Sept. 25, 1962 E. O. ECKHART 3,055,363

HYPODERMIC SYRINGE BARREL ASSEMBLY

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FIG. 1

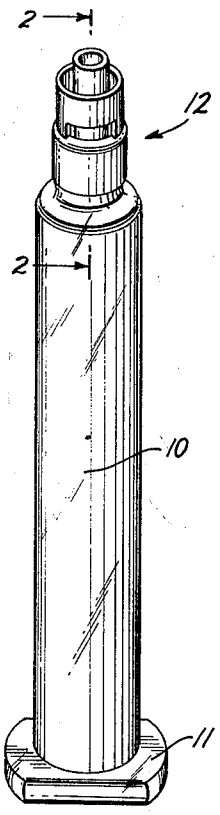
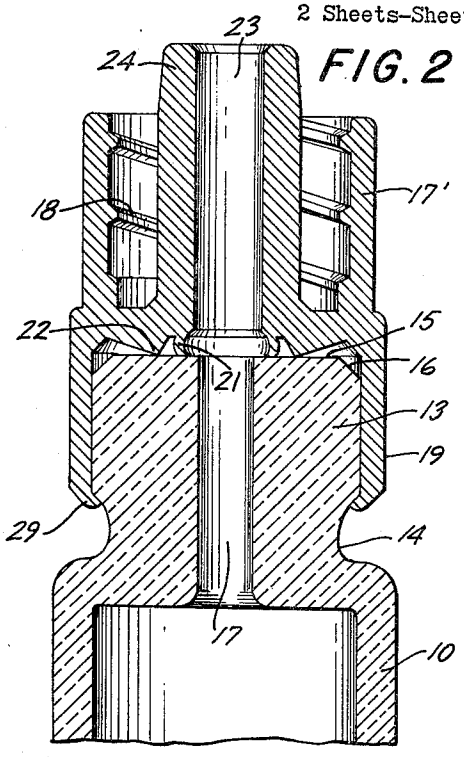


