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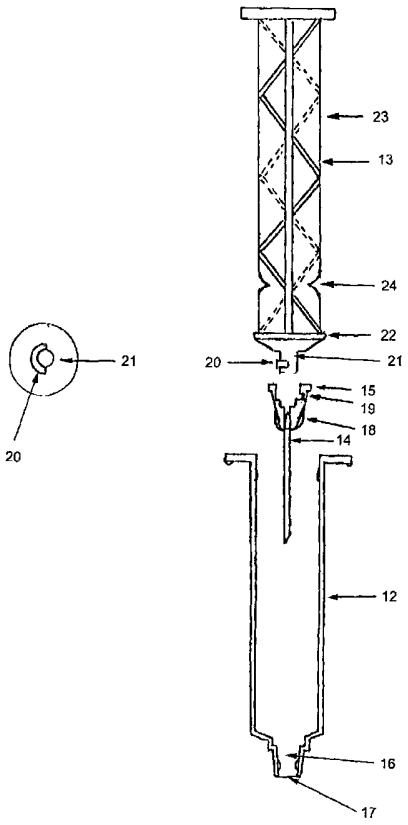
(54) Title: RETRACTABLE NEEDLE FOR A SYRINGE



(57) Abstract: A syringe having a retractable needle (14), body (12) and a plunger (13). Needle (14) is located in a first storage position within the body (12) of the syringe prior to use. In a second in use position, the needle (14) is caused to extend from the body (12) of the syringe so as to function as a useful needle and syringe combination in known fashion. After use, the needle (14) is retracted back into the body (12) of the syringe into the first storage position. The plunger (13) has means located at the end thereof to releasably engage a boss (15) of the needle (14) so as to retain the needle (14) within the syringe body (12) in the first storage position and is thus used to bring the needle boss (15) into engagement with the end of the syringe body (12). The plunger (13) is then able to be disengaged from the needle boss (15) so as to enable the plunger (13) to be withdrawn and thereby take in fluid into the syringe. Upon completion of injection, the plunger (13) is once again brought into engagement with the needle boss (15) so as to retract the needle (14) back into the syringe body (12), the needle (14) remaining attached to the end of the plunger (13). Means associated with the end of the plunger (13) to engage the needle boss (15) may be provided in the form of a thread, slot or similar arrangement where the engagement and disengagement is accomplished by twisting the plunger relative the needle boss. Alternatively, an interference fit, or complementary ridge/recess facility may be provided so that the engagement/disengagement is accomplished by a push/pull action.

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RETRACTABLE NEEDLE FOR A SYRINGE

Technical Field

This invention relates to a retractable needle for use in the medical or dental profession or in personal drug administration so that the physician, surgeon or other needle operator might be protected from injury by the needle after its use.

Background

The danger of injury and possible infection from the HIV or hepatitis B virus to medical practitioners using needles in the normal course of their business is well documented.

Further, persons who are in the habit of administering drugs to themselves run a severe risk of contacting either of the specified viruses, or indeed contacting other viruses if a needle, once used, is reused in an unsterilised form.

There have been many proposals aimed at reducing the number of so-called needle-stick injuries and various attempts have been made to provide a safe system for disposal of such needles once used, but such prior proposals have had deficiencies.

Object of the Invention

It is an object of the present invention to provide a syringe which employs a retractable surgical needle, in a sterile manner prior to use, and for permanently storing that surgical needle, once used, in a substantially safe manner. At the very least the invention provides an alternate means for accommodating the needle of a used syringe to protect against accidental injury arising from unwanted contact with the exposed needle once the syringe has been used.

Although the following description generally refers to a syringe of conventional size, no such limitation is intended thereby, and reference to a syringe is meant to encompass any other needle/syringe combination or needle alone including slimline syringes, where, by suitable adaptation, the invention may also be usefully applied.

Disclosure of the Invention

The invention in one broad form provides a syringe having a retractable needle facility incorporated therein, so that in a first storage position prior to use, the needle is safely enclosed within the body of the syringe and in a second in use position, the needle is

caused to extend from the body of the syringe so as to function as a useful needle and syringe combination in known fashion, and wherein the needle is then caused to retract again into the body of the syringe, once it has been used, so as to return it to the first storage position; the syringe comprising a body and plunger, wherein the plunger has means associated with the end thereof contained within the body of the syringe to releasably engage a boss of the needle located in the syringe body so as to retain the needle within the syringe body in the first storage position, and wherein the body of the syringe has means located at the end thereof opposite to where the plunger extends from the body for releasably retaining the needle boss in the second in use position so that the needle extends from the syringe body, the plunger being used to bring the needle boss into engagement with the end of the syringe body; the plunger then being able to be disengaged from the needle boss so as to enable the plunger to be withdrawn and thereby take in fluid into the syringe and then to be used to inject same into a patient in known fashion; and when upon completion of injection, and the needle having been withdrawn from the patient, the plunger is once again brought into engagement with the needle boss and withdrawn so as to cause the needle boss to be released from the end of the syringe body so that the needle is once again retracted into the body of the syringe, the needle remaining attached to the end of the plunger.

Preferably the means associated with the end of the plunger to engage the needle boss is provided in the form of a thread, slot or similar arrangement where the engagement and disengagement is accomplished by twisting the plunger relative the needle boss. Alternatively, the means associated with the end of the plunger to engage the needle boss is provided in the form of an interference fit, or complementary ridge/recess facility, so that the engagement/disengagement is accomplished by a push/pull action.

In embodiments where the engagement is by way of a twisting action and a thread is utilised, the thread arrangement may be a conventional thread arrangement or may be a so called luer-lock style thread. It may also a single, double or three start thread, the latter being especially preferred to provide rapid engagement.

Thus, for example in one embodiment, an internal thread may be located in the needle boss, which allows engagement therein of a protrusion such as a tab located about the

periphery of a stem designed to extend into the needle boss. Alternatively, the thread may be located on a stem or protrusion extending from the base of the plunger, such as a luer lock type thread, which is able to mate with a ridge about the periphery of the needle boss to achieve engagement therewith.

In another embodiment, the end of the plunger is provided with wire clips or the like, preferably three, which extend downwardly from the end of the plunger and which each have outwardly extending flanges. These are inserted into corresponding slots located in the needle boss so that upon twisting the plunger, the flanges are caused to move into spaces under lips adjacent the slot so as to prevent removal of the plunger from the needle boss except by twisting the plunger back.

Preferably, the thread or slot arrangement is also provided with a locking means in the form of some additional interference fit to facilitate positive control over the needle boss during engagement and disengagement of the needle boss with the end of the syringe body.

Alternatively, in an embodiment where the engagement/disengagement is accomplished by means of a push/pull action, the means to engage the end of the plunger in the needle boss is provided by means of a first ridge located about the periphery of a stem or the like located at the end of the plunger, designed to extend into the needle boss. A complementary recess located about the inner wall of the needle boss allows the first ridge to mate with the recess so that prior to use, the plunger is engaged with the needle boss, so that the boss and hence the needle is held within the syringe body prior to use, and so that the boss and hence needle itself can be moved into position in the end of the syringe body ready for use when the plunger is pushed down.

With advantage, a second larger ridge is preferably located behind the first ridge so that in use the first ridge allows releasable engagement with the needle boss, thereby facilitating relatively easy withdrawal of the plunger from the needle boss after the needle boss is caused to engage in the end of the syringe body ready for use, whereas, after use (ie after the syringe has been used to inject a patient), the plunger is brought once again into engagement with the needle boss, but on this occasion with greater force so as to ensure engagement of the larger second ridge, rather than the smaller first ridge,

in the recess, effectively locking the plunger to the needle boss. This not only allows for greater ease of withdrawing the needle boss from its engagement with the end of the syringe, but also provides greater security against the risk that the needle becomes disengaged from the plunger once it is withdrawn and the needle retracted into the syringe body.

It will also be understood that the ridge and recess may be reversed on the plunger and the needle boss to provide in effect mating in reverse geometry to that described above.

Preferably the means to releasably engage the needle boss in the end of the syringe body is provided by a friction fit of sufficient strength to retain the needle boss whilst the needle and syringe is used in known fashion.

