

[54] **HYPODERMIC SYRINGE BODY
STRUCTURE**

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[51] Int. Cl. A61m 5/00, A61m 5/04

[58] Field of Search 128/220, 221, 218 R,
128/218 N, 218 P, 218 M, 216, 272, 237,
218 D, 218 DA, 215; 206/43

[56] **References Cited**

UNITED STATES PATENTS

1,718,602	6/1929	Smith.....	128/218 D
1,833,598	11/1931	Smith.....	128/220
1,848,711	3/1932	Hall	128/220
1,929,247	10/1933	Hein	128/220
2,497,562	2/1950	Smith.....	128/220
3,306,291	2/1967	Burke.....	128/218 R
3,376,866	4/1968	Ogle.....	128/220
3,378,008	4/1968	Ogle.....	128/220
3,469,581	9/1969	Burke	128/218 N
3,472,227	10/1969	Burke	128/221
3,638,650	2/1972	Burke	128/221

FOREIGN PATENTS OR APPLICATIONS

1,938,864	2/1970	Germany	128/220
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[57]

ABSTRACT

A hypodermic syringe body structure including a plastic barrel open at one end and having an integral sleeve extending inwards from its other end, a separately formed plastic inner tubular member is arranged within the barrel and connected therewith so that at least a portion thereof is within the sleeve, one of the barrel and tubular member having an integral tubular extension projecting outwards of the other end of the barrel and which extension includes a frangible portion and a bore for receiving a cannula. One of the inner tubular member and the sleeve has a connector thereon for connection with the connector on the stopper of a liquid medicament container, and a piercing spike for piercing the stopper is connected to one of said tubular member and said connector so that the syringe body structure can be connected with a liquid medicament container to constitute a complete hypodermic syringe with the tubular extension and associated cannula being broken off after a single use.

34 Claims, 33 Drawing Figures

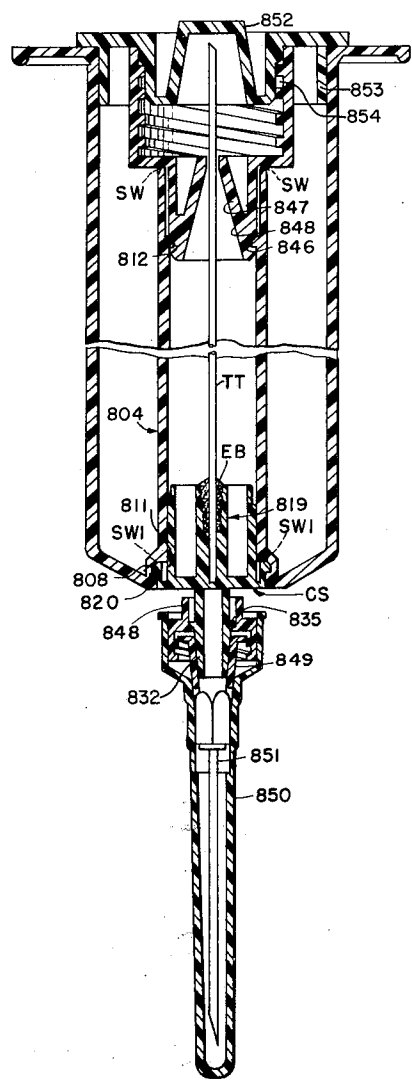


FIG. 1.

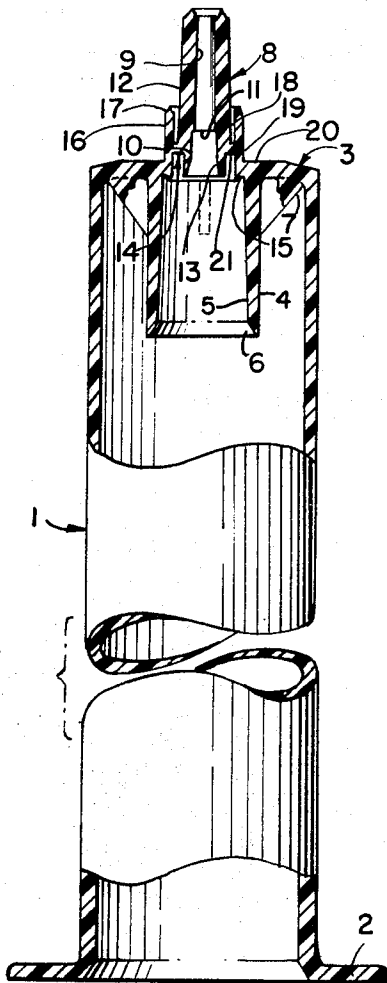


FIG. 2.

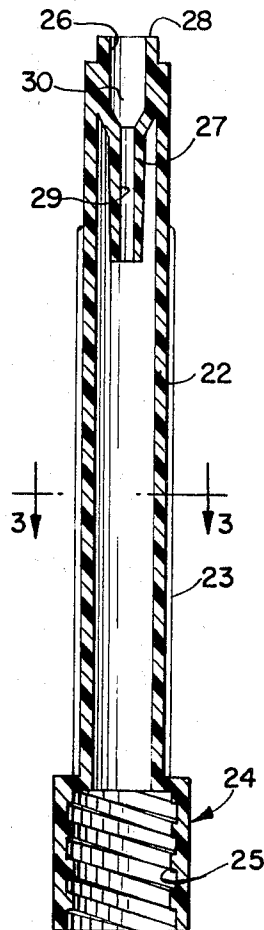


FIG. 4.

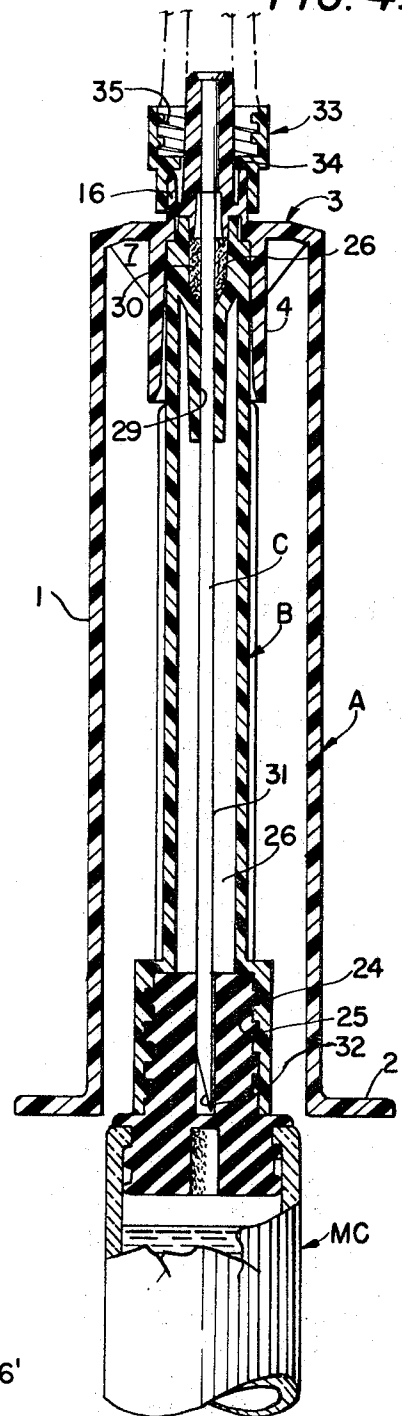


FIG. 2a.

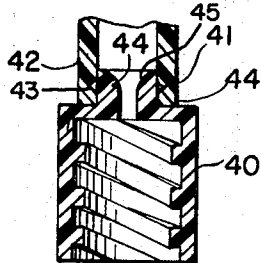


FIG. 19.

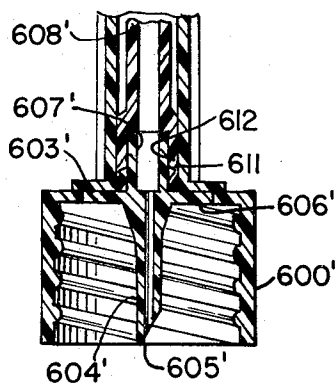
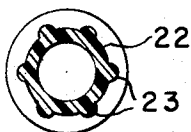


FIG. 3.



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FIG. 5.

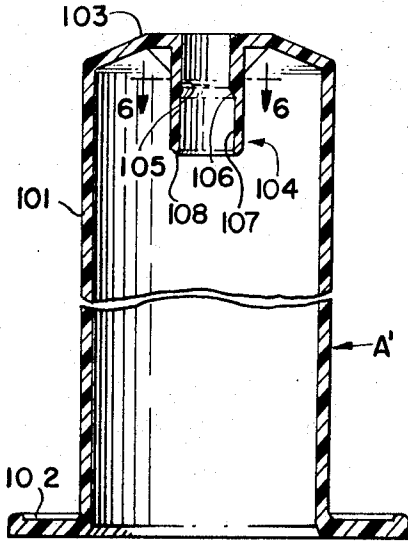


FIG. 7.

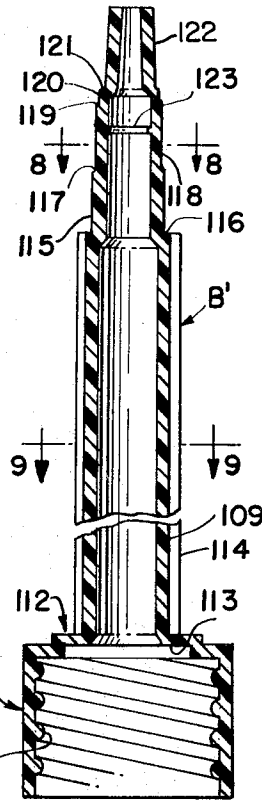


FIG. 10.

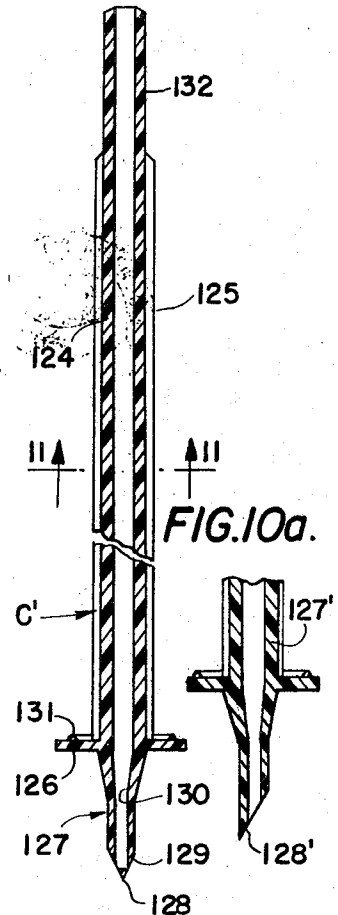


FIG. 6.

