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Burke et al.

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[54] **HYPODERMIC SYRINGE BARREL AND NEEDLE STRUCTURE**

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[52] **U.S. Cl.** ..... **128/221,** 128/218 N

[51] **Int. Cl.** **A61m 5/32**

[58] **Field of Search** ..... 128/218 N, 221, 218 R, 128/216, 220, 215

[56] **References Cited**

UNITED STATES PATENTS

3,472,227	10/1969	Burke	128/221
3,638,650	2/1972	Burke et al.	128/221
3,523,531	8/1970	Burke	128/221
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3,306,291	2/1967	Burke	128/218 R

FOREIGN PATENTS OR APPLICATIONS

201,395	2/1966	Sweden	128/218 N

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[57] **ABSTRACT**

A hypodermic syringe barrel and needle structure in which a molded plastic barrel is formed with an integral tubular extension having cannula and bonding material receiving bore surfaces thereon, a separately molded plastic confining cap member having an internal flange at its end is sonically welded or sealed to the extension to form a permanent part thereof, a cannula is disposed within the aperture defined by such flange and with the bore surfaces of the extension and a bonding material composition is set within the bore surfaces and beneath such flange and in intimate bonding engagement with the outer surfaces of the cannula to retain the cannula in fixed position relative to the extension and cap member.

9 Claims, 3 Drawing Figures

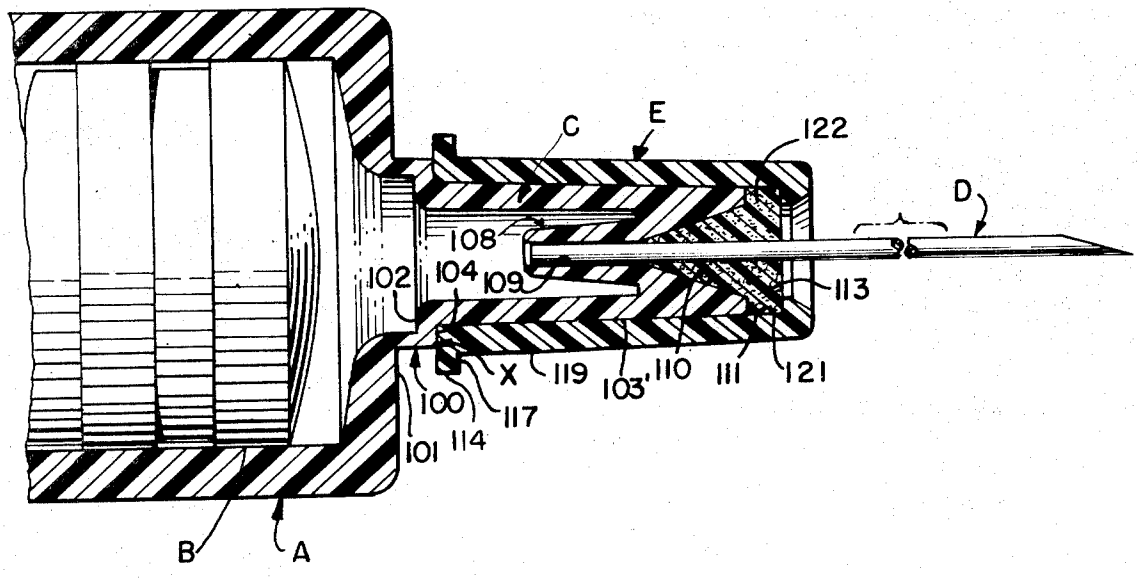


FIG. 1.