Preferably engagement of the needle boss in the end of the syringe is by means of a taper fit. Preferably the needle boss is fluted or has notches and/or ridges to assist in engaging the needle boss especially so as to assist the plunger to engage and disengage therefrom.

Alternatively, a ridge may be provided about the periphery of the needle boss which mates with a corresponding depression about the inner wall of the end of the syringe, to allow releasable engagement of the needle boss therein. Again it will be understood that the relative positions of ridge and recess may be reversed.

Thus in an one preferred embodiment, the means of engagement is provided by a multi-start thread and more preferably by a three start thread having a taper to allow rapid engagement and sufficient locking force.

An additional ridge may be provided in the inner periphery of the syringe body where the needle boss comes into mating contact therewith so as to allow the needle boss to be "locked" temporarily in position, thereby providing security against accidental retraction whilst in use, until such time as the needle boss is once more engaged with the end of the plunger for permanent retraction.

Preferably the end of the syringe body is sealed initially in order to retain sterility, the seal being broken only as the needle is brought down into the in use position by the action of the plunger. Again, with advantage, the seal may be a rubber membrane which effectively reseals once the needle is retracted. This has the advantage that any fluids

withdrawn into the body of the syringe also remain therein for disposal without leaking. Alternatively to puncturing the seal, it may be a removable seal in the form of say a cap or other suitable fitting, which itself may be capable of being refitted to retain any fluid contents.

Preferably, a circlip or other protecting sleeve is provided about the exposed periphery of the plunger prior to use, ie in the region where the plunger extends from the body of the syringe in the initial configuration, so as to prevent the plunger being accidentally depressed, rendering the syringe dangerous and breaking any sterile seal before necessary.

Although such a circlip or protecting sleeve could conceivably be utilised once again to prevent the plunger from being depressed after it has withdrawn the needle following use, it is preferred to have instead a region of weakness in the plunger located on the shaft of the plunger in the vicinity of where it extends from the upper end of the syringe body when fully withdrawn, so that after the needle is itself withdrawn into the body, the plunger may be broken off so that it cannot be depressed again. Thus the syringe will be rendered useless and the needle safely contained in the body of the syringe without any means associated therewith to cause it to be extended again from the body of the syringe.

Furthermore, it is preferred that locking means are provided in the body of the syringe to engage the plunger once it is retracted after use, thereby further assisting in rendering the syringe incapable of being used again. For example a split locking threaded bush is provided in one embodiment about the inner upper periphery of the body at the end in which the plunger is inserted which mates with a corresponding locking thread located about the periphery of the plunger.

In this way, in combination with a break point provided in the plunger just above the locking thread, the plunger can be locked after retraction and broken off as well to make it impossible to access or use the needle contained in the body of the syringe.

The plunger may be of any suitable structure, although preferably the shaft thereof is reinforced to withstand the twisting forces necessary to engage and disengage the needle boss in the end of the syringe body.

The means for sealing the lower periphery of the plunger, ie so that it acts as a piston in the body of the syringe, may be by any conventional means including a close or interference fit, as well as by means of rubber piston rings or other sealing membrane located about its periphery.

The invention is thus of particular benefit in that the needle is not only safely retracted after use, but is provided in a safe retracted condition prior to use, which can also remain sterile until use. There is no physical contact at all with the needle, the engagement and disengagement thereof in the end of the syringe body being accomplished remotely by the use of the plunger. Coupled with the advantages of resealing the syringe body with replaceable seal or self closing membrane, not only is the risk of needle-stick injuries obviated, but so too are potentially dangerous fluids usefully and safely contained in the body of the syringe. Snapping off the plunger also renders the syringe both ineffective for subsequent use as well as providing additional safety in that there is no means by which the needle can be caused to re-emerge or extend from the syringe body.

Brief Description of the Drawings

The invention may be better understood from the following non-limiting description of preferred embodiments, in which:

Figure 1 is cross sectional exploded side view of a needle and syringe combination according to one embodiment of the invention utilising a twisting action, showing a locking tab/slot arrangement for securing the needle boss to the end of the plunger;

Figure 2 is a cross sectional exploded side view of a second embodiment of the invention utilising a twist action, showing a luer lock style thread for securing the needle boss to the end of the plunger;

Figures 3a, 3b, 3c, 3d and 3e are a series of diagrams showing a simplified embodiment of the invention utilising a twist action in the various stages of use, including before and after use;

Figures 4a, 4b, 4c and 4d are a further series of diagrams showing yet another embodiment of the invention utilising a twist action in the various stages of use;

Figures 5a, 5b are a cross sectional views of a further embodiment of the invention utilising a three start thread for engagement between the plunger and needle boss, as well as a locking bush to retain the plunger after use;

Figures 6a, 6b are a cross sectional views of a still further embodiment invention utilising a three clips and slots for engagement between the plunger and needle boss, as well as a locking bush to retain the plunger after use;

Figure 7 is a cross-sectional view of a further embodiment employing a push/pull action;

Figure 8 is a cross-sectional view of an embodiment of the invention showing the needle engaged in the in-use position; and

Figures 9a, 9b, 9c, 9d and 9e are cross-sectional views of the components of anther embodiment similar in arrangement to that shown in Figure 8.

Detailed Description of the Drawings

Turning to Figure 1, there is shown a syringe and needle combination generally referenced 11, which comprises a syringe body 12, a plunger 13 and a needle 14. The needle 14 is provided with a boss 15 at its upper end.

The syringe body 12 is essentially similar to a conventional syringe body except in so far as the needle 14 is neither permanently connected to the syringe body 12 (as for example in slimline syringes), nor is it attachable to the syringe body 12 from the outside of thereof. Rather, as is apparent from Fig. 1, the needle 14 is located initially inside the body of the syringe. Furthermore, the end region 16 of the syringe body 12 is closed by means of a membrane 17, which may be punctured when the needle 14 is caused to move downwards and into the in use position where the boss 15 thereof occupies the central internal area of tapered end region 16 (see particularly Figures 3 and 4).

The needle 14 is also provided with protrusions or locking web members 18 about boss 15. The locking web members 18, facilitate gripping of the boss 15 in the end region 16 of the syringe body 12, when the needle 14 is forced down into the tapered end region 16.

A locking groove 19 is located about the inner periphery of needle boss 15.

Plunger 13 is provided with a locking tab 20 located on a stem 21 at the base of the plunger 13. The locking tab 20 mates with the locking groove 19, when the stem 21 of the plunger 13 is located in the needle boss 15.

Plunger 13 is also provided with a piston region 22 about its lower periphery which seals against the inside if the syringe body 12, when inserted therein (as shown in Figures 3 and 4). Although shown here as a fluted arrangement, the plunger 13 may for example be of cylindrical cross section. Such an arrangement would be perhaps more suited to a narrow slimline style syringe. In this embodiment however, the plunger 13 is reinforced with diagonal bracing ridges 23 to provide greater rigidity so as to prevent the plunger 13 itself from twisting as it is turned to engage and disengage the needle boss 15 as described below.

A break groove or weaker region 24 is provided at a suitable location on the plunger 13, so that it may be broken off after it has retracted the needle 14 into the body of the syringe 12, after use as described below.

Figure 2 shows an alternate embodiment where like components to those illustrated in Fig. 1 are referenced with the same reference numerals. In this case the essential differences lie in the regions of the needle boss 15 and plunger stem 21. Specifically the locking tab of Fig 1 is replaced with a luer-lock style thread 25 located about the inner periphery of an annular skirt 26 located axially about the central stem 21. The needle boss 15 has a flange element 27 located about it upper periphery instead of the inner locking groove of Fig 1. In this way the flange 27 may be made to engage with the luer-style thread 25 for retraction of the needle 14 as described in detail below.