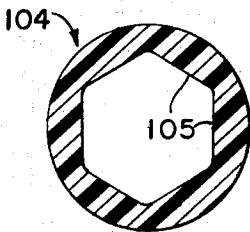


FIG. 11.

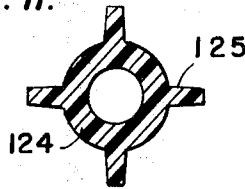


FIG. 8.

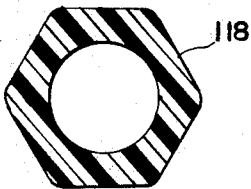


FIG. 18.

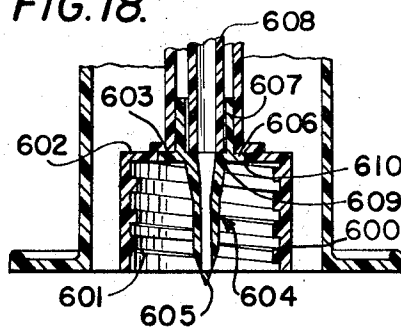


FIG. 20.

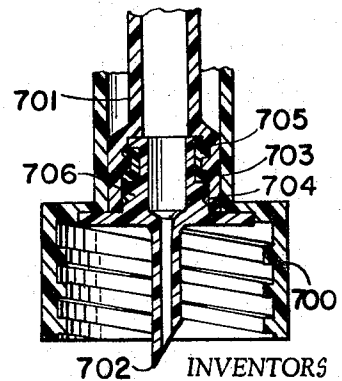
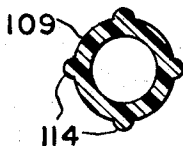


FIG. 9.



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FIG. 12.

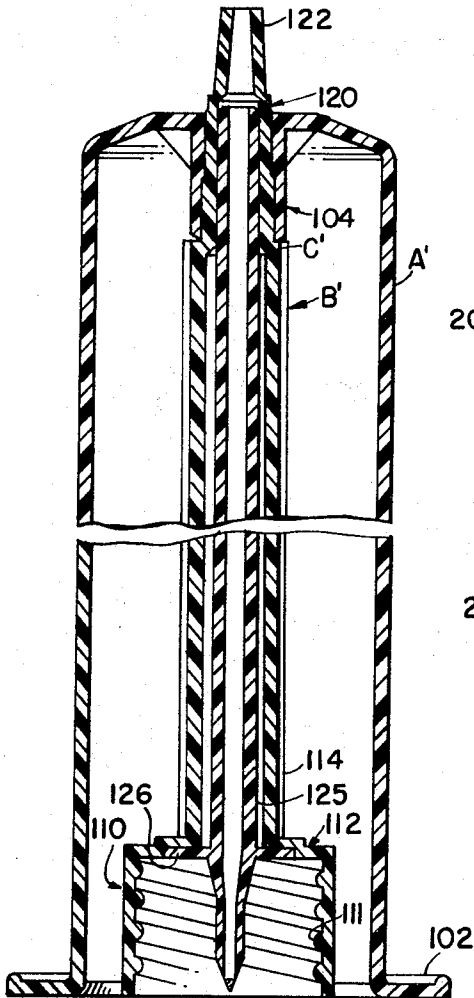


FIG. 13.

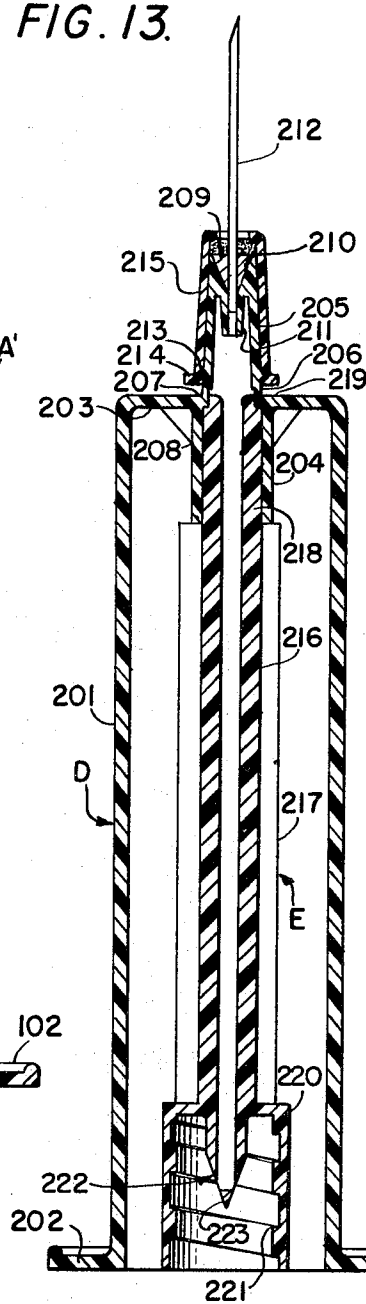


FIG. 14.

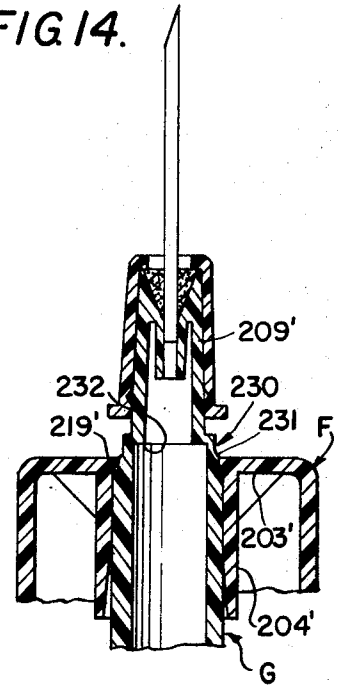


FIG. 15.

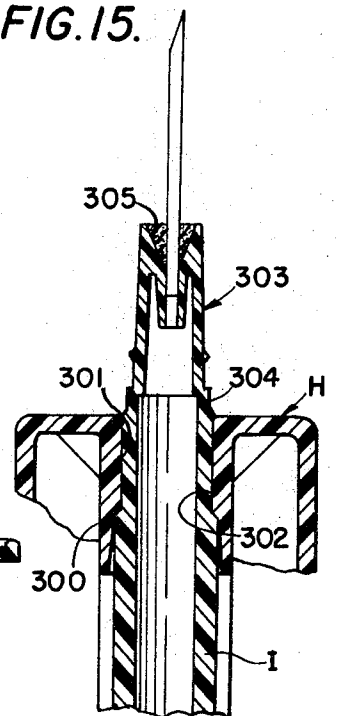


FIG. 16.

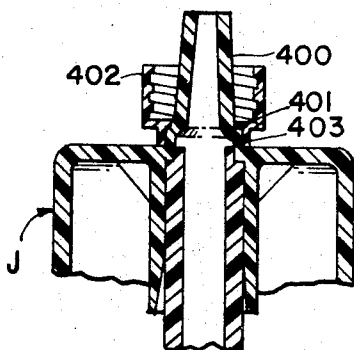
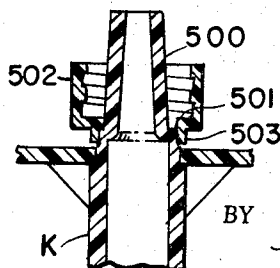


FIG. 17.



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FIG. 21.

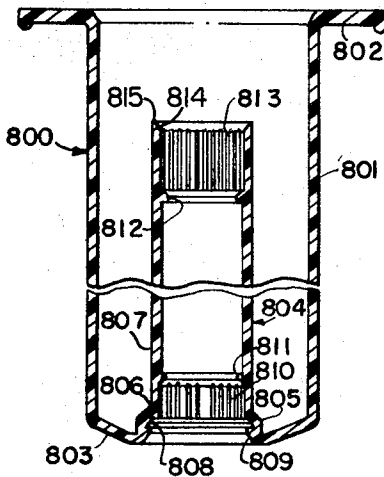


FIG. 22.

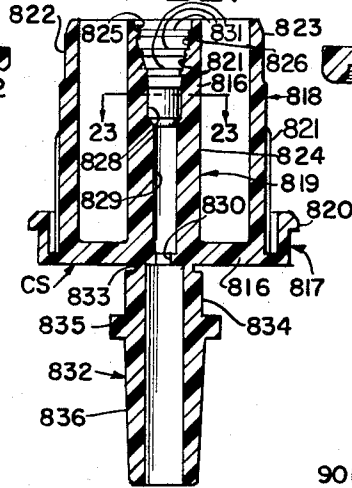


FIG. 28.

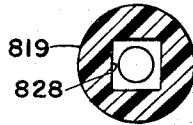
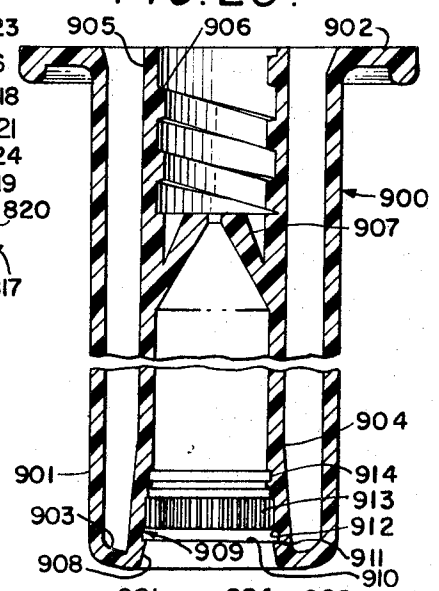


FIG. 24.

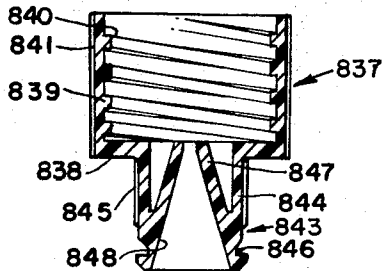


FIG. 23.

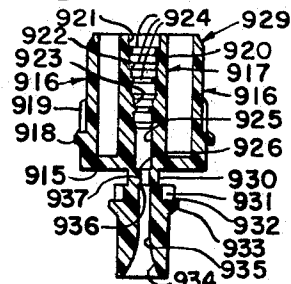
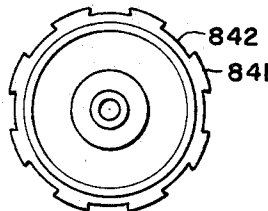


FIG. 29.

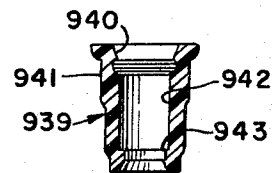


FIG. 30.

FIG. 27.

