passage and snugly surrounding a segment of said needle, said hypodermic needle being axially disposed within said passage, the forward end of said needle projecting beyond the forward end of said passage and the rear end of said needle extending axially through the center of said elastic plug and being so positioned that the channel of said needle is in communication with an opening at the rear end of said hub, there being hardened adhesive material within said passage forward of said plug, surrounding said needle and binding said shell and said needle together in the positions indicated, said elastic plug being adapted to prevent contact between said adhesive material and any material rearward of said hub.

2. The construction of claim 1, wherein said shell has an outwardly directed annular flange at one end.

3. The construction of claim 2 wherein said plug has an outwardly directed annular flange adjacent said annular flange at said one end of said shell.

4. The construction of claim 2 wherein said shell has a cylindrical skirt portion projecting from the rim of said annular flange rearward in a direction away from said other end of said shell.

5. The construction of claim 4 wherein said skirt portion is adapted to be turned inwardly around the shoulder formed by the rearward face of the lip of a cylindrical container having a groove at its forward end, forming a lip.

6. The construction of claim 4 wherein said skirt portion is made of rigid but springy material and the rim of said skirt portion has an internally directed annular bead adapted to snap into the groove of a cylindrical container having an annular groove at its forward end, forming a lip.

7. The construction of claim 4 wherein said skirt has threads adapted to mate with matching threads of a syringe holder surrounding a cylindrical container.

8. The construction of claim 4 wherein said skirt portion has laterally projecting lugs adapted to interlock with bayonet slots in the forward rim of a cylindrical case surrounding a cylindrical container.

9. The construction of claim 4 wherein said means of sealing the junction of said hub with said container consists of an elastic stopper, said stopper having an outwardly directed annular elastic flange, the outer edge of said flange bearing against the wall of the skirt portion of said shell, said flange being adapted to be interposed between the rearward face of the flange of said shell and the forward rim of said container, and the portion of said stopper extending rearward from said elastic flange being adapted to extend into the forward end of said container, there being a longitudinal hole through said stopper, a rear segment of said hypodermic needle extending into said hole and the channel of said needle being in communication with the rearward opening of said hole, said elastic stopper being held within said cylindrical skirt portion of said shell by friction between the outer edge of said elastic flange and the wall of said skirt portion of said shell.

10. The construction of claim 9 wherein said elastic plug and said elastic stopper are integral and consists of an elastic stopper having an outwardly directed annular flange intermediate its ends, the portion of said stopper projecting forward of said flange extending forward into the rearward end of said central passage in said shell and the portion of said stopper projecting rearward from said flange being adapted to extend into the forward end of said container, said elastic flange being adapted to be interposed between said hub and the forward rim of said container.

11. The construction of claim 1 wherein said rear end of said needle projects beyond the rear end of said hub.

12. The construction of claim 1 wherein said rear end of said needle does not project through said rear end of said plug but communicates with a centrally located longitudinal passage in said rear end of said plug.

13. The construction of claim 1 wherein the forward rim of said shell is turned inward to form an internal annular bead.

14. The construction of claim 1 wherein the means of sealing the junction of said hub with said container consists of an elastic ring washer adapted to be interposed between said hub and the forward rim of said container.

15. The construction of claim 1 wherein said means of sealing the junction of said hub with said container consists of an elastic stopper, said stopper having an outwardly directed annular elastic flange, said flange being adapted to be interposed between said hub and the forward rim of said container and the portion of said stopper projecting rearward from said flange being adapted to extend into the forward end of said container, there being a central longitudinal hole through said stopper, a rear segment of said hypodermic needle extending into said hole and the channel of said needle being in communication with the rearward opening of said hole, said elastic stopper being held affixed to said needle by friction between said needle and said stopper, the forward face of the flange of said stopper bearing against the rearward face of the flange of said shell.

16. The construction of claim 15 wherein said elastic plug and said elastic stopper are integral and consist of an elastic stopper having an outwardly directed annular flange intermediate its ends, the portion of said stopper projecting forward of said flange extending forward into the rearward end of said central passage in said shell and the portion of said stopper projecting rearward from said flange being adapted to extend into the forward end of said container, said elastic flange being adapted to be interposed between said hub and the forward rim of said container.

17. Means for attaching a hypodermic needle to and sealing one end of a cylindrical container which has an annular internal shoulder adjacent said one end, said means consisting of a generally cylindrical elastic shell having a central cylindrical passage therethrough, one end of said passage being closed by an end wall of the material of which said shell is made, there being an annular internal groove in the side wall of said passage at the end thereof adjacent said end wall and a hole through said end wall, there being a hypodermic needle axially disposed within said passage and passing through said hole, one end of said needle extending through said end wall, the other end of said needle extending through said passage and projecting beyond the other end thereof, a hardened adhesive material within said passage, surrounding said needle, and binding said shell and said needle together in the positions indicated, said shell having an outwardly directed annular flange intermediate its ends and an annular external bead surrounding said groove in the side wall of said passage, said bead being adapted to lock said shell behind said internal shoulder of said container when said passage is filled with hardened adhesive material.

18. A hypodermic syringe cartridge consisting of a cylindrical barrel having an annular groove adjacent one end thereof forming a cylindrical lip at said one end, a plunger piston reciprocally mounted within said barrel closing the other end thereof, said plunger piston having means adapted to removable attachment of a plunger shaft, a hypodermic needle permanently affixed to said one end of said barrel, the means by which said needle is affixed to said barrel consisting of a generally cylindrical shell having a central cylindrical passage therethrough

and, at the rearward end of said shell, an outwardly directed annular flange, a generally cylindrical plug of elastic material, the forward end of said elastic plug projecting into but not through the passage in said shell, said hypodermic needle being axially disposed within said plug, the forward end of said needle projecting through said passage in said shell and beyond the forward end of said shell, the other end of said needle communicating with an opening in the rearward end of said plug, a hardened adhesive material within said passage in said shell, forward of said plug, said adhesive material surrounding said needle and binding said shell, said plug and said needle together in the positions indicated, an annular elastic sealing ring interposed and compressed between the rearward face of said annular flange of said shell and the forward rim of said barrel, a generally cylindrical connector member surrounding said annular flange of said shell, said annular elastic sealing ring, and said lip of said barrel, the forward rim of said connector member being turned inward and bearing against the forward face of said flange of said shell, the rearward rim of said connector member being turned inward and bearing against the rearward facing shoulder formed by the forward wall of said annular groove in said barrel, said shell being adapted to removable attachment of a needle protective hood.

19. The construction of claim 18 wherein said annular elastic sealing ring is an outwardly directed annular flange intermediate the ends of said elastic plug, the rearward end of said plug projecting into the channel through the neck and lip of said barrel.

20. The construction of claim 18 wherein said annular elastic sealing ring is an outwardly directed annular flange at one end of said elastic plug.

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