Also illustrated is the ring or circlip 28 which may be located about the plunger 13 in the weakened region 24 thereof in order that prior to use the plunger 13 cannot be accidentally depressed

Turning then to Figures 3 and 4 there are shown various stages of two further embodiments of the invention illustrating the steps in first extending the needle 14 from and then retracting it back into the syringe body 12. Again like components to those in figures 1 and 2 are referenced with identical reference numerals. In the case of Figure 3

however the actual means of mating between the end of the plunger 13 and the needle boss 15 is not specifically illustrated. However in Figure 4, it will be observed that an alternate arrangement to that of the earlier figures is provided where a tab 29 is located on the needle boss 15 for engagement in a slot 30 located instead on the stem 21 of the plunger 13. The piston region 22 in this embodiment is a more complex multi-structure piston arrangement, but functions essentially the same as the foregoing piston arrangements of the earlier illustrations.

Also illustrated in this embodiment is a resealable cover or cap 31 located at the end of the syringe body 12 instead of the membrane 17 of the earlier described embodiments. Cap 31 may be removed to allow the needle 14 to pass through the end of the body 12 and once the needle 14 is retracted the cap 31 may be refitted to prevent fluids drawn into the syringe body 12 escaping, thereby reducing risk of cross infection etc.

In Fig 3a and Fig 4a it will be observed that the needle 14 is in the retracted position within the syringe body 12, ie prior to use. Fig. 3a specifically shows the collar or circlip 28 located about the plunger 13 in the weakened region 24 thereof which prevents it from being accidentally depressed.

Once it is desired to use the syringe, the circlip is removed and the plunger 13 depressed as shown in Fig 3b and Fig 4b, which causes the needle to break the membrane of 17 in Fig 3b or to pass through the end of the syringe body in Fig 4b, the cap 31 having been removed prior to doing so. The needle boss 15 is caused to locate and lock in the end of the syringe body 12 by twisting the plunger which also disengages the plunger from the needle boss 15. The needle 14 is thus locked in the outer or use position.

The plunger 13 of the syringe 11 is then used to draw up fluid for injection 32 from a reservoir etc not shown in the usual manner, the effect of which is shown in Fig 3c, 4c.

Once full, the syringe 11 is then used in the convention way (the result of which is shown in Fig 4d, where the syringe body 12 is emptied if injectable fluid 32 to inject a patient. After use the needle 14 of the syringe 11 is withdrawn from the patient.

This action once again brings the end of the plunger 13 into contact with the needle boss 15, with which it may be caused to mate once again by twisting the plunger 13 in the opposite direction to that which earlier disengaged it.

As shown in Figs 3e and 4d, the plunger 13 may then be retracted bringing back with it the needle 14 safely into the body of the syringe 12. As shown specifically in Fig 3e, the plunger may then be broken off at the weaker region 12, thereby rendering it completely useless, but also harmless.

Turning to Figures 5a and 5b, there is shown the components which make up a syringe and needle combination which comprises a syringe body 12, a plunger 13 and a needle 14. The needle 14 is provided with a boss 15 at its upper end as is the case with the embodiments illustrated in Figures 1 to 4. Other features common to the previous embodiments are referenced with the same reference numerals.

The needle 14 is located initially inside the body of the syringe 12 and is screwed to the plunger 13 by means of the three start (male) thread 33, which mates with an internal (female) threaded region 34 in the needle boss 15. The thread however may be any other suitable single or multi-start thread. It will be understood that in some circumstances it may be preferred to have the male and female threads located so that the male thread is on the needle boss 15, whilst the female thread is located on the end of the plunger 13.

The additional features of this embodiment are provided by a three start lock thread 35 located in the region between the piston portion 22 and the break of point 24. A corresponding internal lock thread 36 is located in the upper region of the body 12. Again other single multi-start thread arrangements may be utilised.

Thus in use, the plunger 13 is pushed down initially in order to engage the needle 14 (which at this time is engaged with the plunger as mentioned above) into the end region of the barrel 16. The plunger 13 is then retracted so as to draw up the solution to be injected (not shown) into the body 12 of the syringe. After the injection is given, the needle is removed from the patient and the plunger 13 is once again screwed into engagement with the needle 14 so that it may be retracted. Following partial retraction of the plunger 13 and needle 14 into the body 14, the end of the needle 14 may be placed

on a hard surface and be caused to bend thereby making it inoperative.. The plunger 13 is then drawn fully back and the locking threads 35, 36 are engaged so as to retain the plunger 13 in that position. The plunger is then snapped off at break point 24. With the plunger 13 disabled and the needle 14 bent and retracted inside the body 12 of the syringe it is rendered totally useless and may then be disposed of safely.

Figures 6a and 6b show a further alternate embodiment where like components to those illustrated in the previous Figures are again referenced with the same reference numerals. The locking threads 35, 36 shown in the embodiment of Figs 5a, 5b are again present. In this case the essential differences again lie in the regions of the needle boss 15 and end of the plunger 13. Specifically the locking tabs and threads of the earlier embodiments are replaced by a wire clips 37 (in this case three) which depend from the end of the plunger 13 as shown. These mate with slots 38 arranged about the top of the needle boss 15 as shown. The slots communicate with a hollow region below 39 so that when the clips 37 are inserted into the slots 38 and the plunger 13 is twisted the ends of the clips 37 are prevented from leaving the needle boss by virtue of the rim or lip 40. Schematically, these are shown in detail in the circled regions of Fig 6b. Otherwise the basic operation of the embodiment in Figures 6a, 6b is similar to that of Figures 5a, 5b.

Turning to Figure 7, there is shown an embodiment of the invention generally referenced 11, comprising a syringe body 12, plunger 13, needle 14 and cap 45. Plunger 13 is provided with a piston region 22 as described above in relation to earlier embodiments. Similarly a break point 24 is located generally above the piston region 22 on the plunger 13. The plunger 13 is further provided with a stem 21, about which are located a first small peripheral ridge 41 and a second larger peripheral ridge 42. A twist locking thread 35 is also located above the piston region 22, similar to that described in relation to the embodiments of Fig 6.

The body of the syringe 12 has a recess or depression 43 about the inner wall thereof in the end region 16 of the syringe body 12. Needle 14 has a boss region 15 as described above in relation to earlier embodiments. Located about needle boss 15 is a locking ring or ridge 44 which mates with the aforementioned recess 43 when the boss 15 is brought into engagement with the end 16 of the syringe body 12. Also located about the inner

wall of needle boss 15 is an inner groove 46, which receives either of the larger or smaller ridges 41, 42 located on the stem 21 of the plunger 13, when it is brought into engagement with the needle boss 15 as described below.

Prior to use, the needle boss 15 is held temporarily to the plunger 13 by engagement of the small ridge 41 in the inner groove 46 of needle boss 15. When the plunger 13 is pushed down, the needle boss 15 engages with the end 16 of syringe body 12, by means of the engagement of the locking ring 44 in the recess 43. When the plunger 13 is pulled back, the small ridge 41 on the stem 21 of plunger 13 disengages from the inner groove 46 of the needle boss 15, leaving the needle 14 locked in the "out" or in use position. The syringe 11 may then be used in the convention manner.

After use, when the plunger 13 is pushed down hard, the larger ridge 42 engages with the inner groove 46 of the needle boss 15, providing a more permanent lock. When the plunger 13 is then drawn back again , the needle boss 15 comes out of engagement with the end 16 of the syringe body 12, ie locking ring 44 disengages from recess 43, the needle boss 15 and hence needle 14 being held securely onto the plunger 13, buy virtue of engagement of the larger ridge 42 located on the stem 21 of the plunger 13 with inner groove 46 of the needle boss 15.

The plunger 13 is then drawn fully back and by means of the twist lock thread 35 locked as described above in reference to the embodiment of Figure 6, so that the needle 14 remains securely in the syringe body 12 after use. The plunger is then broken off break point 24 as described in relation to the earlier embodiments

Similar embodiments to that described in principle in Figure 7 are detailed in Figures 8 and 9, where similar features are referenced once again using the same reference numerals where relevant. Referring to Figure 8, there is shown an assembled syringe 11 of standard dimensions, whilst a similar but slimline version is shown as separate components in Figure 9. The main points of relevance are the shape of the larger peripheral ridge 41 which in these cases is tapered, which allows for a ratchet like locking when engaged in the correspondingly shaped inner groove 46 of needle boss 15.

Also shown in detail is a sleeve 47 which is located about the plunger 13 to provide the piston region 22 described above. Otherwise, the operation of the embodiments of Figures 8 and 9 is essentially the same as that described in relation to the embodiment depicted in Figure 7.