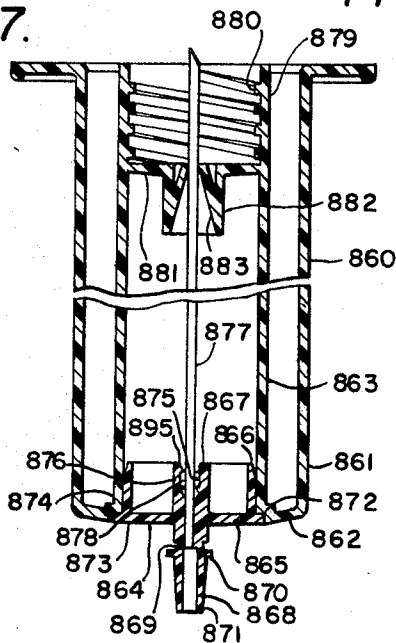


FIG. 25

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FIG. 26.

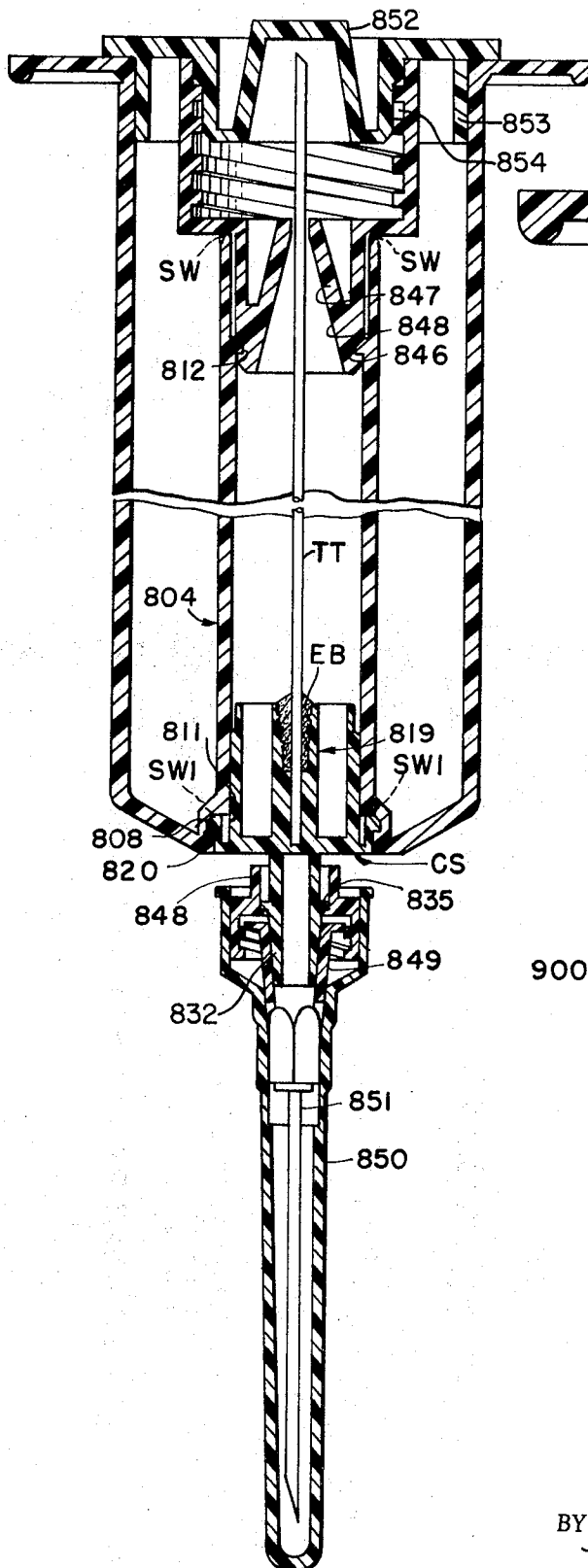
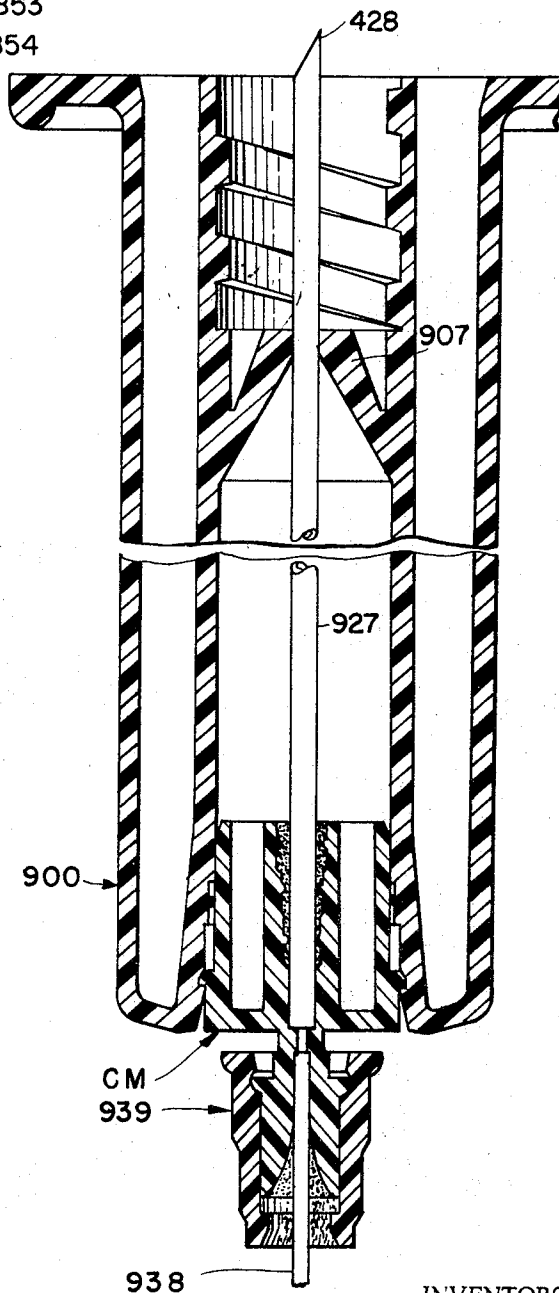


FIG. 31.



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HYPODERMIC SYRINGE BODY STRUCTURE

BACKGROUND OF THE INVENTION

The present invention relates to the hypodermic syringe or medicament injector of the type which embodies a syringe body for association with a medicament container in such a manner that the medicament can be expelled through a cannula or needle associated with the syringe body.

Arrangements of this type are generally known, as exemplified by the disclosures of U. S. Pats. to R. W. Ogle Nos. 3,376,866 and 3,378,008, dated Apr. 9, 1968 and Apr. 16, 1968, respectively.

In each of those known arrangements, the container for the liquid medicament is to be so associated in use with a cannula carrying syringe body as to act as the expeller for the liquid.

In this art, the aspect of destroying the components after a single dosage is becoming more important than ever with the present day increases in contamination and infection possibilities and also to prevent any of the components being utilized for other than the originally intended purpose.

Further, the production of hypodermic syringe and vial or medicament container components on a large scale production basis, particularly from organic plastic materials, such as polyethylene or polypropylene, present certain problems as regards molding the various necessary structural features which enter into the assembly of and positioning of the cannula within the syringe body and relative to the plunger of the medicament container. In addition, the destruction capability of the cannula carrying syringe body gives rise to certain problems that can be more readily overcome during manufacture if proper considerations are given thereto.

Therefore, it is desirable to provide a constructional arrangement of a syringe body which includes destructible aspects to limit usage to a single dosage and which also includes features facilitating large scale production on an economical basis as well as providing proper and accurate assembly of a cannula and piercing spike relative to a syringe body and relative to the plunger of a medicament container.

STATEMENT OF THE INVENTION

In the invention, there is provided a syringe body that includes a barrel forming tubular portion, an inner tubular portion that is to be operatively associated with a plunger or stopper of a liquid medicament container, and which is effectively integral with the barrel forming portion, a tubular component that projects beyond the base of the barrel that embodies a weakened portion effected during manufacture that permits ready separation of such tubular component from the barrel after a single dosage, a hollow piercing spike for cooperation with a plunger or stopper of a medicament container and means to mount a recipient needle relative to such tubular component.

The arrangement can be such that the tubular component embodying the weakened portion is formed simultaneously during molding with either the outer barrel forming portion, the inner tubular portion, or as a separately molded tubular member. Further, a liquid transfer tube can be separate from or integral with the inner tubular portion or the separately molded tubular

member, the piercing spike can be integral with the transfer tube or the inner tubular portion, and the transfer tube and piercing spike can be integrally formed in a single molding. Also, the tubular component that projects beyond the barrel can be formed to internally receive a fixed recipient needle, or constitute a luer taper having effectively externally integrally related therewith a luer lock adapter structure to receive replaceable needles.

Further, in the invention there is no patient piercing cannula or needle that extends substantially throughout the barrel and also outwardly of the barrel a substantial extent. With prior art arrangements, the destruction capability is diminished since a stainless steel needle as used in the art has to be severed or broken off. Also, in one aspect of the invention, a plastic transfer tube is provided with an integral piercing spike so that the barrel and any component still associated therewith can be effectively incinerated after the outer frangible or weakened area connection of the tubular portion that projects beyond the barrel and has the recipient metal needle associated therewith has been broken off.

Another feature of the invention consists in the provision of a relatively short inwardly extending centering boss or guide sleeve at the base of the barrel for receiving the inner tubular portion that carries means at its outer end for cooperative connection with the stopper or plunger of a medicament container.