FIG. 2



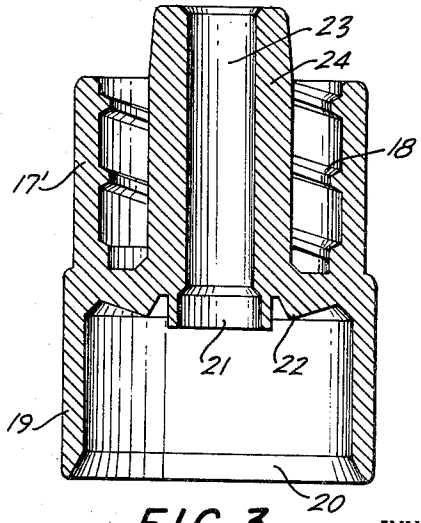


FIG. 3

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FIG. 6

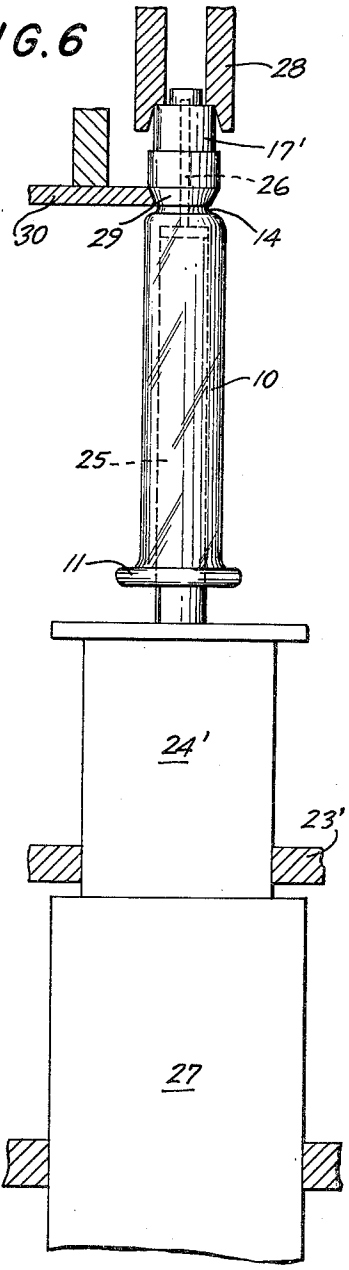


FIG. 5

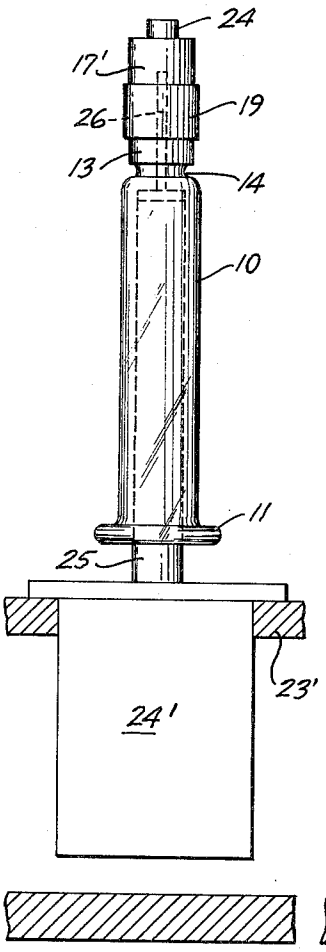
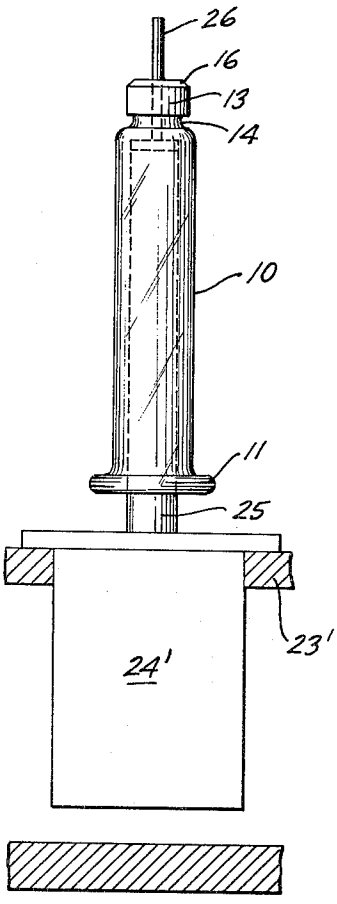


FIG. 4



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HYPODERMIC SYRINGE BARREL ASSEMBLY

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3 Claims. (Cl. 128—218)

This invention relates to a structurally and functionally improved hypodermic syringe barrel assembly, and also teaches a novel method of producing that assembly.

By means of the present invention, a hypodermic syringe is produced which may be heat sterilized at 400° F. without developing leaks and without damage resulting to its parts.

Moreover, a syringe assembly will be provided in which the danger of breakage in ordinary handling will be materially reduced, and in which the cost of manufacture will be minimized.

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

FIG. 1 is a perspective view of a complete syringe barrel assembly;

FIG. 2 is a fragmentary enlarged sectional view thereof taken along the line 2—2 in the direction of the arrows, as indicated in FIG. 1;

FIG. 3 is also an enlarged sectional side view showing a preferred form of tip fitting conveniently included in the assembly; and

FIGS. 4, 5 and 6 are somewhat diagrammatic and partially sectional side views illustrative of successive steps in the manufacture of the assembly.

Referring primarily to FIG. 1, the numeral **10** indicates the barrel of a hypodermic syringe, which at its open end may present a flange **11** of suitable configuration. This syringe, in accordance with conventional practice, is formed of glass. At its opposite end it carries a metallic fitting **12**, which, as shown, is of the Luer type. Alternatively, fittings of other types might be employed.

