Sept. 23, 1969 J. DREWE 3,468,309

HYPODERMIC SYRINGE WITH LOCKABLE NEEDLE HOLDER

Filed April 4, 1967

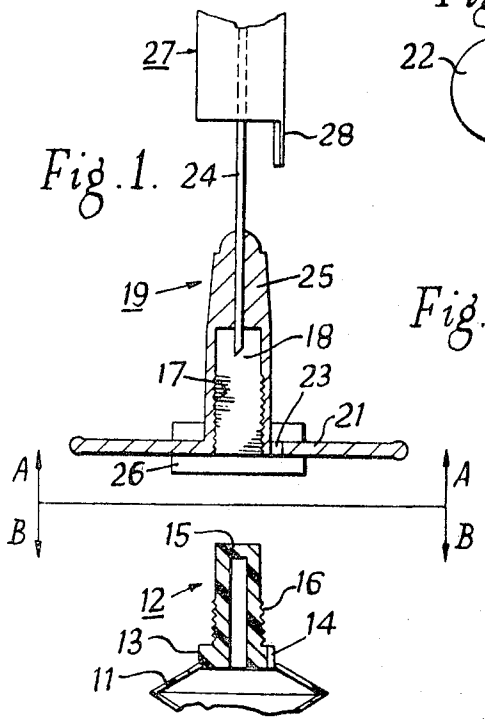


Fig. 1.

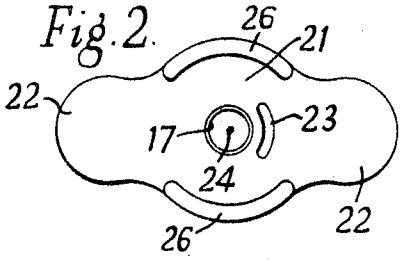


Fig. 2.

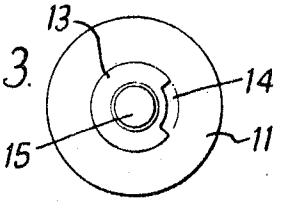


Fig. 3.

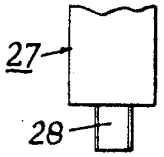


Fig. 4.

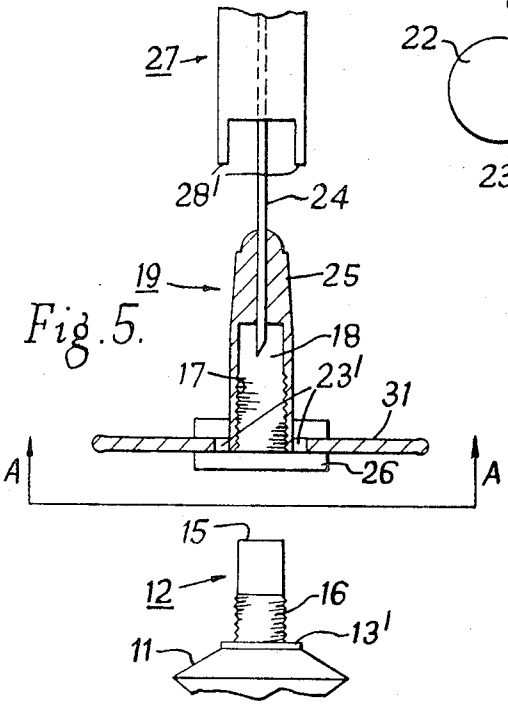


Fig. 5.

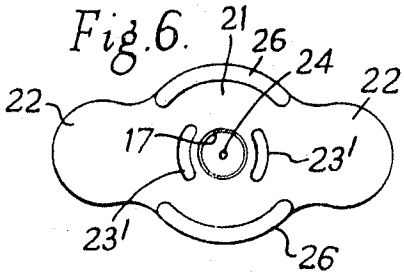


Fig. 6.

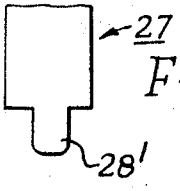


Fig. 7.