BRIEF DESCRIPTION OF THE DRAWINGS

Further and more specific features and advantages of the invention will be more readily apparent from the following description taken in connection with the accompanying drawings in which:

FIG. 1 is a longitudinal sectional view, partially broken away, of a barrel member according to one form of the invention;

FIG. 2 is a similar view illustrating a tubular structure for association within the barrel member of FIG. 1;

FIG. 2a is a fragmentary longitudinal sectional view illustrating a modification of the connecting end portion of the tubular structure shown in FIG. 2;

FIG. 3 is a cross-sectional view taken along lines 3—3 of FIG. 2;

FIG. 4 is a longitudinal sectional view of an assembled and integrally connected syringe body structure including the barrel member and tubular structure of FIGS. 1 and 2;

FIG. 5 is a view similar to FIG. 1, illustrating a barrel member according to another form of the invention;

FIG. 6 is a cross-sectional view taken along lines 6—6 of FIG. 5;

FIG. 7 is a view similar to FIG. 2, illustrating a tubular structure for association within the barrel member of FIG. 5;

FIGS. 8 and 9 are cross-sectional views taken, respectively, along lines 8—8 and 9—9 of FIG. pierceable

FIG. 10 is a longitudinal sectional view of a combined liquid transfer tube and stopper piercing spike;

FIG. 10a is a fragmentary view illustrating a modification of the piercing spike tip shown in FIG. 10;

FIG. 11 is a cross-sectional view taken along lines 11—11 of FIG. 10;

FIG. 12 is a view similar to FIG. 4 illustrating the components of FIGS. 5, 7 and 10 in assembled and integral connected relationship;

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FIG. 13 is a view similar to FIGS. 4 and 12 illustrating a third form of the invention and one that embodies a fixed recipient needle;

FIGS. 14 and 15 are fragmentary longitudinal sectional views illustrating modifications of the relationship of components shown in FIG. 13 in which the inner tubular member is formed with a needle receiving socket;

FIGS. 16 and 17 are views similar to FIGS. 14 and 15 illustrating the tubular extensions from the barrel and inner tubular member shaped to receive a removable needle;

FIG. 18 is a fragmentary longitudinal sectional view illustrating still a further modification in which the transfer tube and piercing spike are separately formed;

FIGS. 19 and 20 are views similar to FIG. 18 but illustrating modifications of the piercing spike and connector assembly;

FIG. 21 is a longitudinal sectional view, partially broken away, and illustrating a barrel member of a syringe body structure in accordance with a still further form of the invention;

FIG. 22 is a longitudinal sectional view of a crown member that carries a transfer tube and embodies a frangible tubular extension and which is connectable with the barrel member of FIG. 21;

FIG. 23 is a cross-sectional view taken on line 23—23 of FIG. 22;

FIG. 24 is a longitudinal sectional view of a connector member for association with the barrel member of FIG. 21;

FIG. 25 is an end view of the connector of FIG. 24;

FIG. 26 is a longitudinal sectional view, partly in elevation, illustrating an assembled hypodermic syringe body structure utilizing the components of FIGS. 21 to 23;

FIG. 27 is a view similar to FIG. 26, but illustrating modifications in the crown member of FIG. 22 and showing the connector member as being formed with the barrel;

FIG. 28 is a view similar to that of FIG. 21 but illustrating the connector member as an integral part of the inwardly extending tubular sleeve;

FIG. 29 is a view similar to FIG. 22 but illustrating a crown member structure including a frangible tubular extension and a tubular socket portion for receiving a fixed recipient needle;

FIG. 30 is a longitudinal sectional view of a shell member that engages over and connects with the tubular socket portion so as to complete the formation of an epoxy resin receiving pocket for fixing the needle in position; and having connected

FIG. 31 is a view illustrating the component parts of FIGS. 28 to 30 in assembled relation.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Referring to the drawings, FIGS. 1 to 4, the first embodiment of the syringe body of this invention includes three basic components comprising an outer tubular barrel A, an inner tubular sleeve structure B having means at its outer end for connection with a stopper of a liquid medicament container and a liquid transfer tube C having a piercing spike at its outer end for piercing the stopper of such a medicament container when the syringe body is operatively associated with such a container.

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The outer barrel is molded from a suitable plastic material, such as polypropylene or the like, and includes an outer wall 1 having integral finger grasping extensions 2 at its outer end. The base 3 of the barrel is molded with an inwardly directed short guide sleeve 4 that is internally tapered inwardly from its outer end to provide a tapered surface 5 to later receive the sleeve structure B. The end of sleeve 4 is chamfered at 6. Ribs, such as at 7, are molded between the exterior of the guide sleeve 4 and the inner bottom surface of the base 3 of the barrel. These ribs which may be three or more in number, usually four, are provided to strengthen the guide sleeve structure and minimize wobbling thereof during assembly and use of the components as described hereinafter.

The base 3 is further provided with an externally projecting tubular portion 8 that is shaped to provide a tapered bore 9 having a widened inner portion 10 to define a seat 11 to receive the end of a liquid transfer tube as set forth hereinafter. The exterior surface 12 of tubular portion 8 is tapered to constitute a conventional luer taper surface. Further, the inner end of the bore 9, 10 is defined by an annular portion 13 that defines a groove 14 in the base 3 of the barrel. The inner surface of annular portion 13 is inwardly tapered and the outer surface is of reverse taper. An annular bead 15 is provided at the inner rim of the base portion that defines the outer limit of groove 14. This bead of plastic material is utilized in forming a sonic seal with the tubular sleeve structure as later described. Surrounding the periphery of tubular portion 8 is an enlarged portion 16 that receives a luer lock adapter. The relationship of such a luer lock adapter relative to the projection or extension 8, 16 is as clearly shown and described in my prior U.S. Pat. No. 3,542,024, dated Nov. 24, 1970 and entitled HYPODERMIC ASSEMBLY. To effect connection with a luer lock adapter, an annular bead 17 is provided on the end of sleeve-like portion 16. Ribs 18 are provided between the interior of portion 17 and exterior of the inner end of tubular portion 8 to facilitate uniform shrinkage of the material and to prevent dimple formation during the molding operation. This relationship is shown and described in my prior U.S. Pat. No. 3,306,291, dated Feb. 28, 1967, see FIGS. 20 and 22 thereof. Thus, the portions 8 and 16 constitute a projection or boss extending outwardly of the base 3 of the barrel and a frangible portion 19 joins the boss with the base. This frangible portion 19 is formed between laterally extending surfaces or shoulders 20 and 21. As shown, the portion 19 is of less thickness than the adjacent wall portions and is a prestressed area, as described in said last-mentioned patent, so that the boss structure or projection with or without an associated needle thereon can be broken away from the barrel after a single use.

The tubular sleeve structure B, likewise of such molded plastic material, includes an elongated wall portion 22 having external strengthening ribs 23 thereon for a substantial extent of its length. These ribs terminate short of the inner end of sleeve B a distance sufficient to permit insertion of sleeve B into guide sleeve 4 of the barrel A. The outer end portion of sleeve B is enlarged to provide an internally threaded socket 24, the threads 25 of which cooperate with the external threads on a stopper of a medicament container, generally indicated at MC in FIG. 4. The inner end of the sleeve B is provided with a bore 26 commu-

nicating with an internally extending liquid transfer tube receiving sleeve arrangement 27. The bore is tapered inwardly from a projecting annular rim 28 to a bore portion 29 that accommodates such a transfer tube in such a manner as to define a widened adhesive receiving pocket 30, an epoxy resin being a suitable adhesive.

The liquid transfer tube 31 has a piercing spike 32 at one end and is inserted in the bore 29 to extend through the pocket 30 and project past the end of the barrel 28 a distance sufficient to seat against the shoulder 11 on the interior of the boss structure on the barrel A. Further, the bead 28 has a length such as to fit within groove 14 when the barrel A and inner sleeve structure B with the associated transfer tube are integrally joined by sonic welding. A luer lock adapter 33, as shown in my prior U.S. Pat. No. 3,542,024, is sonic welded to and fits over the enlarged portion 16 of the projection from the barrel A via the bead 17 engaging an internal flange 34 on such luer lock adapter. The luer lock adapter has internal threads 35 for receiving and cooperating with lateral flange portions on a cannula and interconnected hub. This arrangement permits the use of different size needles, depending on the desired flow rate to the patient.

In assembling this form of the invention, the outer barrel A, the inner tubular sleeve structure B and the luer lock adapter 33 are separately molded. The liquid transfer tube 31 is then inserted within sleeve structure B and adhesively bonded therein. Then the transfer tube-carrying sleeve structure B is inserted within barrel A until the rim 28 fits within socket 14. A luer lock adapter 33 is then fitted over the projection from the base of the barrel to engage the flange 34 against bead 17. With the components so assembled, they are passed, while in vertical relation, through sonic welding apparatus to effectively integrally unite, via material flow, the barrel A to the sleeve structure B and to the luer lock adapter 33. In effecting this welding, some of the material from the various beads, which act as sonic energy directors, flows laterally to provide an effective seal as well as integral bonding of the components together.

If desired, the energy directing beads can be discontinuous or formed as a series of individual pointed projections. Further, the energy directing beads or projections can be formed on the flange 34 of the luer lock adapter rather than as at 17 on the boss or on the shoulder surrounding the rim 28 of the internal sleeve B rather than on the base 3 of the barrel as shown at 15. Essentially there should be energy directing beads or projections on one component in facing relation with surfaces on the component to which it is to be effectively integrally united and sealed.

FIG. 2a illustrates a modification in which the connector is molded separately. Thus, the internally threaded connector 40 has a tubular extension 41 that is force fit within the outer end of the tubular member 42. This member 42 is similar to the member B of FIG. 4. A snap lock connection between the extension 41 and the tubular member 42 is shown at 43. The bead for this connection can be formed on either the extension or the tubular member and the bead receiving groove in the other of these components. If the plastic material of the connector 40 is compatible with compatible plastic of the tubular member 42, the connection can be a sonic weld connection as indicated diagram-

matically at 44. Also, an adhesive connection can be utilized. The internal bore of the extension is generally conically shaped as at 45 to center a transfer tube spike member, such as shown at C in FIG. 4 when the connector 40 is secured to the tubular member 42.

The second form of the invention, FIGS. 5 to 12, incorporates the same general components and includes a barrel A' having a wall portion 101 provided at its outer end with lateral finger engaging flange or extension portions 102. The base 103 is provided with a short inwardly extending guide sleeve portion 104 of cylindrical external wall shape and having a stepped internal bore including an outer portion 105 of polygonal, preferably hexagonal cross section, a beveled shoulder 106 and an inner portion 107 having an energy directing bead 108 or a series of separate projections formed on the rim thereof. As shown, the wall thickness outwardly of the shoulder 106 is thinner than at the portion 105. Stiffening ribs similar to ribs 7, FIG. 1, extend between the guide sleeve and base of the barrel.

To fit within this guide sleeve 104, there is separately molded a tubular sleeve portion B' that includes an elongated intermediate portion 109 and an enlarged end portion 110 that is internally threaded as at 111 for connection with the external threads on a stopper of a liquid medicament container. The base 112 of the enlarged outer end portion is stepped to provide a circular recess 113 which receives a flange on a later described transfer tube. External strengthening ribs 114 are provided on the intermediate portion of the tubular structure B'. The other end portion of such structure is externally stepped and shaped to provide a first portion 115 of cylindrical outer shape extending between a straight shoulder 116 that fits against the rim of guide sleeve 104, and a beveled shoulder structure 117 that merges with a second portion 118 of hexagonal external shape. This portion 118 merges via a shoulder 119 with an externally cylindrical frangible portion 120 delimited at its other end by shoulder 121. The final and external portion 122 of the tube structure constitutes a luer taper for receiving a luer lock adapter (not shown). A bead of material to form a seal with a liquid transfer tube is provided at 123 on the interior of the portion 118 of the tubular structure.