Referring to FIG. 2, it will be seen that the upper end of the barrel assembly is defined by an integral tip portion **13**. Adjacent the base of this portion, a recess in the form of an annular groove **14** exists. Portion **13** terminates in an outer face **15**; a chamfered surface **16** intervening this outer surface and the side wall of portion **13**. Communication between the interior of barrel **10** and outer surface **15** is established by a bore **17**. Contrary to accepted technique, the side face or faces of tip portion **13** are not ground. Thus, the hard skin surface remaining after formation of the barrel is maintained.

In FIGS. 2 and 3, the detailed structure of a preferred form of end fitting has been illustrated. As will be understood, if such fitting embodies the Luer design, it will include a collar portion **17'** having a double thread **18** which is spirally disposed and engages in the usual manner with the projecting portions of a needle hub. In any event, this fitting is made of metal and includes a side wall **19** defining a socket portion. The outer edge zone of the latter is countersunk or beveled, as indicated at **20**. Extending outwardly from the base surface of the socket and forming a part of that surface is a flange **21**, which has a diameter slightly in excess of that of the bore **17**. Concentrically disposed with respect to annular flange **21**, and also forming a part of the base surface, is a second flange or projecting portion **22**. The character of the metal providing this end fitting and the thickness of flange **21** are such that in response to a thrust of reasonable force against that flange, it will distort. The outer edge zone of flange or

projection **22** is inwardly of that of flange **21**. Also, the mass of this portion is greater than the thickness of the walls defining flange **21**. The space embraced by the latter is coextensive with the bore **23** of a tip **24** forming an integral part of the fitting. As will be understood, this tip extends into the hub portion of a needle mounted on the fitting and establishes a leakproof connection with the surface thereof.

At this time it is to be observed that the bore of the socket of fitting **12** is of constant diameter. The same is true of the outer face of tip portion **13**. Considering an assembly of one size, this unground glass tip portion would measure 0.3446" plus .003" minus .000". The base of groove **14** would measure 0.300" in diameter. The area or width of the beveled or chamfered surface **16** would be .032". It would extend conveniently at a 45 degree angle and define at the outer face of the tip portion a diameter of 0.300". The fitting, as in FIG. 3, would include a socket or recess having a diameter of 0.342", plus .0016", minus .000". The countersunk or beveled surface **20** would preferably extend at a 30 degree angle and have an area of .032". Its maximum diameter would preferably be around 0.390". The metal fitting or tip assembly, after it has been produced, is stress-relieved at 570° F. for a period of approximately one-half hour. Following this, the fitting is plated.

Under all conditions, tip portion **13** will involve a diameter in excess of the initial diameter of the socket embraced in the fitting. Surfaces **16** and **20**, however, will define what might be termed overlapping diameters. Accordingly, these surfaces may be interengaged to dispose tip portion **13** so that its outer surface extends into the socket. With the parts thus arranged, and a thrust being exerted, surfaces **16** and **20** will cooperate to guide the tip portion **13** into the socket, while a camming action is simultaneously exerted on the parts.

A mechanism suitable for assembling the parts has been shown somewhat diagrammatically in FIGS. 4, 5 and 6. In those views the numerals **23'** indicate supporting and guiding surfaces with which mounting members **24'** are operatively associated. These members carry mandrels **25** upon their upper faces. In turn extending beyond these mandrels are pins **26**. The diameter of the mandrels is such that they may be received within the bores of the syringe barrels. The diameter of pins **26** is sufficiently small so that they may be passed through bores **17** of tip portions **13** and bores **23** of the fittings. The length of the pins is sufficiently great so that they may simultaneously extend into these bores to maintain the parts in operative association.

Thus, as in FIG. 4, a barrel is ensleeved over the mandrel, and pin **26** passes through and beyond bore surface **17**. Thereupon, and preferably by suitable mechanism (not shown), the fitting **12** is axially aligned with tip portion **13** and moved toward the same so that pin **26** enters bore **23**. This condition of the parts has been illustrated in FIG. 5, wherein there has also been shown the initial telescopic relationship of the fitting with respect to the tip portion of the barrel. At a further station (FIG. 6) a raising mechanism **27** is present which will elevate supports **24'** together with the mandrels and parts carried thereby. In line with this station, a stop member **28** is positioned. This stop member conveniently cooperates with the outer edge of collar **17'**, if the latter forms a part of the fitting. Otherwise, it may be engaged by any other suitable portion of that fitting.