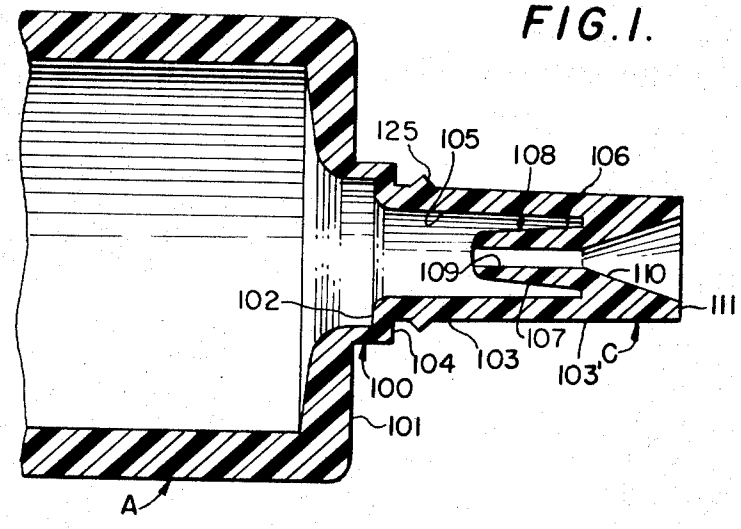


FIG. 2.

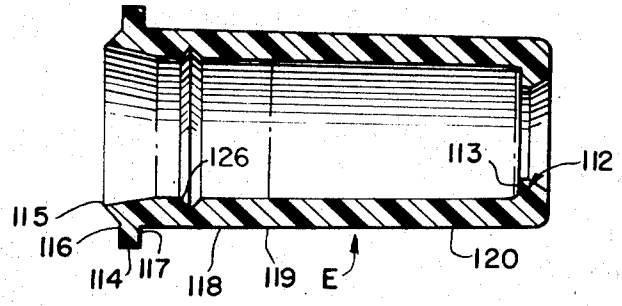
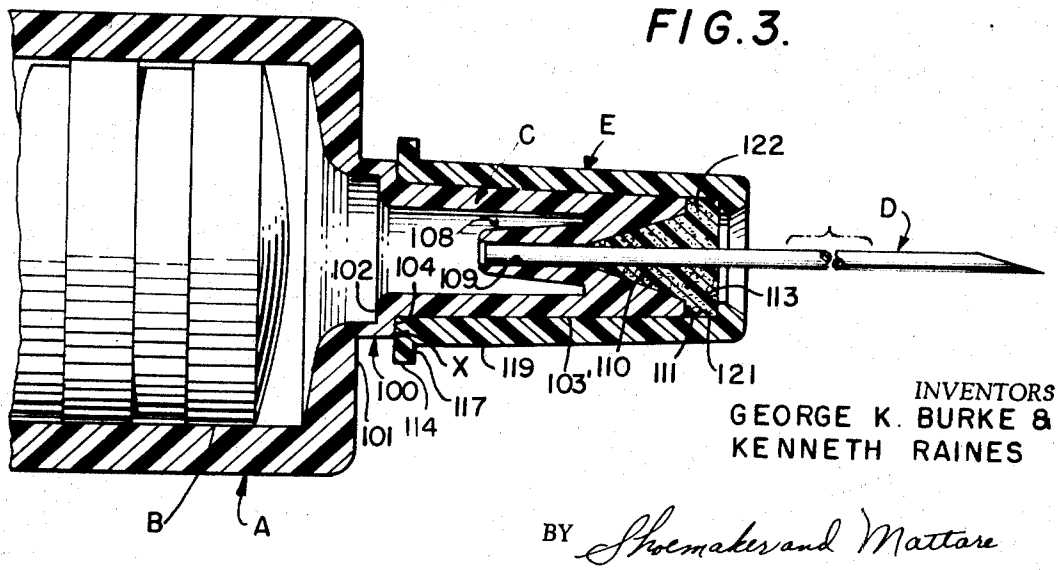


FIG. 3.



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HYPODERMIC SYRINGE BARREL AND NEEDLE STRUCTURE

BACKGROUND OF THE INVENTION

The present invention relates to the art of disposable sterile devices, such as hypodermic syringes and the like, which are adapted to be destroyed after a single use.

Devices of this character are known in the art, such as in U. S. Pat. No. 3,306,291, dated Feb. 28, 1967.

In general, the needle or cannula is mounted within a needle hub that is connected to an extension or boss on the barrel of a syringe or the needle can be fused within a glass extension of a glass syringe barrel.