It will be appreciated by those skilled in the art that many modifications and variations may be made to the embodiments described herein without departing from the spirit or scope of the invention.

Throughout the specification the word "comprise" and its derivatives are intended to have an inclusive rather than exclusive meaning unless the context requires otherwise.

Claims

1. A syringe having a retractable needle facility incorporated therein, so that in a first storage position prior to use, the needle is safely enclosed within the body of the syringe and in a second in use position, the needle is caused to extend from the body of the syringe so as to function as a useful needle and syringe combination in known fashion, and wherein the needle is then caused to retract again into the body of the syringe, once it has been used, so as to return it to the first storage position; the syringe comprising a body and plunger, wherein the plunger has means associated with the end thereof contained within the body of the syringe to releasably engage a boss of the needle located in the syringe body so as to retain the needle within the syringe body in the first storage position, and wherein the body of the syringe has means located at the end thereof opposite to where the plunger extends from the body for releasably retaining the needle boss in the second in use position so that the needle extends from the syringe body, the plunger being used to bring the needle boss into engagement with the end of the syringe body; the plunger then being able to be disengaged from the needle boss so as to enable the plunger to be withdrawn and thereby take in fluid into the syringe and then to be used to inject same into a patient in known fashion; and when upon completion of injection, and the needle having been withdrawn from the patient, the plunger is once again brought into engagement with the needle boss and withdrawn so as to cause the needle boss to be released from the end of the syringe body so that the needle is once again retracted into the body of the syringe, the needle remaining attached to the end of the plunger.

2. A syringe according to claim 1, wherein the means associated with the end of the plunger to engage the needle boss is provided in the form of a thread, slot or similar arrangement where the engagement and disengagement is accomplished by twisting the plunger relative the needle boss.

3. A syringe according to claim 2, wherein the means associated with the end of the plunger to engage the needle boss is provided in the form of a conventional thread arrangement or a luer-lock style thread.

4. A syringe according to claim 2, wherein the means associated with the end of the plunger to engage the needle boss is provided in the form of a single, double or three start thread.

5. A syringe according to claim 2, wherein the means associated with the end of the plunger to engage the needle boss is provided by wire clips or the like located on the end of the plunger, which extend downwardly from the end of the plunger and which each have outwardly extending flanges, which are able to be inserted into corresponding slots located in the needle boss so that upon twisting the plunger, the flanges are caused to move into spaces under lips adjacent the slot so as to prevent removal of the plunger from the needle boss except by twisting the plunger back.

6. A syringe according to any one of claims 3 to 5 wherein the thread or slot arrangement is also provided with a locking means in the form of some additional interference fit to facilitate positive control over the needle boss during engagement and disengagement of the needle boss with the end of the syringe body.

7. A syringe according to claim 1, wherein the means associated with the end of the plunger to engage the needle boss is provided in the form of an interference fit, or complementary ridge/recess facility, so that the engagement/disengagement of the plunger with the needle boss is accomplished by a push/pull action.

8. A syringe according to claim 7, wherein the engagement/disengagement is accomplished by means of a push/pull action, and the means to engage the end of the plunger in the needle boss is provided by means of a first ridge located about the periphery of a stem or the like located at the end of the plunger, designed to extend into the needle boss, and where a complementary recess located about the inner wall of the needle boss allows the first ridge to mate with the recess so that prior to use, the plunger is engaged with the needle boss, so that the boss and hence the needle is held within the syringe body prior to use, and so that the boss and hence needle itself can be moved into position in the end of the syringe body ready for use when the plunger is pushed down.

9. A syringe according to claim 8, wherein a second larger ridge is located behind the first ridge so that in use the first ridge allows releasable engagement with the needle boss, thereby facilitating relatively easy withdrawal of the plunger from the needle boss after the needle boss is caused to engage in the end of the syringe body ready for use, whereas, after use (ie after the syringe has been used to inject a patient), the plunger is brought once again into engagement with the needle boss, but on this occasion with greater force so as to ensure engagement of the larger second ridge, rather than the smaller first ridge, in the recess, effectively locking the plunger to the needle boss.

10. A syringe according to either claim 8 or claim 9 wherein the ridge or ridges as the case may be and the recess are reversed with respect to their location on the plunger and the needle boss so as to provide in effect mating in reverse geometry.

11. A syringe according to any one of the preceding claims, wherein the means to releasably engage the needle boss in the end of the syringe body is provided by a friction fit of sufficient strength to retain the needle boss whilst the needle and syringe is used in known fashion.

12. A syringe according to claim 11, wherein the engagement of the needle boss in the end of the syringe is by means of a taper fit.

13. A syringe according to either claim 12 or claim 13 in which the needle boss is fluted or has notches and/or ridges to assist in engaging the needle boss so as to assist the plunger to engage and disengage therefrom.

14. A syringe according to claim 12, in which a ridge is provided about the periphery of the needle boss which mates with a corresponding depression about the inner wall of the end of the syringe, to allow releasable engagement of the needle boss therein.

15. A syringe according to claim 12, in which a ridge is provided about the inner wall of the end of the syringe which mates with a corresponding depression about the periphery of the needle boss, so as to allow releasable engagement of the needle boss with the syringe.

16. A syringe according to any one of the preceding claims, in which the end of the syringe body is sealed initially in order to retain sterility, the seal being broken only as the needle is brought down into the in use position by the action of the plunger.

17. A syringe according to claim 16 in which the seal is a rubber membrane which effectively reseals once the needle is retracted.

18. A syringe according to claim 16, in which the seal is a removable seal in the form of a cap or other suitable fitting, which itself is capable of being refitted to retain any fluid contents.

19. A syringe according to any one of the preceding claims, in which a circlip or other protecting sleeve is provided about the exposed periphery of the plunger prior to use, ie in the region where the plunger extends from the body of the syringe in the initial configuration, so as to prevent the plunger being accidentally depressed, rendering the syringe dangerous and breaking any sterile seal before necessary.

20. A syringe according to any one of the preceding claims, wherein a region of weakness is provided in the plunger, located on the shaft of the plunger in the vicinity of where it extends from the upper end of the syringe body when fully withdrawn, so that after the needle is itself withdrawn into the body, the plunger may be broken off so that it cannot be depressed again

21. A syringe according to any one of the preceding claims, wherein locking means are provided in the body of the syringe to engage the plunger once it is retracted after use, thereby further assisting in rendering the syringe incapable of being used again.

22. A syringe according to claim 21 wherein a split locking threaded bush is provided about the inner upper periphery of the body at the end in which the plunger is inserted which mates with a corresponding locking thread located about the periphery of the plunger.

23. A syringe according to any one of the preceding claims in which the plunger is reinforced to withstand the twisting forces or push/pull forces as the case may be, necessary to engage and disengage the needle boss in the end of the syringe body.

24. A syringe according to any one of the preceding claims, wherein the means for sealing the lower periphery of the plunger, so that it acts as a piston in the body of the syringe, is by any conventional means including a close or interference fit, or by means of rubber piston rings or other sealing membrane located about its periphery.