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HYPODERMIC SYRINGE WITH LOCKABLE NEEDLE HOLDER

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U.S. Cl. 128—216 4 Claims

ABSTRACT OF THE DISCLOSURE

A hypodermic syringe of the kind comprising a collapsible container with closed-ended nozzle at one end. A needle holder with fixed, double pointed needle is screw threaded onto the nozzle for the purpose of displacing the needle toward the container in order that the needle may pierce the closed end of the nozzle. A needle cover is push fit over the needle holder and has at least one projection which projects, through a slot in a laterally projecting part of the needle holder, into engagement with part of the container, thus serving as locking means to prevent axial displacement of the needle.

This invention relates to hypodermic syringes generally and especially to syringes of the kind comprising a collapsible container of plastics material and a hypodermic needle which is adapted to be connected to the container by one of its ends, so that the bore in the needle is in communication with the interior of the container.

The invention is concerned primarily with hypodermic syringes of this kind in which the container is filled with a predetermined quantity of a liquid medicament and is hermetically sealed before being fitted with the needle, but it is also concerned with syringes used for taking and storing specimens of blood or other body fluids, in which case the container, before being sealed, may be wholly or partly filled with air or may be collapsed and evacuated. In both cases, the sealed container will be produced by the manufacturers under sterile conditions. Hitherto, however, difficulty has been experienced in avoiding a break in the sterile chain during the period beginning with the fitting of the needle on the container and ending at the moment when the needle is injected into the body of a patient.

One object of the present invention is to provide an improved mounting for the needle whereby this difficulty is avoided and a further object is to enable the needle to be mounted on the container in an inoperative position in which it is isolated from the interior of the container and to be disengageably secured in this position until the syringe is to be used, whereupon it can be released and moved into an operative position in which its bore is in communication with the interior of the container.

With these objects in view, the hypodermic syringe according to this invention makes use of a hypodermic needle which is pointed at both ends and is mounted in a needle holder having a disengageable screw-threaded connection with a closed-ended nozzle on the container, and also having a closed-ended needle cover removably applied over it as a push fit, the needle being fixed in the needle holder so that one of its pointed ends projects a substantial distance into the interior of the needle cover, while its other end porjects a short distance from its mounting in the needle holder in the direction towards the container and the arrangement being such that the needle (after disengagement of locking means which will be referred to below) is axially displaceable, by tightening the screw connection from an inoperative position, in which its said other end is clear of the closed end of the

nozzle, so as to pierce the closed end of the nozzle and assume an operative position in which communication is established between the bore of the needle and the interior of the container. The hypodermic syringe according to this invention is additionally provided with locking means whereby the needle can be retained against displacement from its inoperative position until the syringe is required for use, which locking means consists of at least one projection on the needle cover adapted, when the needle cover is applied, to project through a slot in a laterally projecting part of the needle holder into engagement with part of the container.

In one preferred form of the invention, the lower end part of the projection on the needle cover is adapted, in the locked position, to engage in a locking recess formed in a part which is rigid with the container and which may be a laterally projecting base flange on the container nozzle. In this case, the locking means acts positively to prevent relative rotation between the needle holder and the container until it is disengaged by pulling the needle cover off the needle holder.

In an alternative form of the invention, the needle cover has two symmetrically arranged locking projections, the lower ends of which are adapted, in the locked position, to be frictionally engaged with an annular surface surrounding the base of the container nozzle. In this case, after the needle cover has been fitted on the needle holder with its projections projecting through slots in laterally projecting parts of the latter, the assembly of the component parts with the needle in its inoperative position is effected by screwing the nozzle of the container into the needle holder until a firm resistance to further screwing, due to engagement of the ends of the projections with the said annular surface, is felt. Subsequently, when the syringe is to be used, the nozzle is screwed further into the needle holder until the needle pierces through the closed end of the nozzle. During the last-mentioned operation, the needle cover is forced off its sealing on the needle holder.

Alternatively, the needle cover may be pulled off its sealing on the needle holder, prior to such further screwing in of the nozzle to effect the piercing of the closed end of the nozzle.

The invention will now be described by way of example with reference to the accompanying drawings, in which:

FIG. 1 is a fragmentary exploded view, partly in section and partly in elevation, showing the nozzle end part of a syringe ampoule, a needle holder and a needle cover according to a preferred embodiment of this invention,

FIG. 2 is a bottom plan view, of the needle holder,

FIG. 3 is a top plan view of the syringe ampoule,

FIG. 4 is a fragmentary elevation of the needle cover as viewed in a direction at right angles to the direction of the view of the needle cover shown in FIG. 1, and

FIGS. 5 to 7 inclusive are views, corresponding to the views shown in FIGS. 1, 2 and 4 respectively, of an alternative embodiment of the invention.