Since disposable syringes must be mass produced, it is desirable to provide a syringe barrel and needle combination wherein the needle is fixed in relation to the barrel.

Further, it is desirable to produce the syringe barrel from organic plastic materials, such as polyethylene or polypropylene, and certain difficulties arise in fixing a metal cannula within bores provided in tubular portions molded from such materials.

Consequently, a constructional arrangement is desired in which a metal needle can be readily fixed to a syringe barrel molded of such plastic materials and wherein means are provided to lock the needle in place so as to prevent removal thereof.

STATEMENT OF THE INVENTION

Thus, the invention provides a syringe barrel that is so molded of the above-mentioned materials as to include an integral tubular extension having a frangible portion outwards of the base of the barrel and a needle accommodating bore and bonding material receiving pocket as well as a bonding or interlocking surface thereon to mate with a facing bonding or interlocking surface of a plastic cap of the same material and which cap, after bonding or interlocking with the tubular extension, permanently confines the needle and its associated bonding material relative to the pocket.

Particularly, the invention provides an integral tubular extension from the base of the barrel that includes a needle and bonding material accommodating internal shape, a frangible portion outwards of the base and a lateral shoulder to receive a bonding or interlocking surface on the end of a molded plastic cap and which end has an energy directing bead or a series of pointed projections thereon so that the cap can be effectively integrally bonded to the tubular extension by sonic, i.e. ultrasonic, welding, and after which a needle can be inserted within the extension and an epoxy resin bonding composition introduced into the pocket to bond the needle in place. Since the cap is now an integral part of the extension, the needle and surrounding epoxy bonding composition are permanently confined by the cap. In some instances, the material from which the cap is made may not be the same as the syringe body and, in such instances, the interior wall of the cap and the exterior surface of the barrel extension may be provided with a mating bead and groove construction to interlock the parts.

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 fragmentary longitudinal sectional view of a molded syringe barrel and the integral tubular extension thereof;

FIG. 2 is a longitudinal sectional view of a molded cap; and

FIG. 3 is a view similar to FIG. 1 illustrating the barrel and cap in sonically bonded relation and with the needle and bonding material confined by the cap.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

In the drawings, the syringe barrel A is formed of molded organic plastic material, such as polyethylene or polypropylene, and receives a plunger indicated at B, the arrangement being similar to that of prior U.S. Pat. No. 3,306,291 mentioned hereinbefore.

During molding, the barrel is formed with a tubular extension C that includes a frangible portion **100** defined between the outer or annular shoulder surface **101** of the barrel and an internal annular shoulder **102** on the extension. This formation of providing a frangible portion is as in said U.S. Pat. No. 3,306,291. Thus, the length of the frangible portion, which is an area of stress, should have a length no more than twice its wall thickness. The outer wall surface of the extension includes a cylindrical portion **103** extending from the external laterally extending shoulder **104** and an inwardly tapered portion **103'** that extends to the end surface **111** of the extension. The surface of shoulder **104** constitutes a bonding surface. The extension is provided with an inner bore surface **105** that is slightly tapered inwardly from its juncture with shoulder **102** and via surface **106** joins with the outer surface **107** of a generally frusto-conically shaped portion **108** formed within the extension. The portion **108** has a bore surface **109** that merges with a further surface **110** that flares outwardly toward the end surface **111** of the extension. The outwardly flaring surface defines a bonding material receiving pocket. The bore surface can be slightly tapered or straight and of a diameter to accommodate the outer surface of an inserted needle or cannula D, FIG. 3.

The separately molded cap E includes an inwardly directed flange **112** that defines an opening in the outer end of the cap. The inner surface **113** of this flange acts as a confining surface as explained hereinafter. The other or inner end of the cap is shaped to provide an outwardly directed flange **114**. An annular pointed head **115** of material is formed as a projection from surface **116** of flange **114**. The outer surface of the cap includes a cylindrical or straight portion **118** extending beyond surface **117** of flange **114** and which merges at **119** with an inwardly tapered surface portion **120**. The inner surface of the cap includes portions that are complemental with the outer surface portions of the extension. The bead **115** is an energy directing bead of plastic that effects the bonding and sealing connection between the surface **116** of flange **114** of the cap and the surface of shoulder **104** on the tubular extension when the cap is assembled with the extension of the barrel

and the assembly is subjected to an ultrasonic field in a sonic welding apparatus.

