May 13, 1958 J. Q. ADAMS 2,834,346

SYRINGE AND HUB LOCKING ASSEMBLY

Filed June 6, 1955

Fig. 1

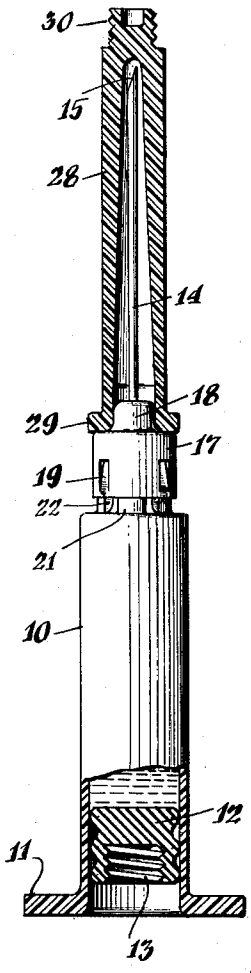


Fig. 2

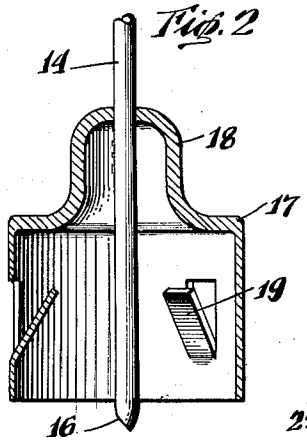


Fig. 3

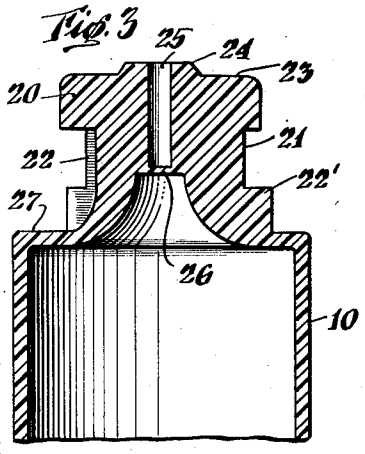


Fig. 4

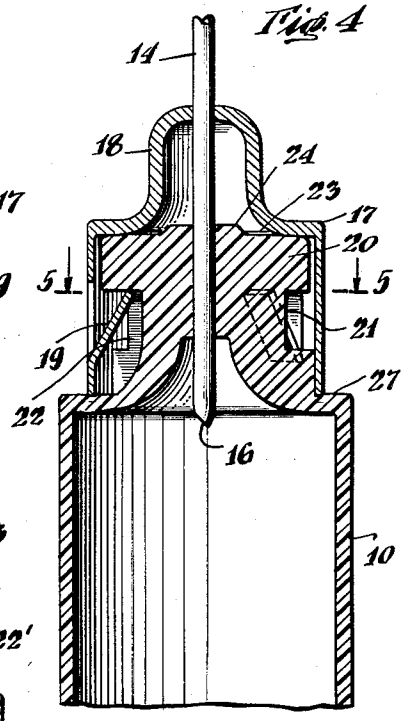


Fig. 5

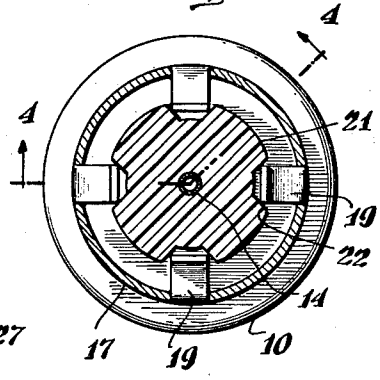
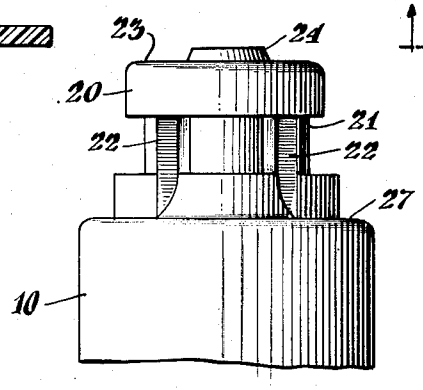


Fig. 6



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SYRINGE AND HUB LOCKING ASSEMBLY

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7 Claims. (Cl. 128—218)

This invention relates to a structurally and functionally improved syringe assembly and especially an assembly intended for a "one-time" use.