The liquid transfer tube C' is of molded plastic and is combined with a piercing spike and includes an intermediate portion 124 having external strengthening ribs 125 that fit this portion within the intermediate portion 109 of tubular structure B'. The opposite ends of the ribs are tapered as shown. An enlarged flange 126 is provided at the inner end of the tube for fitting within the recess 113. The tube structure extends beyond the flange 126 and is shaped to provide a piercing spike 127 having an anti-coring solid pointed tip 128 and at least two lateral apertures 129 to admit liquid into the inner bore or passage 130. The face of flange 126 opposite spike 127 is provided with an energy directing bead or a series of projections as at 131. The outer end portion 132 fits within tube portions 115 and 118 of tubular structure B' with the chamfered or tapered ends of ribs 125 being at least close to an internal shoulder on the enlarged diameter intermediate portion 109 of tubular structure B'.

In assembling this form of the invention, the barrel A', tubular structure B' and combined transfer tube and piercing spike structure C' and a luer lock adapter,

are separately molded, interfitted together and then effectively integrally united by sonic welding via beads or projections 131 on the flange 126, 123 on tubular structure B', and 108 on the guide sleeve 104 of barrel A'. Other beads or projections are provided on either shoulder 121 on tubular structure B' or on the base of the luer lock adapter to integrally unite such adapter to the luer taper portion outwardly of the frangible portion 120.

FIG. 10a illustrates a modified piercing spike 127' having a single barrel tip 128'.

The third basic form of the invention, FIG. 13, includes a barrel D, and an inner tubular structure E that combines the liquid transfer tube, the connector for the stopper of the medicament container and the piercing spike in a single component. for a

Thus, the barrel D includes a wall portion 201, finger engaging extensions 202 at one end thereof, a base 203 at the other end and a guide sleeve 204 extending inwardly of the base. Stiffening ribs as shown in FIGS. 1, 4 and 12 extend between the base and guide sleeve. Projecting externally of the base is an extension 205 that is shaped to provide a socket for cannula or needle. The extension includes an inner frangible portion 206 of reduced wall thickness and defined between the outer surface 207 of the base and an internal shoulder 208 on the extension. The needle receiving socket 209 includes the epoxy resin receiving pocket 210 and an inner tubular extension 211 to accommodate a length of the needle 212. An external snap ring 213 is formed on the extension to cooperate with an internal groove 214 on a cap or shell structure 215 which confines the needle and resin.

The inner tubular structure E includes an intermediate portion 216 having external strengthening ribs 217 thereon and an end portion 218 that fits within the guide sleeve portion 204 and has a reduced rim defined by a shoulder 219 that fits within the bore through the base 203 of the barrel. The other end portion of the tubular structure combines a connector sleeve 220 having internal threads 221 thereon and a piercing spike 222 having a solid anti-coring point 223.

In assembly, the separately molded barrel D and tubular structure E are interfitted after a needle has been epoxy resin bonded in the socket. Thereafter they are effectively integrally united by sonic welding utilizing a bead or projections formed on either shoulder 219 or the adjacent base surface and a bead on the interior of guide sleeve portion 204.

The last described arrangement contemplates a fixed recipient needle. While this form has such needle carried by the barrel, modifications provide the needle carrying socket on the inner tubular structure. Thus, as in FIG. 14, the base 203' of the barrel F has an internal guide sleeve 204' extending inwardly of the barrel radially outwards of the bore through the base. The internal tubular structure G is shaped to provide a shoulder 219' for sealing and integrally uniting with the barrel base 203', a frangible portion 230 between shoulders 231 and 232 and a needle socket 209'.

In another form where a fixed recipient needle is utilized, FIG. 15, the structure is akin to that shown in FIGS. 1 and 12, in which the barrel or holder H is provided with an internally stepped guide sleeve 300 that includes an inner surface portion 301 of polygonal, preferably hexagonal, internal shape that accommodates a stepped plastic tubular inner sleeve I having a

complementary polygonally shaped external surface portion 302 and which further includes an extension 303 that projects through and beyond the base of the barrel and which, during molding, is provided with a frangible intermediate portion 304. The outer end of this tubular structure is shaped to constitute a socket 305 for a fixed recipient needle. In the arrangements shown in FIGS. 14 and 15, a cap such as shown at 215, FIG. 13, is utilized. that

It is likewise believed clear that the structures shown in the last three described forms can be further modified so that the tubular portion extending outwardly of the frangible portion, regardless of whether such frangible portion is embodied with the outer body or barrel or an inner tubular member that passes through the guide sleeve and barrel, is molded to constitute a luer taper and has a shoulder to which is bonded a luer lock adapter, see FIGS. 16 and 17.

In one of these last described forms, FIG. 16, the luer taper 400, the shoulder 401 for receiving a luer lock adapter 402 and an intermediate frangible portion 403 are molded integrally with the barrel J, whereas in still another form, FIG. 17, the luer taper 500, intermediate frangible portion 503 and associated luer lock adapter receiving shoulder 501 for an adapter 502, are provided on the inner tubular structure, the opposite end of which is shaped to provide the threaded connecting portion and piercing spike as in FIG. 13. It is further believed clear that the structures of the first two described embodiments, FIGS. 4 and 12, can be modified to accommodate a fixed recipient needle by providing the tubular portion that extends outwardly of the frangible portion with a shape so that it constitutes a needle socket.

FIG. 18 illustrates a modification in which the transfer tube, piercing spike and inner tubular connector are separately formed. Thus, the injection molded connector includes an enlarged connecting end 600 having internal threads 601 for coupling with external threads on a stopper of a medicament container. The base 602 of the connecting end is provided with a recess as at 603. The piercing spike 604 is an injection molded plastic tubular member and includes a point or tip 605, an external flange 606 that fits within recess 603 and a tubular extension 607. The liquid transfer tube 608 is an extrusion and is connected to the piercing spike by a sonic welding and sealing connection diagrammatically shown at 609. In effecting this connection, the energy directing bead or a series of pointed projections can be formed on either the end of the transfer tube or on the flange of the piercing spike. The connected transfer tube and piercing spike are fit within the tubular portion of the connector so that flange 606 fits in recess 603 and extension 607 fits within the elongated tubular part of the connector. The parts are subjected to a sonic welding and sealing operation to provide the sonic weld and seal as shown at 610. The energy directing bead can be formed on either flange 606, similar to the showing at 131 in FIG. 10 or on the base of recess 603. The transfer tube is also sonically welded to the interior of the connector via a bead such as at 123 in FIG. 7.

FIG. 18 only illustrates the connecting end of the connector, piercing spike and transfer tube assembly. The other end of tubular connector can be the same as shown in FIG. 7 and include an external polygonal portion for fitting within a guide sleeve of a barrel of the

shape shown in FIG. 5. Thus, the assembly would present the same appearance as shown at the upper end of FIG. 12, with the transfer tube 608 terminating approximately at the level of the outer surface of the base of the barrel.

The tip 605 of piercing spike 604 can project slightly beyond the level of the end of the connector or terminate within the threaded portion of the connector as shown in FIG. 12.

The structural relationship of FIG. 18 facilitates production in that the necessary small diameter transfer tubes can be extruded plastic members, while the piercing spike and tubular connector can be injection moldings.

Stiffening ribs can be provided on the exterior of the portion of the tubular connector that would extend between the inner end of the guide sleeve on the barrel and the base of the enlarged threaded portion of the connector.

FIG. 19 illustrates a modification of the connector, liquid transfer tube and piercing spike assembly in which these latter two components are separately formed. Thus, the piercing spike member 604' is separately molded and includes a point 605', an external flange 606' that fits within a recess 603' of the connecting end 600'. The transfer tube 608' has an enlarged outer end that accommodates a tubular extension 607' of the spike member. As shown, a snap lock connection 611 fastens the spike member extension within the transfer tube. The bead or ribs of this snap lock can be on either the exterior of the tubular extension 607' or the interior of the enlarged end of the transfer tube 608', with the accommodating groove being in the other and facing surface of these elements. If the plastic materials, of which the spike member, connector end and transfer tube are made, are compatible, a sonic weld connection, as diagrammatically shown at 612, can be utilized. If desired, the various connections can be effected by an adhesive bonding utilizing any of the adhesives well known in the art, such as an epoxy resin adhesive.

FIG. 20 illustrates another and similar modification in which the polypropylene connector 700, the polypropylene liquid transfer tube 701 and the flanged piercing spike 702 are separately formed. In this form of the invention, the piercing spike is molded from any of the ABS resins well known in the art and the connection between the piercing spike and the enlarged outer end 703 of the polypropylene transfer tube is in the form of a snap lock connection shown at 704 since a sonic weld cannot be used as the plastics are incompatible. In this modification, it is desirable that there be relative rotation between the piercing spike, connector and transfer tube when the piercing spike is inserted in the externally threaded rubber plunger on the end of a medicament containing vial and this plunger is rotated when being coupled to the threads of the connector. This allows the piercing spike to go straight through the rubber of the plunger and eliminates any torque reaction on the parts. A rubber seal ring 705 arranged between the tubular extension 706 of the piercing spike and the enlarged outer end 703 of the transfer tube provides an adequate seal and also permits the piercing spike to rotate with the rubber plunger when the same is being threaded into the connector.

The form of the invention shown in FIGS. 21 to 26 still retains the essential features of the syringe body

structure of the invention but incorporates a modified arrangement of the main component elements thereof.

Thus, in FIG. 21, the barrel member 800, molded from a plastic material, such as polypropylene, includes an outer wall 801 having integral finger grasping lateral flanges or extensions 802 at its outer end. The base 803 of the barrel is molded with an integrally formed inwardly extending tubular portion or sleeve structure 804. The end of the sleeve structure adjacent the base 803 is shaped for cooperative connection with the crown member shown in FIG. 22, and the end of the sleeve structure remote from the base is shaped for cooperative connection with the connector structure shown in FIG. 24. The sleeve structure includes a short portion 805 of larger diameter that merges at 806 with the major wall 807 of the sleeve structure. An integrally formed and shaped internal groove 808 is provided in the enlarged diameter portion to provide the female part of a snap lock connection for receiving the crown member. The base 803 has a chamfered surface 809 leading to one side of the groove 808 to facilitate entry of the bead or rib portion of the snap lock connection. The interior of the major wall 807 of the sleeve structure inwardly of the juncture 806 is formed with a flute and rib formation at 810 for cooperation with a like formation on the crown member as set forth hereinafter. Inwardly of the flute and rib formation 810 but in close proximity thereto is an internal bead or ring 811 that provides a sterility seal and bacteria barrier when the crown member is force fit within the tubular sleeve structure.

The outer end of the sleeve structure includes an internal and shaped ring flange or bead structure 812 that constitutes the male member of a snap lock connection that is to be effected with the connector shown in FIG. 24. Outwardly of the bead structure 812, the inner surface of the sleeve structure is provided with a flute and rib formation at 813 for cooperative association with a flute and rib formation in the connector of FIG. 24. Beyond the flute and rib formation, the extreme end of the sleeve structure has an internal chamfer at 814 that extends to a thin end surface 815 that can constitute an energy director if the connector is of a plastic that is compatible with the plastic of the sleeve structure.