In producing the assembled components of the invention, the barrel A and its integral extension C are injection molded from polypropylene. The cap E, likewise injection molded from this material, is placed over the extension with the tip of bead **115** in contact with shoulder **104** of the extension. These parts are subjected to ultrasonic welding so that the cap is permanently integrally bonded and sealed to the extension generally as is shown at X in FIG. **3.**

A stainless steel needle or cannula D is then inserted within bore surface **109** of the frusto-conically shaped portion **108** of the extension and an epoxy resin bonding composition is introduced into the space surrounding the cannula that is delimited by the outwardly flaring bore surface **110,** the end surface **111** of the extension, the inner surface **113** of inwardly directed flange of the cap E, and that inner wall surface portion **121** of the cap that is between the end surface **111** and inner flange surface **113.** Thus, the epoxy resin bonding material, when set, forms into an annular portion **122** so that outward pulling force applied on the needle is resisted by the inner flange surface **113** of the cap which is integrally united to the extension of the barrel.

In providing this effective epoxy resin receiving space, the extension and cap are so dimensioned that the longitudinal distance between the surface **116** of outwardly directed flange **114** and the surface **113** of inwardly directed flange **112** is greater than the distance between the shoulder **104** and the end surface of the tubular extension.

After the cannula has been mounted and fixed to the now interconnected extension and cap, a protective needle cover, not shown, is positioned over the exterior of the cap.

Thus, this invention provides a hypodermic syringe barrel structure of molded plastic material having an integral tubular extension projecting beyond the base of the barrel. The extension includes a frangible portion outwards of the base and an internal surface shaped to provide a cannula accommodating bore portion and an outwardly flaring portion extending beyond such bore portion. The extension also includes a laterally directed bonding surface adjacent the frangible portion and an outer cap accommodating surface. A molded plastic cap having at one end an outwardly directed flange constituting a bonding surface provided with a shaped energy directing portion is effectively integrally bonded and sealed to the extension and a cannula is bonded within the bore by a quantity of an epoxy resin bonding composition that at least fills the space surrounding that portion of the cannula that is inwards of an inwardly directed flange on the other end of the cap.

While the energy director, either a bead or a series of projections, is preferably formed on the cap, the same could be formed on the lateral shoulder of the tubular extension.

Additionally, it is to be understood that the bore surface in the frusto-conical portion of the tubular extension is usually dimensioned to accommodate a particular size cannula, however, a larger diameter cannula can be utilized therein because the same can be positioned with its end peripheral surface contacting the outwardly flaring portion of the bore surface and the resin utilized to retain the cannula in place.

Under certain circumstances, it may be desirable to form the cap and syringe body from different materials and, therefore, the ultrasonic sealing technique described above may not be practical since the materials are not compatible. Thus, the external surface of the barrel extension may be provided with a circumferential bead **125** and the internal surface of the cap E may be provided with a complementary circumferential groove **126** to cooperate with the bead **125.** The cap is interfitted with the extension and the bead and groove snap together to effectively retain the cap in position on said extension.

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, since the scope of the invention is defined by the appended claims rather than by the description preceding them, and 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 barrel and needle structure comprising a one-piece molded plastic syringe barrel having a substantially uniform internal diameter, a base and an integrally molded tubular extension projecting outwardly from said base, said extension including means defining a frangible portion outwards of the base, and an internal surface including portions shaped to define a cannula accommodating bore portion and an outwardly flaring bore portion outwards of said cannula accommodating bore portion, a separately molded plastic cap member shaped to fit on said extension and spaced from said base of said barrel, said cap member having an inwardly directed flange at its outer end, means bonding said cap member to said extension, a cannula inserted within said extension in abutting contact with at least a portion of one of said bore portions of said extension, and a bonding composition disposed in surrounding relationship to said cannula in intimate engagement with and bonded to the outer surface thereof, said bonding composition at least substantially filling the space between said cannula and the surrounding bore portion and the inner surface of said inwardly directed flange to retain said cannula in fixed relation relative to said extension and cap member.