It is a primary object of the invention to furnish an assembly including a barrel and needle; the barrel capable of being prefilled with medicament which will be maintained in a sterile condition free from any factors tending to cause deterioration or contamination. Accordingly, the assembly together with its contained liquid will remain in proper condition for indefinite periods of time. When the assembly is to be used, then, by simple manipulation the cannula may be placed in communication with the barrel interior so that a hypodermic injection may be effected.

A further object of the invention is that of providing an assembly embodying the advantages set forth in the preceding paragraph and in which the needle will be mounted by the barrel in such a manner as to form one rigid unit therewith and in which the connections established will be free from the dangers of breakage or leakage without it being necessary to employ washers or other packing or cushioning elements.

Still another object is that of designing a syringe assembly in which the barrel or its tip may be formed of suitable plastics including synthetic rubber and be capable of being produced in large quantities at relatively nominal figures; the assembly presenting a pleasing appearance and being usable by a physician or technician in accordance with ordinary procedures.

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

Fig. 1 is a partly sectional side view of a complete assembly ready for use.

Fig. 2 is a fragmentary sectional view of the base portion of the needle assembly.

Fig. 3 is a similar view of the outer end of the barrel.

Fig. 4 shows in section the needle and its associated parts mounted upon the barrel—this view being taken along the line 4—4 in the direction of the arrows as indicated in Fig. 5.

Fig. 5 is a transverse sectional view taken along the line 5—5 in the direction of the arrows as indicated in Fig. 4; and

Fig. 6 is a side elevation of the barrel end as shown in Fig. 3.

Referring primarily to Fig. 1, the numeral 10 indicates the barrel of the syringe which is preferably furnished with a flange 11 adjacent its inner or open end. Within the bore of this barrel a piston is mounted for reciprocation. That piston may take the form of a stopper 12 of synthetic or natural rubber and conveniently furnished with a threaded recess 13 in its rear face. The barrel is formed of a suitable plastic such as polyethylene; the finger flange 11 being likewise formed of this material and preferably integral with the barrel.

Forming part of the syringe is a needle assembly. This embraces, according to the present teachings, a cannula

14 having piercing ends 15 and 16. A hub 17 which is cup-shaped and formed of rigid material (preferably metal) has its base portion extended as at 18 and disposed in direct contact with the cannula 14. These parts are secured against movements in any desired manner such as, for example, by staking. The side walls of the cup providing the hub are formed with instruck portions 19 furnishing pawls.

That end of the barrel which is opposite flange 11 provides a tip including a head portion having a diameter less than the internal diameter of the hub cup 17. Below this head the side faces of the tip are recessed as indicated at 21. The recess is interrupted by ribs 22 integral with the tip portion and extending axially of the barrel. In this manner a minimum of material may be embodied in the tip portion while, at the same time, the latter will incorporate maximum strength. The base of zones of each of the ribs may include foot portions 22'. The ribs are preferably spaced 90° from each other. The distance between the outer edges of a pair of opposed foot portions 22' will be equal to the internal diameter of hub cup 17.

Head 20 presents a conveniently flat outer face 23. Centrally of this face, a protuberance 24 may be included in the assembly. Through this protuberance and into the body of the tip, a bore 25 is conveniently provided. The inner end of this bore terminates in a pierceable diaphragm portion 26. The outer end of the barrel body terminates in a surface 27 perpendicular to the axis of the same. That surface extends from the face of recesses 21 or the outer edges of foot portions 22 through to the side face of the barrel.

A sheath is furnished to house needle 14. That sheath is preferably again formed of polyethylene. It will include a body 28 presenting a bore which may be tapered towards the outer sheath end. The diameter of that bore should be adequate to freely accommodate cannula 14. Its length should be in excess of the length of that needle. At its inner end the sheath may include a flange portion 29. Also at this end, the bore of the sheath should have a diameter such that it will snuggly bear in contact with the extended portion 18 of the hub and the base portion adjacent thereto. At its outer end, the sheath may present a coupling portion 30 embracing screw threads. That portion should have a diameter such that it may enter into and engage with the threads of the recess 13 formed in piston stopper 12.

In use, it will be understood that the bore of the barrel will have been filled with medicament in a desired volume. Prior to such filling the barrel will, of course, have been cleaned and sterilized. This is also true of the other parts of the assembly. Piston stopper 12 will close the outer end of the bore, thus completely enclosing the medicament and sealing it from escape and contamination as a consequence of this piston and diaphragm portion 26.

Sheath 28 will have its flange portion 29 disposed to rest against the outer surface of the face of the cup providing hub 17. The adjacent bore portion of the sheath will frictionally engage the extended part 18 of this hub. In this manner, the outer end of the hypodermic needle will be completely protected. The inner end of the same will extend into bore 25 and rest in immediate proximity to diaphragm portion 26. Under these circumstances pawls 19 will rest against the surfaces of head portion 20. They will frictionally bear against those surfaces so that the needle assembly will be maintained in position.