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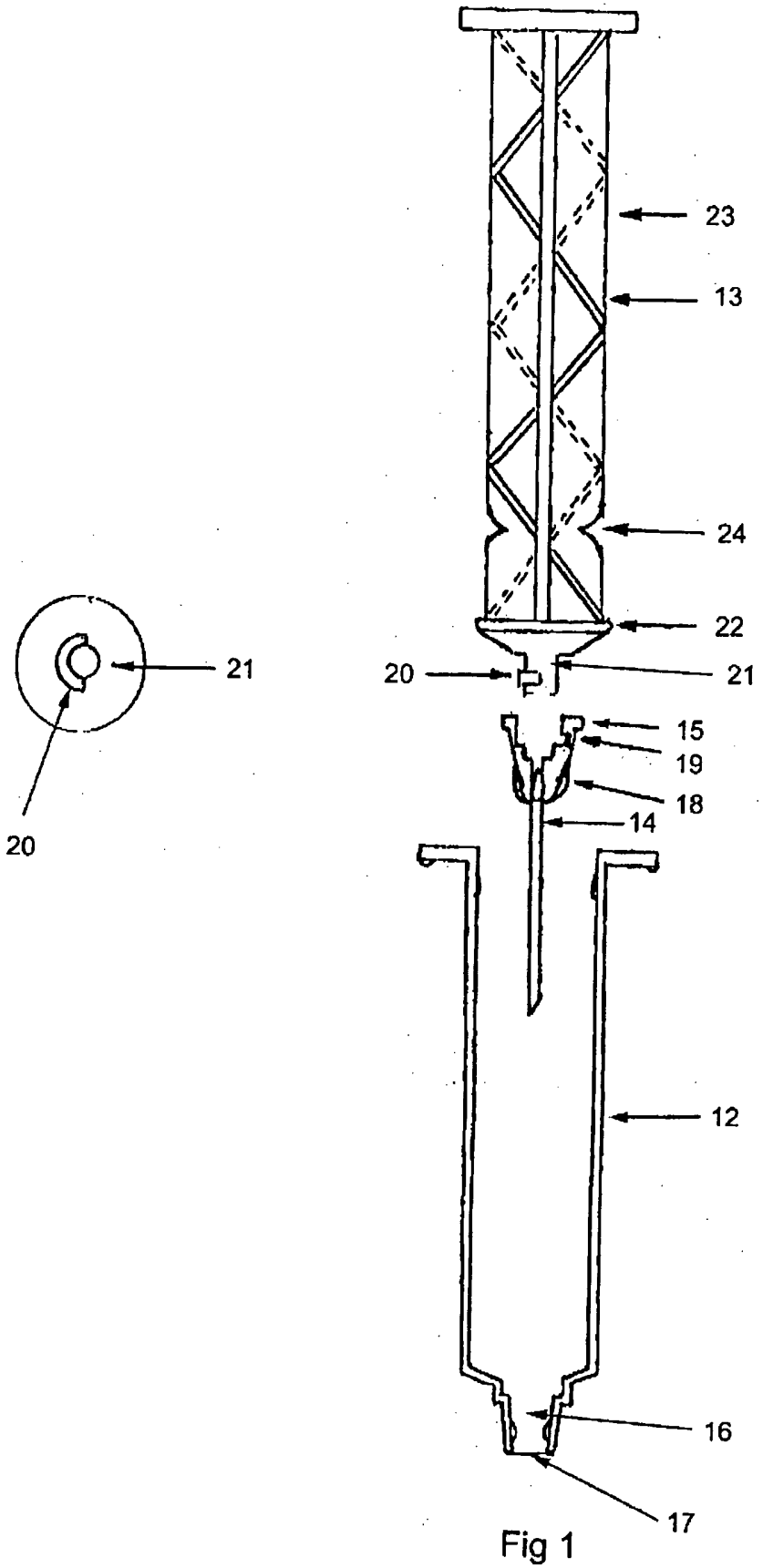