The crown member CS of FIG. 22 includes a base 816 from one side of which extend integrally formed, radially spaced, connectric shaped sleeve structures 817, 818 and 819. The outer sleeve structure 817 is short and provided at its end with a shaped external flange or bead structure 820 that constitutes a male member and fits within the groove 808 of the sleeve structure of the barrel member and effects a snap lock connection therewith. The sleeve structures 818 and 819 are longer and of approximately the same axial extent inwardly of the base. The exterior of the sleeve structure 818 is provided with an external flute and rib formation at 821 of a shape and length to cooperate in a tight fit relation with the internal rib and flute formation 810 in the inner end of sleeve structure 804. The outer end portion 822 of sleeve structure 818 is of reduced thickness and is externally chamfered at 823 so as to facilitate entry of the crown member CS into the barrel member. The innermost sleeve structure 819 has a straight outer wall surface 824 and a shaped internal bore. The outer end of the bore includes three contiguous portions of inwardly stepped formation of decreasing diameter shown at 825, 826 and 827. The inner-

most portion 827 is merged with a short portion 828 of square internal shape, which in turn merges with a bore portion 829 that extends to a small bore portion 830 in the base 816 of the crown structure. Internal rings or beads 831 are respectively provided in the bore portions 825, 826 and 827 so that the internally square portion 828 and the stepped portion 825, 826 and 827 together constitute a pocket structure to receive a liquid transfer tube member that is epoxy bonded thereto. While the inner surface of bore portion 828, as shown in FIG. 23, is a complete square, it could be shaped with a mold core that has four flats therein but which would not define a complete square. However, this internal configuration and the ribs, rings or beads 831 provide an effective lock for the epoxy bonded liquid transfer tube.

Also, integrally molded with the crown structure CS and projecting outwardly of the side of the base thereof opposite sleeve structures 817, 818 and 819, is a tubular extension 832. This tubular extension has at its inner end a thin portion as at 833 that constitutes a frangible connection with the crown structure as described in connection with the various frangible connections mentioned in connection with the arrangements of the previously described forms of the invention. Outwards of this portion 833 is a thicker cylindrical portion 834 that extends to an external flange 835 that receives a luer lock. Projecting beyond the flange 835 there is a luer taper portion 836 as in the other forms of the invention.

FIGS. 24 and 25 illustrate a connector member 837 that is a separately molded element. This connector member includes a base 838 from one side of which extends an enlarged sleeve portion 839 that is internally threaded at 840 for cooperative connection with external threads on a rubber plunger or stopper of a medication containing vial. The exterior of the sleeve portion 839 is provided with equi-spaced ribs and flutes 841 and 842, respectively, for strengthening purposes. Projecting from the other side of base 838 is a tubular extension structure 843 that includes a cylindrical portion 844 that is provided at 845 with a rib and flute formation for cooperation with the rib and flute formation 815 of the sleeve structure 804 of the barrel member of FIG. 21. Beyond the rib and flute formation, the tubular extension is provided with an external groove formation 846 that provides the female part of a snap lock connection with the bead or flange 812 on the sleeve structure 804. The surface of the base 838 outwards of the extension structure will bear against the end surface 815 of sleeve structure 804 and be sonic welded thereto if the plastic of the connector member is polypropylene.

The extension structure 843 also includes an inner conical sleeve portion 847 that merges with and extends inwards of a conical outer internal bore portion 848 of the tubular extension. This internal conical configuration serves and center the guide a liquid transfer tube and piercing spike member that is epoxy bonded in the pocket structure of the crown member of FIG. 22. sonic

In FIG. 26, the components of FIGS. 21 to 25 are illustrated in assembled and connected relationship together with a luer lock, a needle hub, a needle guard and an end cap. Thus, the barrel member 800 with its integral sleeve structure 804 has a connector assembly fit within the outer end of the sleeve structure 804 and

connected thereto by a snap lock connection between ring 812 and groove 846. If the plastics are compatible, a sonic weld connection can also be effected as diagrammatically shown at SW. The rib and flute formation between the inner surface of sleeve structure 804 and the outer surface of the sleeve extension 844 are in mating force fit engagement so that there can be no relative rotation between the connector structure and internal sleeve structure. A separately molded crown member has a liquid transfer tube means TT epoxy bonded at EB in the pocket structure defined in sleeve structure 819 of the crown member. The assembled and connected crown member and transfer tube means are then fit within the barrel member with the mating rib and flute formations on the interior of the inner end of sleeve 804 and the exterior of sleeve structure providing a force fit relationship preventing relative turning movement. The pointed tip of the transfer tube means is guided and centered during assembly by the internal taper provided by surfaces 848 and 847 of the inner extension of the connector member. The crown member is forced into the sleeve structure 804 until the flange 820 thereof snaps into groove 808 of the internal sleeve structure of the barrel member to form a snap lock connection. The bead 811 on the interior of the sleeve structure 804 presses into the exterior of sleeve structure 818 to provide a sterility seal. If the plastic materials of the crown member and barrel are compatible, sonic weld connection can be effected as diagrammatically shown at SW1. In this event, relatively pointed energy directing bead or series of pointed projections can be provided in the end face of flange 820 or the adjacent surface of the tube structure 804. In a sonic weld arrangement, the bead 811 would also be sonically bonded. A luer lock 848 is connected to the flange 835 of extension 832 by adhesive bonding or a sonic weld. The internal threads of the luer lock receive the flange on the end of the needle hub 849 that is internally tapered to fit over the luer taper portion of the extension 832. A conventional needle cover 850 is fit over the luer lock to cover the recipient needle 851 and a shaped end cap 852 including radially spaced sleeve portions 853 and 854 is fit into the outer end of the barrel member with the exterior of sleeve portion 853 engaging the inner surface of the outer wall of the barrel member and the exterior of sleeve portion 853 engaging the threads of the connector member. The end cap is removed when the hypodermic syringe body structure is to be associated with a medicament vial.

FIG. 27 illustrates a modified version of the structure of FIG. 26 in which a barrel member 860 includes an outer wall 861, a base 862 and an integral inwardly extending internal sleeve or tubular structure 863. A shaped crown member 864 includes a base 865 having two concentric sleeve portions 866 and 867 projecting from one face of the base and a tubular extension 868 projecting from the other face of the base. The extension 868 is provided with a frangible portion 869, a flange 870 to be connected with a luer lock not shown, and an outer luer taper portion 871. The barrel base 862 is recessed at 872 to receive a rim or flange 873 on the base 865 of the crown member. Energy directing pointed projection means are provided on either the base recess surface or the surface of flange 873 so that the crown member 864 can be sonically welded to the barrel member when both members are polypropylene. Such a sonic weld connection is diagrammatically

shown at 874. The inner bore of sleeve portion 867 is shaped to provide an epoxy resin receiving pocket 875 having ribs 876 therein so that a transfer tube 877 can be epoxy bonded in place as at 878. The outer end of the inner tubular sleeve structure 863 has an integrally formed connector portion 879 having internal threads 880 and an integral web 881 having a tubular extension 882 that is shaped to provide a tapered centering well or guide bore 883 for guiding and centering the spike end of the transfer tube 877 when the assembly of transfer tube and crown member are being fit within the barrel member. In this connection, rib and flute formations can be provided on the exterior of sleeve structure 866 and on the interior of an inner portion of sleeve structure 863 as in the forms shown in FIGS. 21 and 22. Also, a sterility seal bead like bead 811, FIG. 21, can be provided.

In both forms of the invention shown in FIGS. 26 and 27, the tubular extension that projects beyond the base of the barrel member and which includes a frangible break-off portion is integral with the crown member. The crown member is a separately molded tubular member or means that includes a surface that fits within the tubular portion or sleeve structure that is integral with the base of the barrel member.

Also, if desired, strengthening ribs could be molded on the exterior of the sleeve structure that is integral with the base of the barrel similar to the rib formations 23 in FIG. 3 and 7 in FIG. 1.

The form of invention illustrated in FIGS. 28 to 31 combines some of the features shown in FIGS. 21 and 27, but utilizes a crown member having an outer tubular extension shaped to receive a fixed recipient needle.

Thus, in FIG. 28, the barrel member 900 molded from plastic material, such as polypropylene, includes an outer wall 901 having at its outer end a lateral rim or extension structure 902 to be grasped by the user's fingers when the syringe body structure is associated with a medicament vial. The base 903 of the barrel is molded integrally with an inwardly extending tubular sleeve portion 904 that extends throughout the barrel and terminates on a level with the outer end of the barrel. The outer end of tubular sleeve portion 904 is formed similar to the arrangement of FIG. 27 and includes an integrally formed connector portion 905 having internal threads 906. Inwards of the thread formation is an integrally formed conically shaped centering well and bore structure 907 for guiding and centering the spike end of a liquid transfer tube when an assembly of crown member and transfer tube is being fit within the barrel. The end of the sleeve structure 904 that is adjacent the base 903 of the barrel is shaped to receive the crown member of FIG. 29 and includes a short inwardly tapered portion 908 leading to an internal groove formation 909. The groove formation includes a transverse portion 910, base portion 911 that is parallel to the outer wall of the barrel, and an inner angled side wall portion 912. The angularity of wall portion 912 is the same as a portion of a bead on the crown member described hereinafter. Beyond the groove formation, the inner wall of the sleeve structure is fluted at 913 to provide a ribbed formation. Inwardly of the rib formation is an internal bead 914 that engages the outer surface of the crown structure to form a sterility seal. between

The polypropylene crown structure or member of FIG. 29 includes a base 915 from one side of which ex-

tends integrally formed outer and inner tubular structures 916 and 917. The outer surface of outer tubular structure 916 has a shaped external flange or bead structure 918 that conforms with and fits within groove formation 909 to form a snap lock connection between the crown structure and the barrel member. Beyond the bead structure is a ribbed formation 919 that mates with the fluted or ribbed formation 913 of the sleeve structure of the barrel member so as to prevent any turning of the crown member relative to the sleeve structure. The inner tubular or sleeve structure 917 has a slightly inwardly tapered outer wall surface 920 and a shaped internal bore formation. The outer portion of the bore has three contiguous inwardly stepped portions of decreasing diameter 921, 922 and 923. Centrally of the length of each stepped portion is an internal bead 924. The innermost stepped portion emerges with a straight bore portion 925 that stops at an internal shoulder 926. The bore formation constitutes a socket for a liquid transfer tube 927 having a piercing spike 928 at its outer end. The transfer tube is epoxy bonded in place similarly to the arrangement shown in FIGS. 22 and 26.