The same references are used to indicate parts of the assembly shown in FIGS. 5 to 7 as are used to indicate like parts of the assembly shown in FIGS. 1 to 4.

Referring to FIGS. 1 to 4, an accordion-pleated, bellows-type ampoule **11** is provided at one end with a nozzle **12**. At its base end, the nozzle **12** is provided with a flanged base **13** having an arcuate cut-out **14** and at its delivery end it is closed by a transverse wall **15**. The nozzle **12** also has an external screw thread **16** which cooperates with a screw thread **17** on the wall of a bore **18** of a needle holder **19**. Integrally formed on the lower end of the needle holder **19** is a base flange **21** having two oppositely projecting lateral extensions **22**. An arcuate slot **23** similar in radius and arcuate length to the cut-out **14** is formed

in the base flange 21. Mounted coaxially in a solid upper end part 25 of the needle holder 19 is a hypodermic needle 24 which is pointed at both ends. On the circumferential parts of the base flange 21 between the lateral extensions are arcuate stiffening flanges 26. The solid upper end part 25 of the needle holder 19 is tapered inwardly in the direction towards its upper end to provide a seating for the hollow cylindrical lower end part of a needle cover 27 which is closed at its other end (not shown). Part of the wall of this hollow cylindrical lower end part is extended downwardly to provide a locking projection 28, the cross-section of which is such as to enable the lower end of this projection 28 to be engaged as a free sliding fit in the cut-out 14.

The main component parts shown in FIG. 1 are assembled as follows. First, the nozzle 12 of the amoule 11 which at this stage is empty, is screwed into the needle holder a suffcient distance to ensure a strong connection between the screw-threads 16 and 17, but not far enough to cause the point on the lower end of the needle 24 to pierce the transverse top wall 15 of the nozzle 12. Then, after making sure that the slot 23 is in register with the cut-out 14, the needle cover 27 is slid axially onto the tapered seating on the solid upper end part 25 of the needle holder. Before the lower end of the projection 28 descends to the level of the top surface of the base flange 21, it is rotated, if necessary, to bring this projection 28 into register with the slot 23 and the cut-out 14. During the last part of the descent of the needle cover 27, the projection 28 thereof passes through the slot 23 and engages in the cutout 14. The ampoule nozzle 12 is now locked against rotation in either direction with respect to the needle holder 19 and can only be freed for such rotation by the removal of the needle cover 27. Moreover, so long as the assembly remains locked, the pointed low end of the needle 24 cannot pierce the transverse wall 15 on the upper end of the nozzle 12.

The arcuate lengths of the slot 23 and cut-out 14 are slightly greater than that of the cross-section of the lower end part of the projection 28. Consequently, when the component parts are assembled and locked as described above, the needle cover 27 can still be rotated through a small angle. This is necessary, both to ease assembly and to enable the needle cover 27 to be removed more easily from its seating on the needle holder by slight back and forth rotation as well as a straight pull.

The completed assembly, comprising the ampoule 11, 12, in needle holder 19 and the needle cover 27, is next sterilized, after which the ampoule 11 is filled under sterile conditions with a liquid drug or the like (or, in the case of a blood sampling device or the like, wholly or partly filled with air or evacuated) through an opening (not shown) at the end thereof remote from the nozzle 12, which opening is then sealed. From this moment until the syringe ampoule has to be prepared for an injection, the contents of the ampoule 11 and the needle will be protected against contamination and the needle will be securely held out of contact with the said contents.

To prepare the syringe ampoule for an injection, the needle cover 27 is first removed, thereby freeing the needle holder 19 for rotation with respect to the ampoule 11 and its nozzle 12. The user then screws the nozzle 12 into the bore 18 of the needle holder, so that the lower pointed end of the needle 24 pierces the transverse wall 15 and thereby establishes communication between the interior of the ampoule 11 and the bore of the needle 24. As soon as this has been done, the syringe ampoule is ready for use.