After the assembly shifts to the station shown in FIG. 6, the raising mechanism or plunger **27** elevates the mandrel with the syringe barrel and the fitting loosely supported upon the latter. As that fitting engages stop member **28**, it will have its axis in perfect alignment with the barrel axis. Thrust is exerted which results in tele-

scopic movement of the fitting over the tip portion, and the fitting is subjected to radial tension. Axial motion of the parts is continued beyond a point at which the outer face of the tip portion engages the edge of flange **21**. In the initial stages of this thrust action, surfaces **16** and **20** will cooperate and cam against one another to assure a proper guiding of the tip portion with respect to the fitting and an ensleevement by the latter of the tip portion.

With the end surface **15** of the tip portion engaging the edge of flange **21** and movements of the parts continuing, that flange will be distorted and bowed in the manner shown in FIG. 2. A seal will be established which will assure against leakage of liquid, without it being necessary to employ a washer or similar structure. The edge of flange or raised portion **22** will also be brought into intimate contact with this outer surface and will sealingly engage the same.

As the parts are positioned in this manner, the outer edge zone of the fitting socket overlaps the recess or groove **14**. Under these conditions, this zone may be crimped or spun inwardly, as shown at **29** in FIG. 2, so that it extends into the recess or groove of the barrel to thus retain the fitting against axial movement in a direction outwardly with respect to the barrel. To achieve this result, and as indicated at **30** in FIG. 6, one or more spinning wheels may be positioned adjacent stop **28**. These wheels move inwardly in line with the zone of groove **14** after the parts have been properly positioned, and serve to crimp or shift the edge zone of wall **19** inwardly, as indicated.

As will be understood from the foregoing, a syringe barrel assembly embodying the present teachings may readily be subjected to heat sterilization with no leaks resulting. This will be true even when the parts are subjected to 400° F. of dry heat. These results obtain due to the stress-relieving which is resorted to, as well as the securing of the parts by the spinning or crimping operation after they have assumed proper relative positions. It will be appreciated that stress-relieving reduces the tendency of the metal fitting to crack or split when subjected to temperature changes. The fitting will remain permanently in place. No sealing washer or functionally equivalent structure is employed, so that costs are reduced; the assembly being free from leakage. Also, costs are reduced in manufacture because no grinding of the glass tip portion occurs. Therefore, the skin

surface of the glass remains intact, and the tip portion is not likely to fail when subjected to lateral stresses. It is apparent that high speed assembly is achieved by the procedure herein described.

Thus, among others, the several objects of the invention as specifically aforenoted are achieved. It is apparent that numerous changes in construction and variations in the steps of the method might be resorted to without departing from the spirit of the invention as defined by the claims.

I claim:

1. A syringe assembly including in combination a barrel end portion having an outer face and formed with a bore, a metallic fitting having a socket part, a tip projecting outwardly from the base of such socket part and also formed with a bore extending through to that base surface, a first flange extending inwardly of such socket part from the base surface and providing an extension of the tip bore, and a second flange also extending inwardly from such socket part and concentrically disposed with respect to said first flange, said second flange having initially less height than such first flange, said socket enclosing the end portion of the barrel, both flanges having their edges in direct contact with the outer face of said end portion and said first flange being deformed to present a height substantially equal to that of the second flange.

2. In an assembly as defined in claim 1, the mass of the second flange being greater than that of the first flange and said second flange being substantially free from deformation.

3. In an assembly as defined in claim 1, the edge zone of the socket part being beveled and the end portion of said barrel being chamfered to guidingly contact the beveled surface and establish a telescopic relationship between said end portion and socket part.

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