Now when the assembly is to be used all the operator will have to do is to grasp barrel 10 with one hand and sheath 28 with the other. Moving the parts axially towards each other, thrust will be exerted by flange 29 against the outer face of the hub 17. This will cause the pawls 19 to override the head with the skirt or side wall portion of the hub overriding the foot portion 22' adjacent

the base parts of ribs **22**. Proportioning is resorted to so that the free edge of the cup rides into contact with surface **27** of the barrel as shown in Fig. 4 under continued thrust. Simultaneously, the inner face of the base portion of the cup rides into engagement with the outer face **23** of the tip.

The barrel being formed of a slightly compressible or yielding material, a sealing engagement between the cup surface and outer face **23** is assured under these circumstances. Most important a stable support is thus established between these surfaces. Pawls **19** will ride into recesses **21** and come to underlie head **20** at points between the ribs **22**. The edge of the cup being in firm engagement with surface **27**, a slight compressing or indenting of that surface by the cup edges will occur such that the hub is urged outwardly. Therefore, the free ends of the pawls are forced into firm contact with the underface of head **20**. Under such conditions, the needle assembly in effect becomes a unit rigid with the barrel so that a physician by manipulating the latter will cause the needle to move with it and free from any play of the needle assembly with respect to that barrel.

Simultaneously with the aforedescribed movements of the parts, the inner piercing end **16** of the needle will have penetrated diaphragm portion **26** as shown in Fig. 4. Accordingly, communication is established between the barrel interior and the lumen of the cannula. The syringe is now rendered ready for use by simply removing sheath **28** to strip it from the projecting portion **18** of the hub. Thereupon, coupling portion **30** is mated with recess **13** so that the sheath serves as an actuating rod or plunger for the piston **12**. Tissue penetration is now effected by means of the outer needle end **15**. An aspirating action may be resorted to by retracting stopper **12**. Normally, however, this piston will simply be projected by exerting thrust on the flange portion **29** of the sheath. Under those conditions the medicament will be expelled through the bore of the needle and injected into the tissues underlying the epidermis.

Thus among others the several objects of the invention as specifically aforenoted are achieved. Obviously numerous changes in construction and rearrangements of the parts may be resorted to without departing from the spirit of the invention as defined by the claims.

I claim:

1. A hypodermic syringe assembly including in combination a barrel, a tip at the end of said barrel, a hollow needle having piercing ends, a cup-shaped hub secured to said needle at a point intermediate its ends, an enlarged head portion defining the end of said tip, the side face of said tip presenting a receiving recess intermediate said head and barrel, a pawl carried by said hub and extending into said recess to lock said hub and needle against removal from said tip, said hub encircling said tip and having its edge in engagement with the outer surface of said barrel and one of the needle ends extending through said tip into communication with the interior of the barrel, at least certain recited parts of said assembly being formed of compressible material whereby that material will be placed under compression as said hub is telescoped over said tip, whereby to cause said hub to be urged outwardly and force an edge of said pawl into contact with an end surface of said receiving recess.

2. In a hypodermic syringe assembly as specified in claim 1, the depth of said recess and the length of said pawl and the height of said hub being such that with the edge of the latter bearing directly in intimate engagement with that surface of the barrel which is adjacent the tip, the base surface of said hub bears in contact with an outer surface of said head.

3. In a hypodermic syringe assembly as specified in claim 2, said barrel being formed of compressible material, said hub being formed of substantially rigid material whereby its edge compresses the material of the barrel in such surface to urge said hub outwardly and force an edge of said pawl into contact with the recess surface.

4. In a hypodermic syringe assembly as specified in claim 1, said tip being formed with a bore to receive an end of the needle and a diaphragm portion integral with said barrel closing said bore and to be pierced by said needle end.

5. In a hypodermic syringe assembly as specified in claim 1, a pair of ribs extending axially of said tip and forming a part of the same, said ribs defining said pawl-receiving recess between them.

6. In a hypodermic syringe assembly as specified in claim 1, an annular series of ribs forming a part of said tip and extending axially of said barrel to define between them a number of such recesses and an annular series of pawls forming a part of said hub to extend inwardly of the same one into each of said recesses.

7. In a hypodermic syringe assembly as specified in claim 6, foot portions at the base of each of said ribs and the distance between the outer ends of a pair of such foot portions being substantially equal to the internal diameter of said hub.

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