2. A hypodermic syringe barrel and needle structure as claimed in claim **1** and said inner surface of said inwardly directed flange on said cap member facing said outwardly flaring bore portion and including a surface portion that extends laterally outwards of the outer terminal end of said outwardly flaring bore portion.

3. A hypodermic syringe barrel and needle strucure as claimed in claim **1** in which said integral tubular extension of said plastic barrel member and said cap member have facing bonding surfaces.

4. A hypodermic syringe barrel and needle structure as claimed in claim **3** and the means bonding said cap member to said tubular extension comprising a sonically welded connection located at least at said facing bonding surfaces so that said cap member is effectively integrally combined with said tubular extension.

5. A hypodermic syringe barrel and needle structure as claimed in claim **4** and the bonding surface of said tubular extension comprising a laterally directed external shoulder surface located outwards of said frangible

portion of said extension and the bonding surface of said cap member comprising a laterally directed external flange surface at the inner end of said cap member.

6. A hypodermic syringe barrel and needle structure as claimed in claim 5 and a pointed sonic energy directing means provided on and integral with one of said bonding surfaces.

7. A hypodermic syringe barrel and needle structure as claimed in claim 6 and said pointed sonic energy directing means comprising a pointed annular bead extending from the laterally directed flange surface at the inner end of said cap member.

8. A hypodermic syringe barrel and needle structure comprising a molded polypropylene syringe barrel having a base and an integral tubular extension projecting outwardly of said base, said extension including a first portion extending outwardly of said base and constituting a frangible portion for separating the extension from said barrel member, said frangible portion being defined between a first annular shoulder constituting a portion of said base and a second annular shoulder formed on the inner surface of said tubular extension, said shoulders being longitudinally offset from one another, said tubular extension having an external shoulder longitudinally offset from said second annular shoulder and constituting a bonding face, said tubular extension having an outer wall surface extending beyond said external shoulder and including a first surface portion that is cylindrical and a second surface portion extending from and beyond said first surface portion and tapering inwardly to a terminal annular end surface on said exension, said extension having an inner bore surface that tapers inwardly to and merges with a transversely extending surface that in turn merges with a frusto-conically shaped portion formed with said tubular extension and that projects rearwardly into said bore, said frusto-conically shaped portion having a bore therethrough including a first, cylindrical surface portion for accommodating a cannula and an adjoining outwardly flaring surface portion that extends to said terminal annular end surface of said extension, a separately molded polypropylene cap member having an external flange at its inner end constituting a bonding surface and an internal flange at its outer end, said internal flange defining an opening substantially larger than the transverse dimensions of any cannula to be inserted therethrough, said cap member having an internal surface including joined portions complementary with said first and second surface portions of the outer wall surface of said extension, said external flange at the inner end of said cap member having a pointed bead means of the plastic material of said cap member constituting an energy director, said cap member being sonically welded via said bonding surface and energy director thereon to said bonding face on said extension to integrally unite the cap member and extension, the longitudinal distance between said bonding surface of said external flange and the inner surface of said internal flange on said cap member being greater than the longitudinal distance between said external shoulder and said end surface of said extension so that said internal flange on said cap member is spaced outwardly of said end surface of said extension, a cannula extending through the opening defined by said internal flange and operatively positioned relative to the bore surface of said frusto-conically shaped portion of said extension and said outwardly flaring bore surface portion, and a bonding material composition set within said integrally united extension and cap member in surrounding relation to said cannula and including an annular set portion of said composition extending between said end surface of said extension and the inner surface of said internal flange whereby said cannula is maintained in permanently fixed operative relation.

9. A hypodermic syringe barrel and needle structure as claimed in claim 3 in which one of said facing bonding surfaces includes a circumferentially extending bead and the other bonding surface includes a cooperating circumferential groove to retain said cap member in position on said tubular extension.

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