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(54) **SINGLE-USE SYRINGE**

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(57) **ABSTRACT**

A single use syringe (10) includes a needle (18), barrel (16), plunger assembly (20) and shield (12). The barrel (16) bears a locking member (26) which encircles the front end of the barrel (16) and is carried forward by the barrel (16) to a position where it engages the shield (12) and is retained by the shield (12) such that the locking member (26) is separated from the barrel (16) as the barrel (16) is withdrawn rearwardly after use. The locking member (26) is resilient and, after it is removed from the barrel (16), assumes a configuration which prevents subsequent forward movement of the barrel (16) within the shield (12). The barrel includes a frangible seal (30) which is broken by rearward movement of needle mount (32). The shield (12) includes a shield extender (14) for controlling the depth of penetration of the needle. The syringe can also be used to inject medicament into a IV bag via a male port as shown in FIG. 7.

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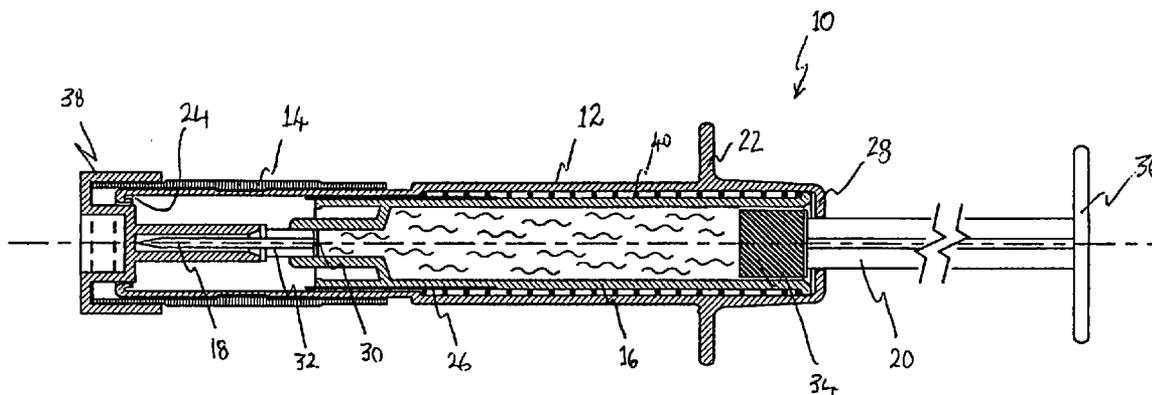
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(30) **Foreign Application Priority Data**