The construction and arrangement of the component parts of the alternative embodiment illustrated in FIGS. 5 to 7 are similar to those of the corresponding component parts of the embodiment illustrated in FIGS. 1 to 4, except in the following respects. The flanged base 13' of the nozzle 12 in FIG. 5 is thinner than the flanged base 13 of the nozzle 12 in FIG. 1 and has no arcuate cut out corresponding to that shown at 14 in FIG. 1. The base flange 21 of the needle holder 19 in the alternative embodiment according to FIGS. 5 to 7 is formed with two arcuate slots 23', which are arranged symmetrically on opposite sides of the main, upwardly projecting part of the needle holder, instead of having only one slot 23 as in the embodiment according to FIGS. 1 to 4. Finally, the needle cover 27 in the alternative embodiment has two projections 28' (see FIG. 5) instead of only one projection 28 as shown in FIG. 1.

The assembly procedure with the alternative embodiment illustrated in FIGS. 5 to 7 is somewhat different from that already described with reference to FIGS. 1 to 4. The first operation, in the case of this alternative embodiment, is to fit the needle cover securely over the needle holder 19 with the projections 28' projecting downward through the openings 23' in the base flange 21. After this has been done, the ampoule nozzle 19 is screwed into the needle holder until the lower ends of the projections 28' abut against the top surface of the flanged base 13', whereupon the screwing is discontinued. As soon as the projections 28' abut against the top surface of the flanged base 13', the user will be made aware that the assembly is complete by encountering an increased resistance to screwing.

The dimensions of the various component parts are so chosen that, when the lower ends of the projections 28' are abutting against the top surface of the flanged base 13', the pointed lower end of the needle 24 will be located a short distance above the top surface of the transverse wall 15 of the nozzle 12.

When the syringe ampoule according to FIGS. 5 to 7 is to be used, the ampoule nozzle is screwed further in, thereby forcing the needle cover 27 off the tapered seating on the needle holder 19. As soon as this occurs, the increased resistance to further screwing disappears. Thereafter, the screwing in is continued until the nozzle 12 is fully home in the bore 18 of the needle holder and the transverse wall 15 on the upper end of the nozzle has been pierced by the pointed lower end of the needle 24.

In an alternative (not illustrated), a 90° annular recess is moulded in the end of the container which faces towards the needle cover and the needle cover has a single projection which is passed through a slot in a flange on the base of the needle holder and is adapted to be engaged in the said annular recess to prevent screwing in of the needle holder beyond the inoperative position until the needle cover is removed.

It will be apparent that the locking devices which have been described in connection with a collapsible syringe ampoule can also be used with rigid syringe bodies which are filled and emptied by the operation of a plunger. It is necessary to provide for piercing of the end of the syringe body by the needle and for this purpose a container of glass or rigid plastics material can be fitted with a thin diaphragm of plastics material.

I claim:

1. A hypodermic syringe of the kind comprising a collapsible container of plastics material and a hypodermic needle which is adapted to be connected to the container by one of its ends, so that the bore in the needle is in communication with the interior of the container, wherein the needle, which is pointed at both ends, is mounted in a needle holder having a disengageable screw-threaded connection with a closed-ended nozzle on the container, and also having a closed-ended needle cover removably applied over it as a push fit, the needle being fixed in the needle holder so that one of its pointed ends projects a substantial distance into the interior of the needle cover, while its other end projects a short distance from its mounting in the needle holder in the direction towards the container, the needle being retained against displacement from its inoperative position in which the said other end is clear of the closed end of the nozzle by locking means consisting of at least one projection on the needle cover

projecting through a slot in a laterally projecting part of the needle holder into engagement with part of the container and the arrangement being such that, after disengagement of said locking means, the needle is axially displaceable from its inoperative position so as to pierce the closed end of the nozzle and assume an operative position in which communication is established between the bore of the needle and the interior of the container.

2. A syringe according to claim 1, wherein the lower end part of the projection on the needle cover is adapted, in the locked position, to engage in a locking recess formed in a part which is rigid with the container.

3. A syringe according to claim 2, wherein the part which is rigid with the container is a laterally projecting base flange on the container nozzle.

4. A syringe according to claim 1, wherein the needle cover has two symmetrically arranged locking projections,

the lower ends of which are adapted, in the locked position, to be frictionally engaged with an annular surface surrounding the base of the container nozzle.

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