Fig 1

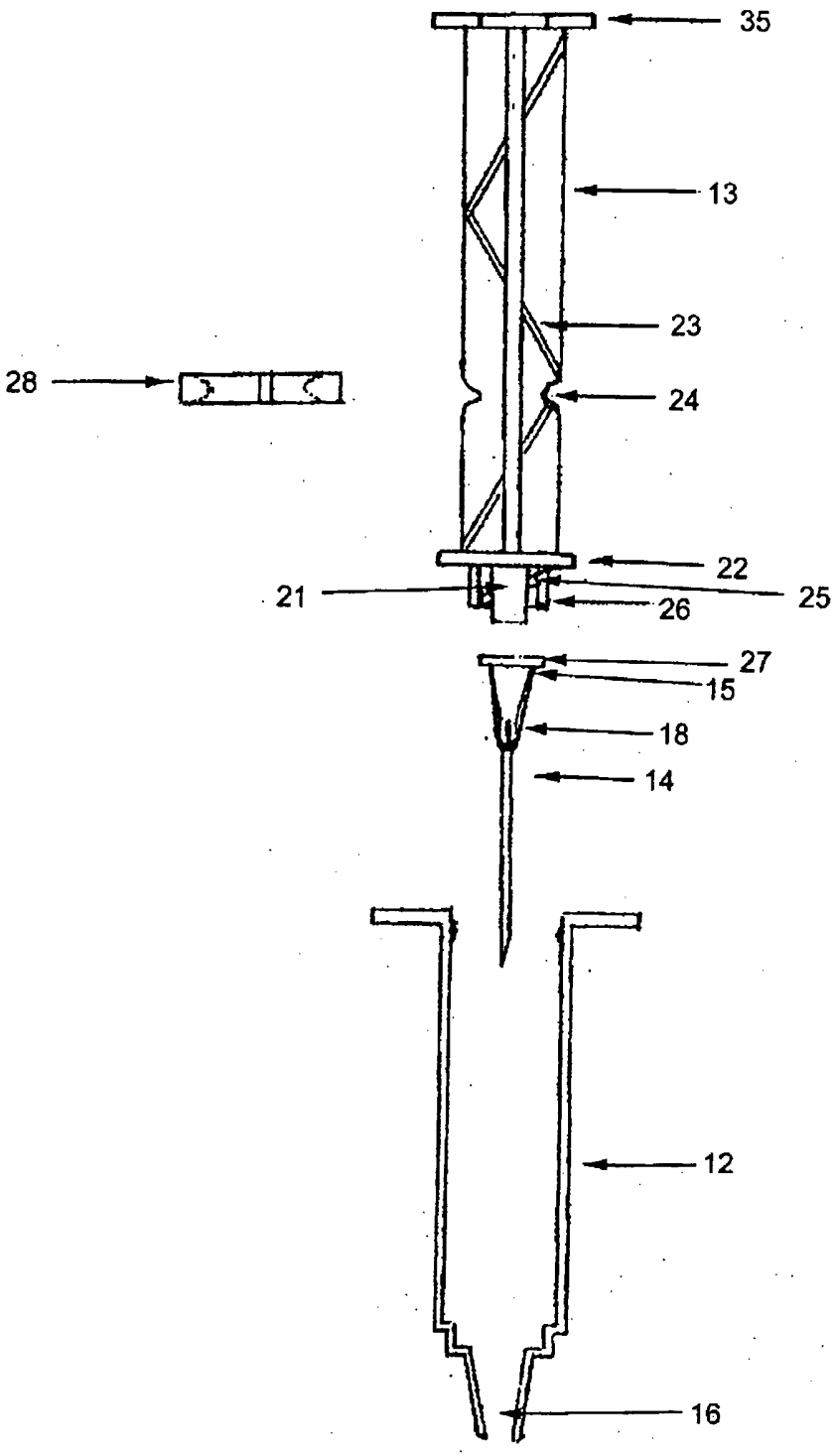

Fig 2

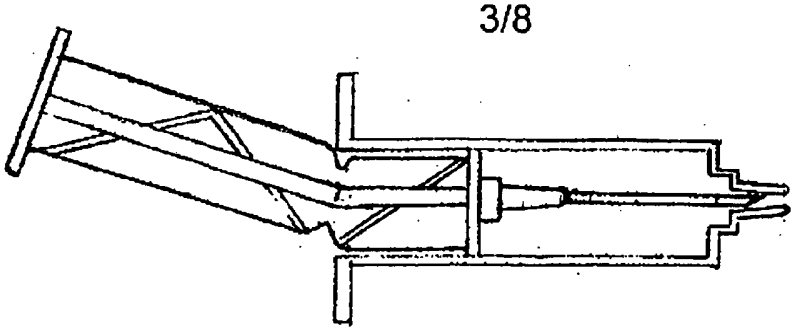

Fig 3e

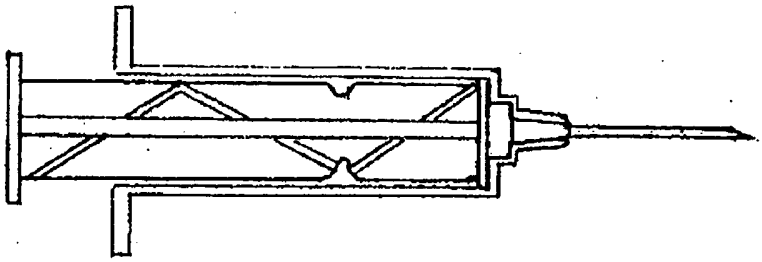

Fig 3d

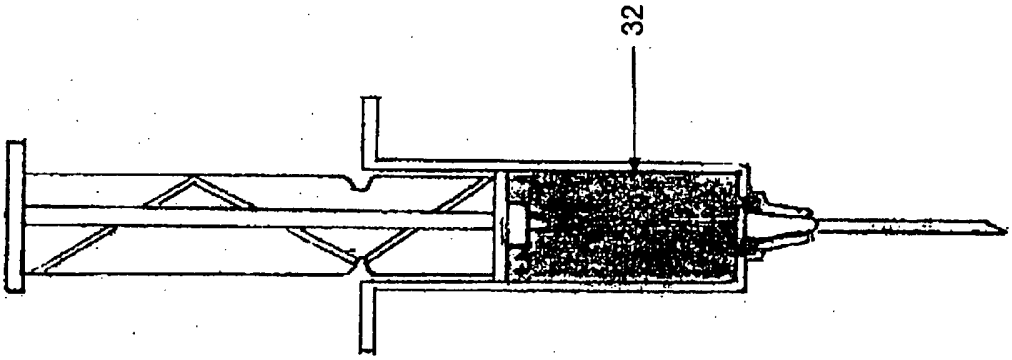

Fig 3c

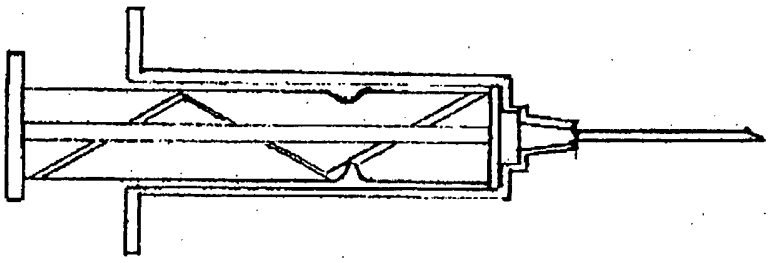

Fig 3b

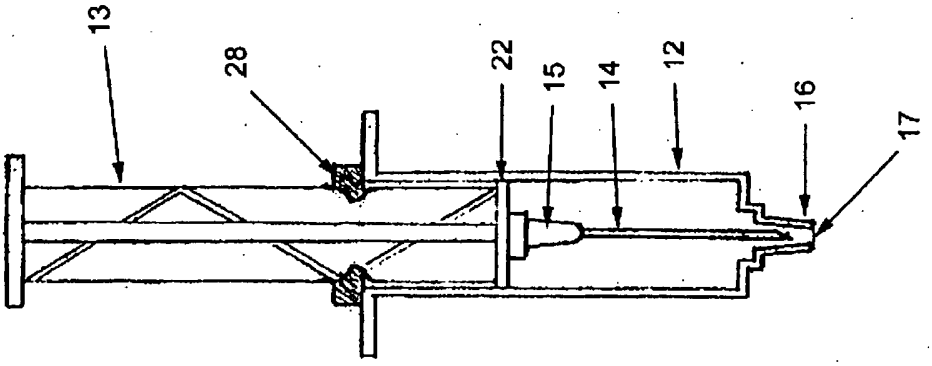

Fig 3a

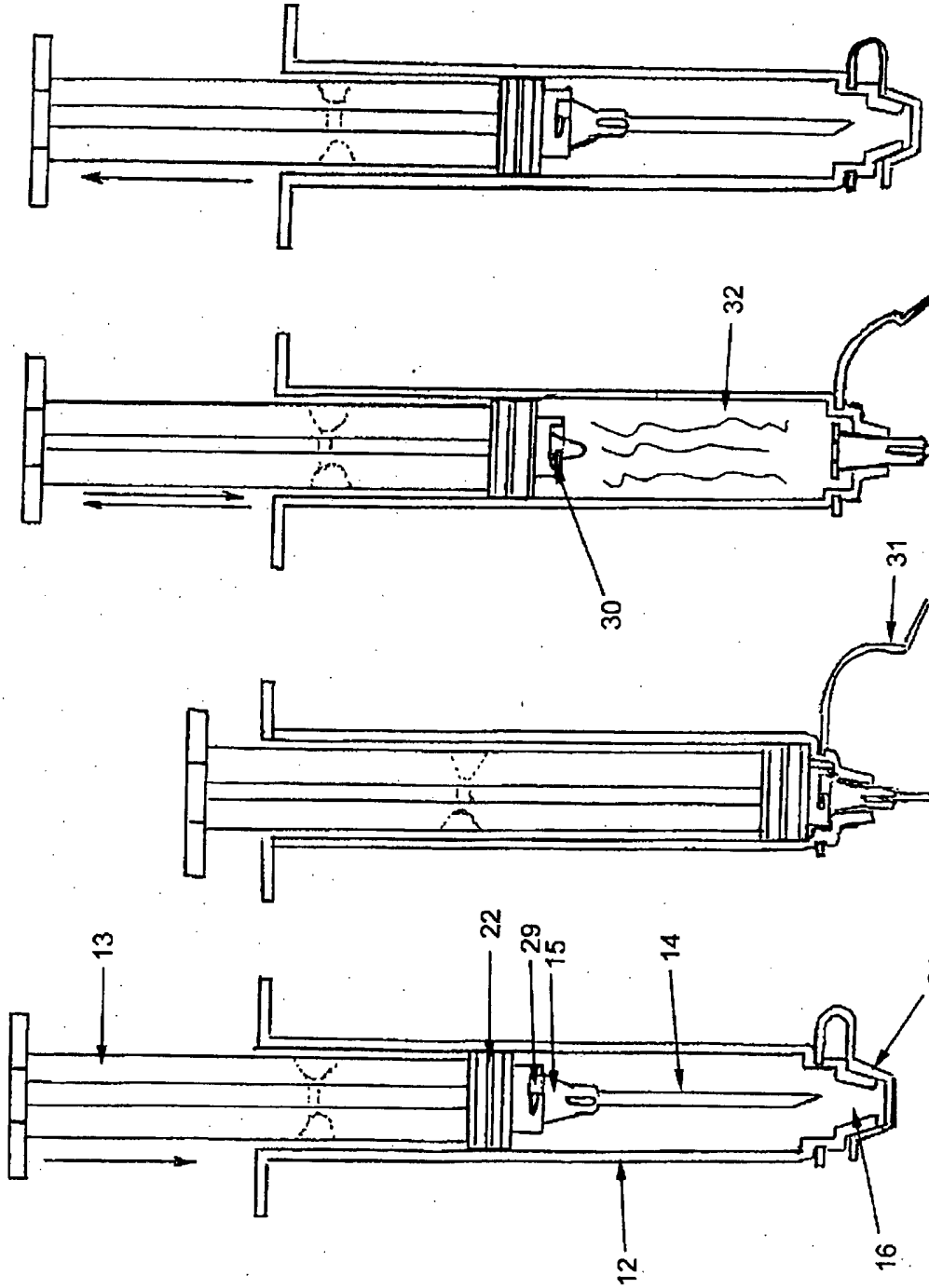