Projecting outwardly of and integral with the base 915 is a tubular extension 929. This extension has a portion of reduced thickness at 930 at its inner end to constitute a frangible connection with the crown structure or member. This formation is similar to the frangible portion described with reference to all other embodiments of the invention. Outwardly of the portion 930 is a short portion 931 of greater wall thickness. Four equi-spaced ribs 932 are provided integrally with the portion 931. A shaped external flange or bead 933 is provided axially outwards of the ribs 932 so as to constitute the male member of a snap lock connection with the polypropylene shell structure of FIG. 30, which fits over the extension 929. The internal bore formation of extension 929 includes an outer inwardly tapered or outwardly flared portion 934, a straight bore portion 935 terminating at an internal shoulder 936, and another straight bore portion 937 communicating with the interior of bore portion 925 of the inner sleeve structure 917. The contiguous bore portions 934 and 935 together constitute a partial socket and pocket arrangement for a fixed recipient needle 938 that is epoxy bonded in place. To complete the epoxy well or socket, the shell 939 of FIG. 30 is snap fit over extension 929. This molded shell 939 includes at its inner end an inwardly tapered inner wall portion 940 leading to an internal groove formation 941 that provides the female member of a snap lock connection to cooperate with the flange structure 933 of the tubular extension 929. Beyond the groove formation and extending toward the outer end of the shell structure is a bore portion 942 having a length greater than the portion of the tubular extension that is outwardly of flange 933. This bore portion 942 terminates at an internal shoulder 943. This shoulder being outwards of the flared end of extension 929 functions to hold the epoxy bonding material in place when the shell is snap lock connected with the tubular extension and a needle 938 is epoxy bonded in place similar to the showing in FIGS. 13 to 15.

FIG. 31 illustrates the barrel member 900, the crown member CM and associated transfer tube 927 and fixed recipient needle 938 and shell 939 assembled and snap lock connected together. A needle guard, not shown,

is fit over the exterior of the shell when the syringe body structure is finally completely assembled under sterile conditions.

With the arrangement of FIGS. 28 to 31 varying size fixed recipient needles can be utilized and varying size transfer tubes can be employed due to the stepped formation of the internal bore surface of the inner tubular sleeve structure 917.

Thus, this invention provides a structural relationship in which the production thereof is facilitated and which lends itself to proper total destruction after a single usage. In some forms of the invention, the outer body or barrel is provided with a relatively short inwardly extending guide sleeve so that the molding of this barrel is facilitated and there are no serious problems involved in disassociating mold members from this structure so that large scale production is possible. The separately formed inner tubular structure is likewise readily molded, regardless of whether this structure is merely a single sleeve component having connecting threads at one end and a liquid transfer tube socket at the other as in FIG. 4, or whether it is shaped as in FIG. 12 to receive a separately formed combined transfer tube and piercing spike and to include a frangible portion and an outer extension that can be shaped as a needle socket or as a luer taper to have a luer lock adapter associated therewith. From a production viewpoint, the relationship of FIG. 18 is excellent in that the transfer tube can be extruded and connected to a molded piercing spike and this sub-assembly bonded to the tubular connector.

Actually, the form of the invention that embodies the simplest approach is that which consists of only two members; namely, the barrel having a short internal guide sleeve and an inner tubular structure that combines the internally threaded connecting socket and piercing spike, regardless of whether the extension beyond the base of the barrel is incorporated with either the barrel or the inner tubular structure, or whether such extension is shaped to provide a needle socket or to constitute a luer taper to receive a luer lock adapter. In addition, the invention contemplates the provision of energy directing beads or pointed projections on any surface extending laterally of the axis of the barrel, regardless of whether they are on outer or inner elements so that when the several components, after initial and separate molding from compatible plastics, are assembled and exposed to sonic welding apparatus, the effective integral bonding and sealing of the parts to one another can be accomplished.

As this invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, the present embodiment is therefore illustrative and not restrictive, and since the scope of the invention is defined by the appended claims, all changes that fall within the metes and bounds of the claims or that form their functional as well as conjointly cooperative equivalents are therefore intended to be embraced by those claims.

We claim:

1. A hypodermic syringe body structure for association with a liquid medicament container of the type including a piercable stopper having a connector thereon, said body structure comprising a molded plastic barrel means open at one end and including an outer wall, a base opposite said open end and an integral tubular portion extending inwardly of the base toward

said open end in spaced relation to said outer wall, a separately molded inner tubular means having a wall portion fitting within at least a portion of said integral tubular portion that extends inwardly of the base of the barrel means and which is at least adjacent said base, a tubular wall structure projecting outwardly of said base coaxially of the inner tubular means and including an outer portion for operative association with a separate cannula, means defining a frangible portion disposed inwards of said outer portion and outwards of said base so that said outer portion structure and an associated cannula can be broken away from said barrel means after a single use, means effectively interconnecting said separately molded inner tubular means to said integral tubular portion that extends inwardly of said base, tubular connector means for operative coupling connection with the connector on a stopper of such a medicament container, said inner tubular means having an elongate, reduced diameter bore therein, a liquid transfer tube means supported in said inner tubular means substantially coaxial therewith and spaced therefrom over a major portion of the length thereof, an elongate portion of said transfer tube means fitted and rigidly supported in said reduced diameter bore, said transfer tube means being separate from said cannula and operatively connected between said connector and said tubular wall structure for transferring liquid from said connector to said tubular wall structure and thus to a cannula that is associated therewith, a hollow stopper piercing spike means operatively connected with said liquid transfer tube means and disposed within said tubular connector means for cooperative relation with a stopper of such a medicament container, and said tubular connector means being operatively carried by one of said separately molded tubular means and said integral tubular portion that extends inwardly of said base of said barrel member.

2. A hypodermic syringe body as claimed in claim 1, and stiffening ribs integral with said barrel and extending from said base to said integral tubular portion.

3. A hypodermic syringe body structure as claimed in claim 1 in which said barrel member and inner tubular means have mutual laterally extending facing bonding surfaces.

4. A hypodermic syringe body structure as claimed in claim 3 and the means interconnecting said inner tubular means and integral tubular portion comprising a sonically welded connection located at least at said facing bonding surfaces so that said members are effectively integrally combined together.

5. A hypodermic syringe body structure as claimed in claim 3 in which said bonding surfaces include facing surfaces on each member extending laterally of the longitudinal axis of said body structure and the means interconnecting said members together comprising a sonically welded connection located at least at said facing surfaces so that said members are effectively integrally combined together.

6. A hypodermic syringe body structure as claimed in claim 1 in which the integral tubular portion extends inwardly from the base a distance that is relatively short in relation to the length of said barrel member.

7. A hypodermic syringe body structure as claimed in claim 1 in which said means defining a stopper piercing spike member is a separately molded tubular plastic member having a tip at one end, said liquid transfer tube means comprising a separately molded plastic

tube having an end portion fitting within said inner tubular means and another end portion fitting said tubular plastic stopper piercing spike member, means effectively bonding said liquid transfer tube to said tubular plastic stopper piercing spike member and to said inner tubular means and said stopper piercing spike member to said inner tubular means inwardly of said connector.

8. A hypodermic syringe body structure as claimed in claim 1 in which said tubular connector means is an enlarged internally threaded portion at said one end of said inner tubular means and includes a base portion having a recess therein, said means defining a stopper piercing spike comprising a separately molded tubular plastic member having a piercing tip at one end, a laterally extending flange inwardly of said tip and disposed in said recess, and a tubular extension projecting beyond said flange, said liquid transfer tube means comprising a separately molded member fitting said last-mentioned tubular extension and within said first-mentioned molded plastic inner tubular means, said flange of said molded plastic stopper piercing member, said base portion of said connector and one end of said liquid transfer tube means having mutual facing bonding surfaces, said transfer tube means and said first-mentioned inner tubular means having mutual facing bonding surfaces and means effectively bonding all said members together at least at said facing surface.

9. A hypodermic syringe body structure as claimed in claim 1 in which said tubular connector means is a separately molded plastic connector member having internal threads thereon and means operatively connecting said separately molded plastic member with said integral tubular portion that extends inwardly of said base.

10. A hypodermic syringe body structure as claimed in claim 1 in which said integral tubular portion that extends inwardly of the base includes an outer end portion having internal threads thereon and which outer end portion terminates at least adjacent said open end of said barrel means so as to constitute said tubular connector means as an integral part of said integral tubular portion.

11. A hypodermic syringe body structure as claimed in claim 1 in which said tubular connector means is a separately molded plastic connector member having internal threads thereon and means operatively connecting said separately molded plastic connector member with said separately molded tubular means.

12. A hypodermic syringe body structure as claimed in claim 1 in which said separately molded tubular means includes an outer end portion having internal threads thereon and which outer end portion terminates at least adjacent said open end of said barrel means so as to constitute said tubular connector means as an integral part of said separately molded tubular means.

13. A hypodermic syringe body structure as claimed in claim 1 in which said tubular connector means is a separately molded plastic connector member including a base having an aperture therein, a tubular extension surrounding said aperture and projecting from one side of said base, a larger diameter internally threaded wall structure projecting from the opposite side of said base, one of said separately molded tubular means and said integral tubular portion that extends inwardly of said base of said barrel member having a terminal end portion disposed inwards of the open end of said barrel, said tubular extension fitting within said terminal end

portion, and means effectively connecting said tubular extension with said terminal end portion.

14. A hypodermic syringe body structure as claimed in claim 13 in which said tubular extension includes a shaped internal wall surface tapering inwardly toward the base of said plastic connector member for centering said stopper piercing spike means.

15. A hypodermic syringe body structure as claimed in claim 1 in which said tubular connecting means has internal threads for cooperation with external threads on a stopper of a medicament vial, said liquid transfer tube means having an outer end portion, said stopper piercing spike means being a separately molded plastic member having a tubular end portion coaxially related with and extending axially inwards of the outer end of said liquid transfer tube means and a smaller diameter opposite end portion terminating in a stopper piercing tip coaxially within said tubular connector means, and means connecting said tubular end portion to said outer end portion of said liquid transfer tube means so as to permit said tubular end portion to turn relative to said liquid transfer tube means when the threads on such a stopper are being engaged with the threads on said tubular connecting means.

16. A hypodermic syringe body structure as claimed in claim 1 in which said tubular wall structure having the frangible portion is integral with said separately molded tubular means, said tubular connector means being integral with said integral tubular portion that extends inwardly of said base of said barrel member, said outer portion of said tubular wall structure having an outwardly flared bore portion for receiving a separate cannula, an external shaped flange on said tubular wall structure axially inwards of said flared bore portion and outwards of said frangible portion and constituting the male member of a snap lock connection, a separately molded shell member having an internal flange adjacent one end and an internal groove formation adjacent the other end that constitutes the female member of a snap lock connection, said shell member being dimensioned to fit over said tubular wall structure with the male and female members of said snap lock connection in engagement and said internal flange disposed axially outwards of the end of said tubular wall structure so as to define with said outwardly flared portion a bonding material receiving and confining pocket, a cannula in said pocket and bonding material bonding the cannula in place.

17. A hypodermic syringe body structure for association with a liquid medicament container of the type container a pierceable stopper having a connector thereon, said body structure comprising a molded plastic barrel member having an open end, a base opposite said open end having an aperture therethrough and an integral guide sleeve surrounding the aperture in said base and extending inwardly of said base a distance that is relatively short in relation to the axial extent of said barrel member, a molded plastic inner tubular member having a connector at one end for cooperation with and connection to the connector of such a medicament container, said inner tubular member including a portion fitting within said guide sleeve of said barrel member, said inner tubular member also having a base at its other end having a bore therethrough and an integral tube-receiving sleeve extending inwardly of said second-mentioned base, and communicating with said bore, said base and sleeve including aligned inner wall

portions defining a bonding material receiving pocket and a tube-receiving bore in inward continuation of said pocket and of less cross-sectional area than said pocket, a liquid transfer tube having an intermediate portion disposed through said last-mentioned bore and pocket, an end portion extending from said intermediate portion to terminate at least slightly beyond the base of said barrel member and an opposite end portion terminating at least approximately at the level of said one end of said inner tubular member, the liquid transfer tube spaced from said inner tubular member over a major portion of its length, said opposite end portion of said transfer tube being shaped to define a stopper piercing spike, bonding means at least within said pocket and surrounding said intermediate portion of said tube to connect said tube to said inner tubular member, said barrel member having a tubular extension projecting outwardly of the aperture in said first-mentioned bore, said tubular extension having a frangible portion outwards of said base of said barrel member, means operatively connected with said tubular extension outwards of said frangible portion for receiving a cannula, said internal guide sleeve being radially outwards of the aperture through the bore of said barrel member, and means connecting the outer surface of the base of said inner tubular member to an inner surface of the base of said barrel member, radially inwardly of said internal guide sleeve.

18. A hypodermic syringe body structure as claimed in claim 17 and said connector at one end of said inner tubular member comprising an internally threaded portion extending inwardly from said one end.

19. A hypodermic syringe body structure as claimed in claim 17 and circumferentially spaced integral stiffening rib means extending between the base of said barrel member and said internal guide sleeve.

20. A hypodermic syringe body structure as claimed in claim 17 and circumferentially spaced stiffening ribs integral with said inner tubular member and extending radially outwards of and along the exterior of said member throughout the major axial extent thereof.

21. A hypodermic syringe body structure for association with a liquid medicament container of the type including a pierceable stopper having a connector thereon, said body structure comprising a molded plastic barrel member having an open end, a base opposite said open end having an aperture therethrough and an integral, internal guide sleeve surrounding the aperture in said base and extending inwardly of said base a distance that is relatively short in relation to the axial extent of said barrel member, a molded plastic inner tubular member having an intermediate portion fitting within said guide sleeve, a connector means at one end of said inner tubular member for cooperation with and connection to the connector of such a medicament container and a tubular extension portion in continuation of said intermediate portion and projecting outwardly of the base of said barrel member, said tubular extension portion having a frangible portion outwards of said base of said barrel member, means operatively connected with said tubular extension portion outwards of said frangible portion for receiving a cannula, a molded plastic liquid transfer tube fitting within said inner tubular member and having an end portion terminating at least approximately at the level of said one end of said inner tubular portion, said end portion of said transfer tube being shaped to define a stopper

piercing spike, said internal guide sleeve and inner tubular member having mutually facing bonding surfaces extending laterally of the major axes of said members, said liquid transfer tube having at least one bonding surface extending laterally of the major axis thereof, said inner tubular member also having at least one laterally extending bonding surface facing said bonding surface of said transfer tube, and means connecting said transfer tube to said inner tubular member and said inner tubular member to said barrel member at least at said bonding surfaces.

22. A hypodermic syringe body structure as claimed in claim 21 and circumferentially spaced integral stiffening ribs extending between said base of said barrel member and said internal guide sleeve.

23. A hypodermic syringe body structure as claimed in claim 21 and said connector means at said one end of said inner tubular member comprising an internally threaded portion extending inwardly from said one end.

24. A hypodermic syringe body structure as claimed in claim 21 and said inner tubular member having stepped internal diameter portions increasing in size inwardly from the end thereof remote from said connector means including a portion of an internal diameter greater than the external diameter of said transfer tube and extending axially of said inner tubular member for a substantial extent thereof between said internal guide sleeve and said connector means, and said plastic liquid transfer tube having integral circumferentially spaced stiffening ribs extending radially outwards of said transfer tube over a substantial axial extent of the portion thereof that extends between said internal guide sleeve and said connector.

25. A hypodermic syringe body structure as claimed in claim 24 and integral circumferentially spaced stiffening ribs extending radially outwards of said inner tubular member over at least a substantial longitudinal extent thereof between said internal guide sleeve and said connector.

26. A hypodermic syringe body structure as claimed in claim 21 and said internal guide sleeve having stepped internal surface portions of different cross-sectional areas including a first internal surface portion extending inwardly from said base of said barrel member and a second internal surface portion extending longitudinally inwardly from said first internal surface portion, said surface portions being separated by an internal shoulder on said internal guide sleeve, said inner tubular member having stepped external surface portions and an external shoulder complementary with said internal stepped surface portions and internal shoulder of said internal guide sleeve.

27. A hypodermic syringe body structure as claimed in claim 26 and said first stepped internal surface portion of said internal guide sleeve and the complementary external surface portion of said inner tubular member being polygonal in cross section.

28. A hypodermic syringe body structure for association with a liquid medicament container of the type including a pierceable stopper having an externally threaded connector portion, said body structure comprising a molded plastic barrel means open at one end and including an outer wall, a base opposite said one end and an integral tubular portion extending inwardly of said base toward said open end, a separately molded tubular means constituting a crown member and in-

cluding a base, a plurality of integral coaxial tubular sleeve structures projecting from one side of said base and including at least a first sleeve structure disposed centrally of said base and a second sleeve structure radially outwards of said first sleeve structure and including an outer wall surface, at least a portion of which fits within and contacts at least a portion of the interior of said integral tubular portion, a tubular extension projecting from the opposite side of said base of said crown member coaxially of said first sleeve structure, said tubular extension having an outer portion for operative association with a separate cannula, said tubular extension including a frangible portion between said outer portion and the base of said crown member so that the outer portion of said tubular extension and an associated cannula can be broken off after a single use, said first mentioned sleeve structure having a shaped internal bore communicating with the interior of said tubular extension, said shaped internal bore including an inner tube receiving portion and an outer enlarged portion constituting a bonding material receiving pocket, a liquid transfer tube having at least a portion disposed within said pocket, bonding material within said pocket and surrounding the portion of said transfer tube disposed therein to connect said transfer tube to said first sleeve structure and thus to said crown member to said barrel means, threaded connector means carried by said integral tubular portion and located at the open end of said barrel means so as to connect said syringe body structure to a stopper of a medicament vial, and a hollow stopper piercing spike carried by said liquid transfer tube and extending within said threaded connector means.

29. A hypodermic syringe body structure as claimed in claim 28 in which said barrel means and crown member are of compatible plastic, said base of said barrel means having a recess therein, said base of said crown member having a rim portion laterally outwards of said second sleeve structure, said rim portion fitting within said recess and the means operatively connecting said crown member to said barrel means including a sonic weld connection between said rim and the facing surface of said recess.

30. A hypodermic syringe body as claimed in claim 28 in which said crown member includes a third sleeve structure extending from said one side of the base of the crown member radially outwards of said second sleeve structure and having a length that is relatively short in relation to the length of said second sleeve structure, said integral tubular portion extending inwardly of the base of the barrel means including a larger diameter portion adjacent the base of the barrel means, said larger diameter portion having an internal annular groove therein, said third sleeve structure having an external projecting annular bead formation for cooperative association within said groove to provide a snap lock connection between said crown member and said barrel means.

31. A hypodermic syringe structure as claimed in claim 28 in which said connector means comprises an integral internally threaded outer portion of said integral tubular portion that extends inwardly of the base of said barrel member, a web structure within said integral tubular portion and located inwards of said internally threaded portion, an integral tubular extension of

said web structure facing the base end of said barrel means and having a bore surface tapering inwardly toward the open end of said barrel means for guiding and centering the piercing spike when the crown member and associated liquid transfer tube and piercing spike are fitted within said integral tubular portion that extends inwards of the base of said barrel means.

32. A hypodermic syringe body structure as claimed in claim 28, said integral tubular portion having an inwardly directed annular bead formation located in inward spaced relation to the outer end of said tubular portion, said connector means comprising a separately molded plastic connector member including a base, an internally threaded sleeve portion extending from one side of the base of the connector member for cooperation with the externally threaded portion of the stopper of a medicament container, a tubular extension structure projecting from the other side of the base of said connector member, said tubular extension structure including a cylindrical portion having an internal annular groove therein for cooperative engagement with the internal bead structure on said integral tubular portion to provide a snap lock connection between said connector member and said integral tubular portion, said tubular extension structure having a bore surface tapering inwardly toward the base of the connector member for guiding and centering the piercing spike when the crown member and associated liquid transfer tube and piercing spike is fit within said integral tubular portion that extends inwards of the base of said barrel means.

33. A hypodermic syringe body structure as claimed in claim 28 in which said tubular extension projecting from the opposite side of said base of said crown member includes an end, an externally shaped flange means axially outwards of said frangible portion and constituting the male member of a snap lock connection, said tubular extension having an outwardly flared bore portion leading to its end for receiving a separate cannula, a separately molded shell member having an internal flange adjacent one end and an internal groove formation adjacent the other end that constitutes the female member of a snap lock connection, said shell member being dimensioned to fit over said tubular extension with the male and female members of said snap lock connection in engagement and said internal flange disposed axially outwards of the end of said tubular extension so as to define with said outwardly flared portion a bonding material receiving and confining pocket, a cannula in said pocket and bonding material bonding the cannula in place.

34. A hypodermic syringe body structure as claimed in claim 28 in which said connector means comprises an integral internally threaded outer portion of said integral tubular portion that extends inwardly of the base of said barrel member, an integral tubular structure within said integral tubular portion and located inwards of said internally threaded portion, said integral tubular structure facing the base end of said barrel means and having a bore surface tapering inwardly toward the open end of said barrel means for guiding and centering the piercing spike when the crown member and associated liquid transfer tube and piercing spike are fitted within said integral tubular portion that extends inwards of the base of said barrel means.

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