Fig 4d

Fig 4c

Fig 4b

Fig 4a

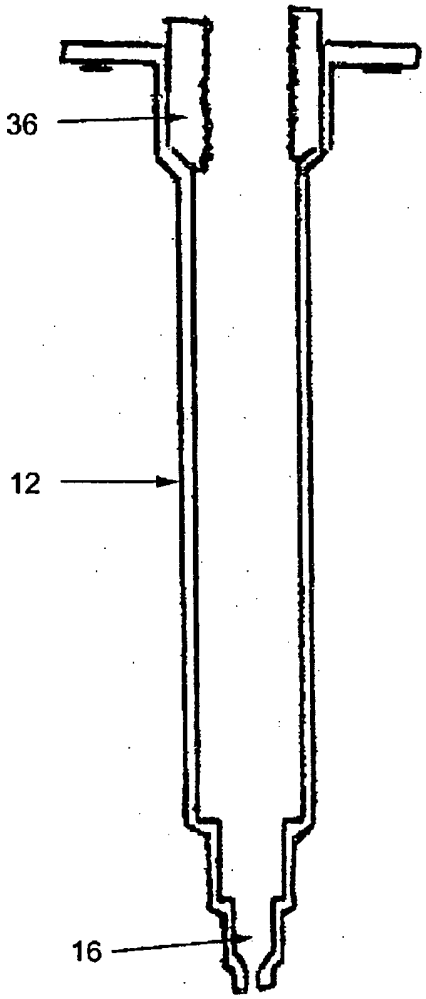

Fig 5a

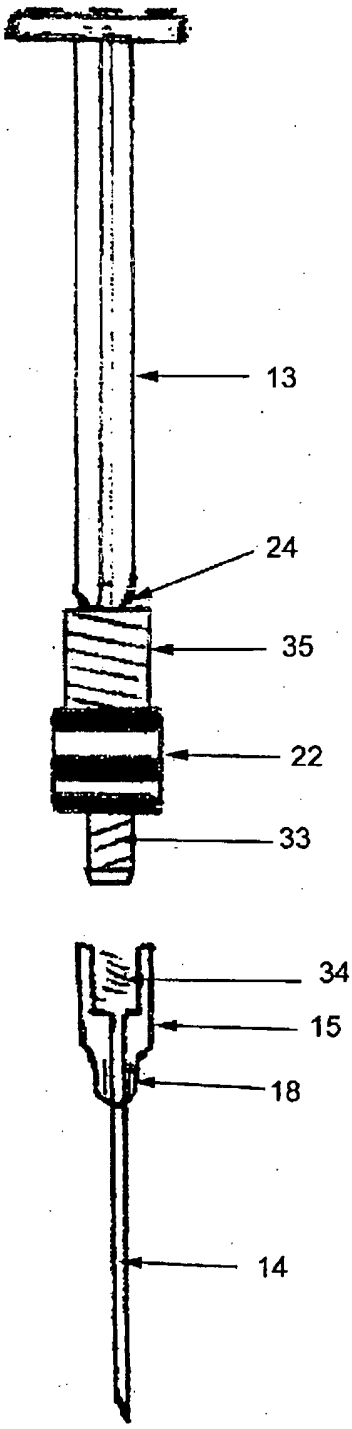

Fig 5b

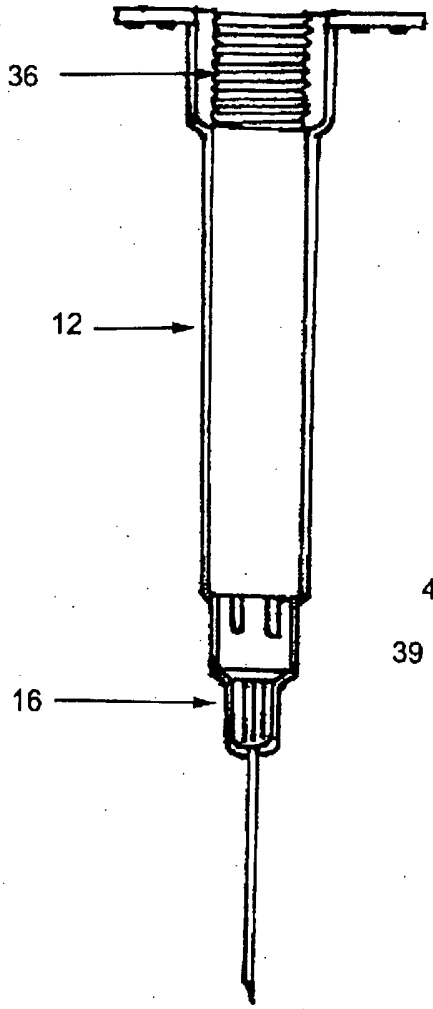

Fig 6a

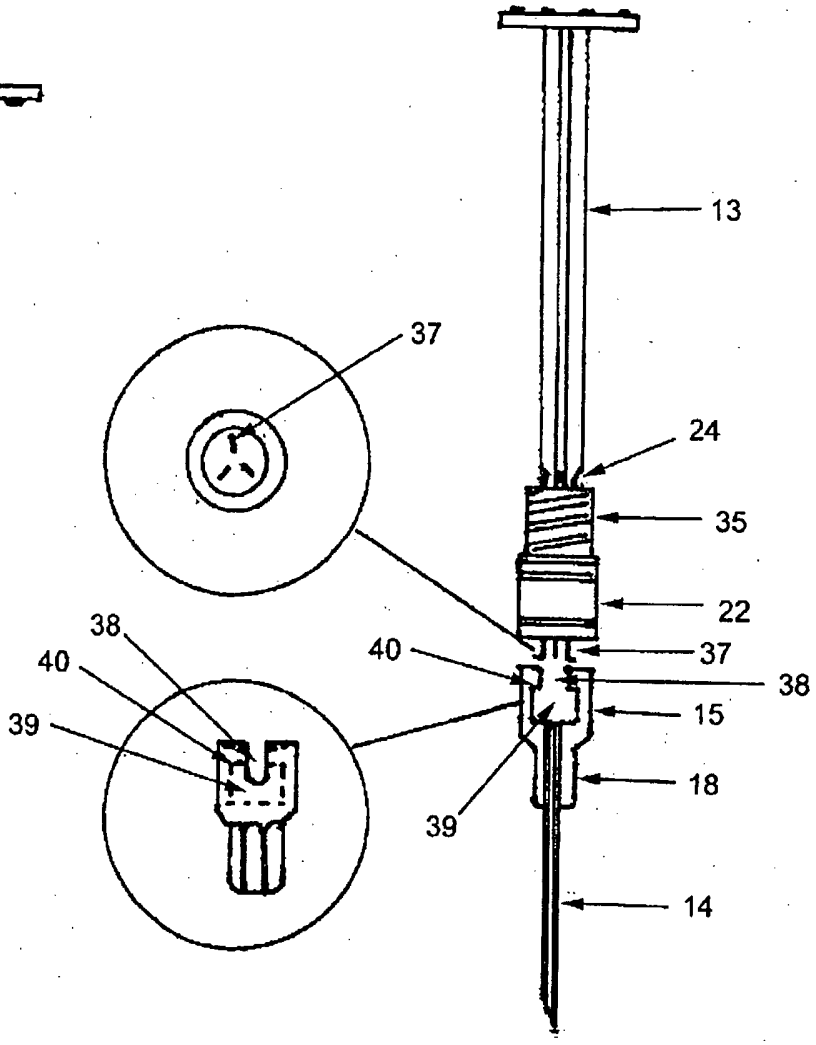

Fig 6b

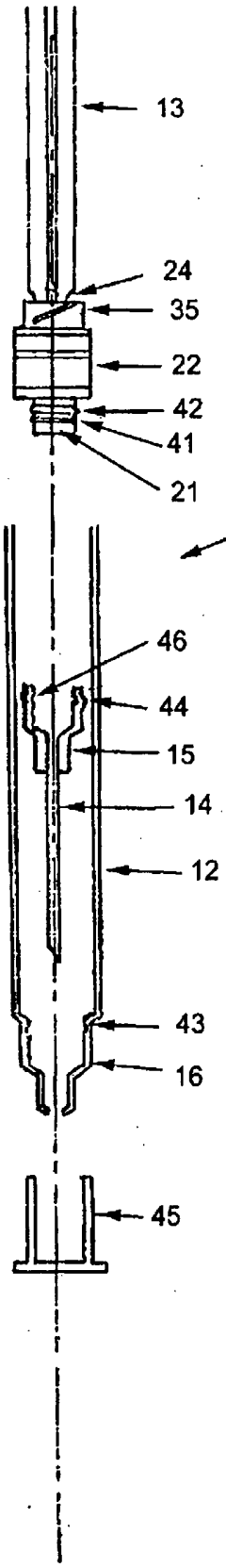
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Fig 7

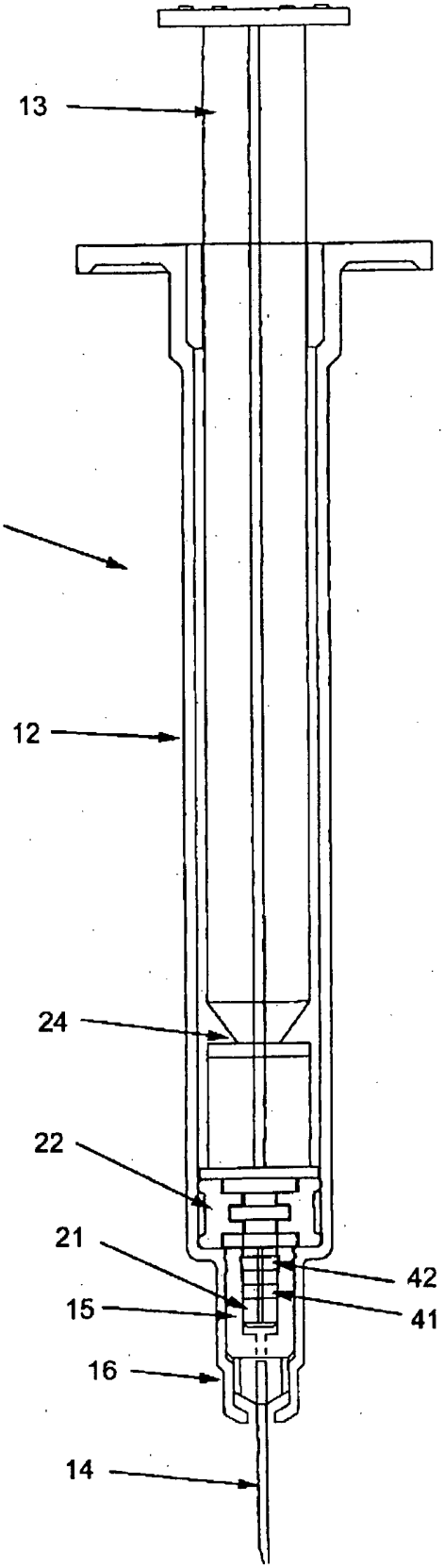
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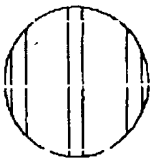
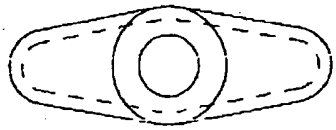
Fig 8





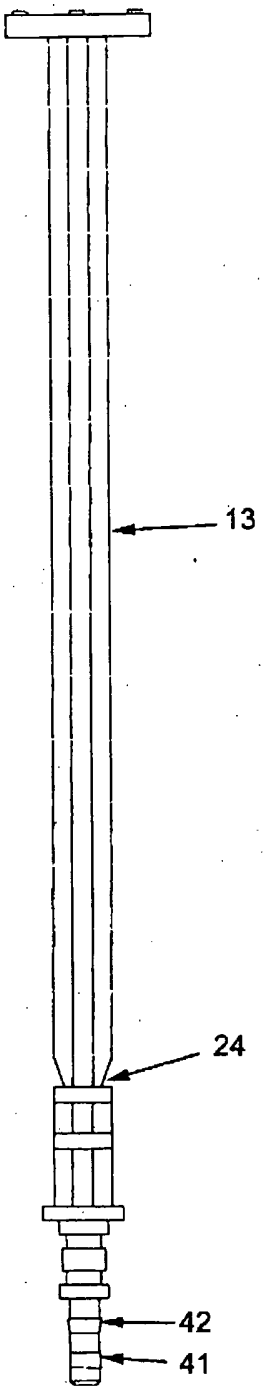


Fig 9a

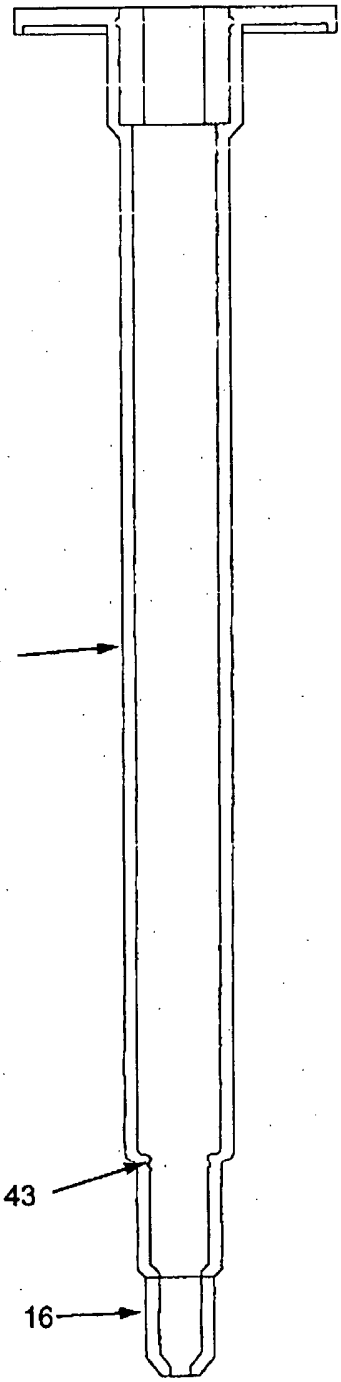


Fig 9b

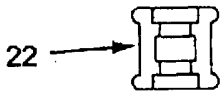


Fig 9c

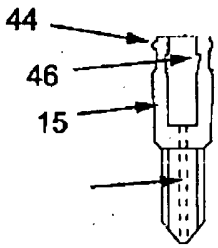


Fig 9d

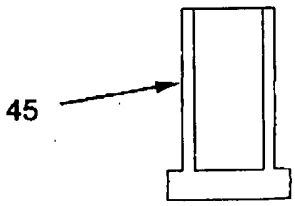


Fig 9e

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2004/001496

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. [7]: A61M 5/32, A61M 5/178

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
DWPI: KEYWORDS: Syringe, pullback, drawback, retract, safety, withdraw, needle, plunger, piston, rod, stem, boss, hub, carrier, extend, push, prior, lock, engage, screw, slot, recess, clip, thread, ridge, luer, disc rupture, break, frangible, tear

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 507 117 A (VINING et al) 26 March 1985 See entire document	1-24
X	WO 1990/006148 A1 (BRIEF S.R.L) 14 June 1990 See entire document	1-24
X	US 5 114 404 A (PAXTON et al) 19 May 1992 See entire document	1-24

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
20 January 2005	1 FEB 2005

Name and mailing address of the ISA/AU	Authorized officer
AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	**SUE THOMAS** Telephone No : (02) 6283 26

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2004/001496

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 969 877 A (KORNBERG) 13 November 1990 See entire document	1-24
X	WO 1990/005555 A1 (REAL WORLD DESIGN & DEVELOPMENT COMPANY) 31 May 1990 See abstract; page 2, line 11 – page 3, line 9; figs 1-5	1-24
X	WO 1991/008788 A1 (ROSSI) 27 June 1991 See entire document	1-24
X	US 4 946 446 A (VADHER) 7 August 1990 See entire document	1-24
X	US 6 183 440 B1 (BELL) 6 February 2001 See abstract; column 2, line 42 – column 3, line 44	1-24
X	FR 2667249 A1 (VARAINE) 3 April 1992 See entire document	1-24
X	US 5971964 A (DONALDSON) 26 October 1999 See entire document	1-24

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2004/001496

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
US	4507117						
WO	9006148	AU	46643/89	CA	2004086	CN	1043083
		CS	8906753	DD	290810	EP	0449907
		GR	89100800	PT	92439	US	5342308
		ZA	8909104				
US	5114404	WO	9313817				
US	4969877	US	4915699				
WO	9005555	AU	47417/90	US	5007903		
WO	9108788	AU	66490/90	BR	9007926	CA	2069412
		EP	0506673	US	5370619		
US	4946446	GB	2232602				
US	6183440	AU	46170/01	BR	0101564	CA	2348154
		CN	1325737	EP	1157713	JP	2002058740
		NZ	510883				
FR	2667249						
US	5971964						

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

END OF ANNEX