Aug. 2, 2001 (WO)..... 01/54758 A1
Jan. 27, 2000 (AU)..... PQ 5249



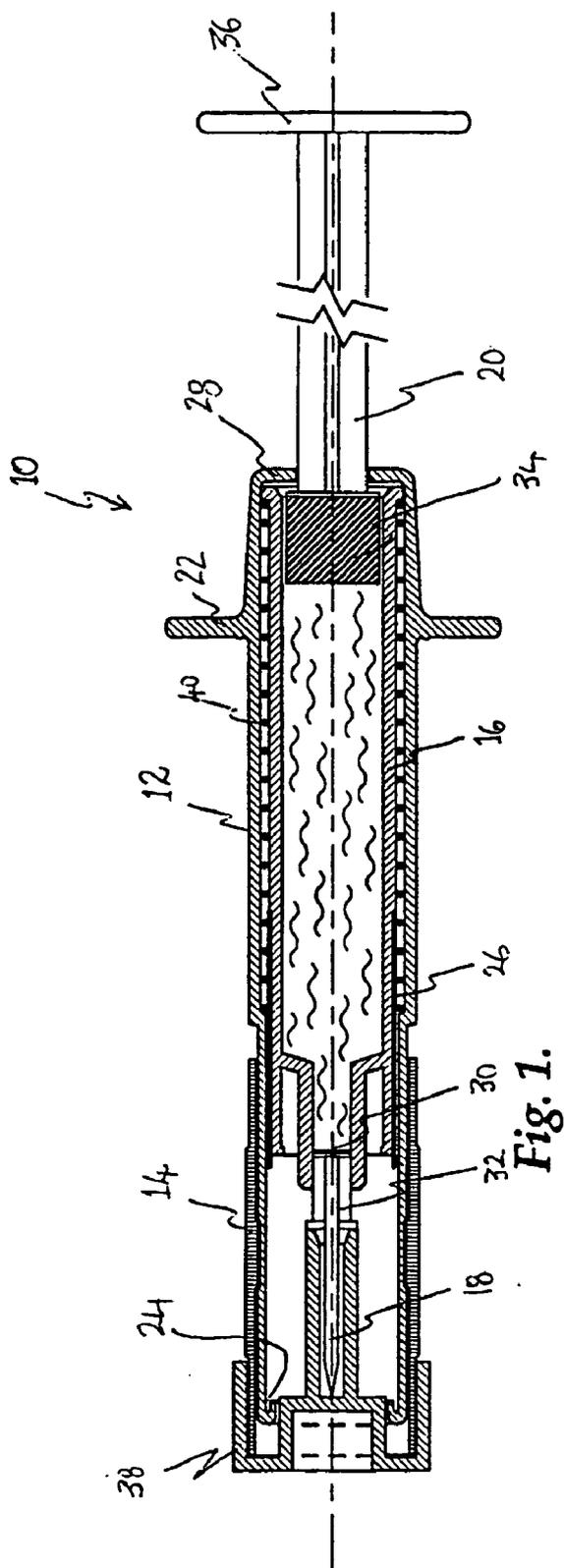


Fig. 1.

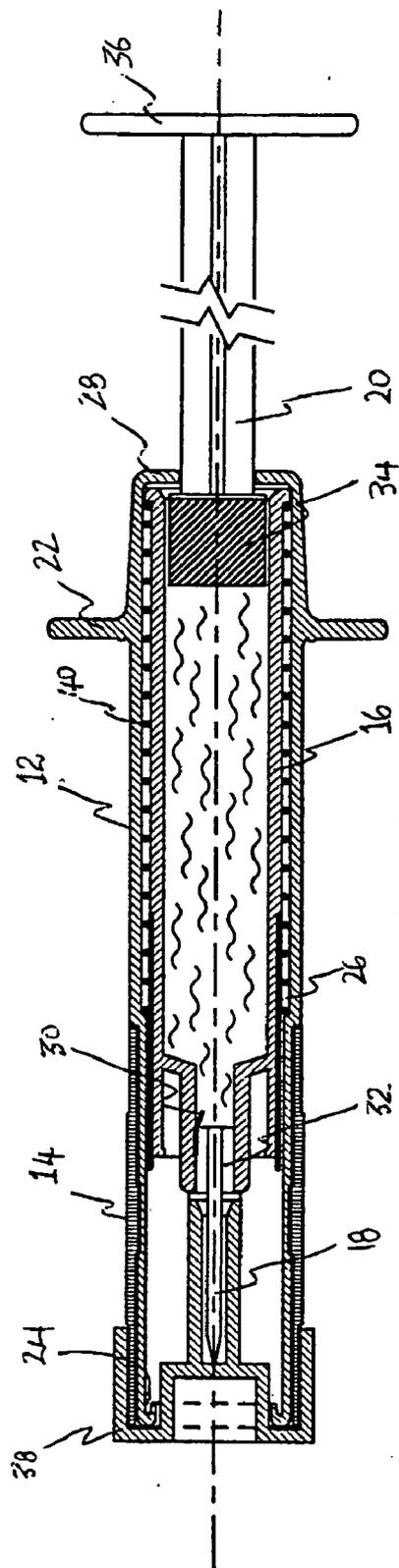


Fig. 2.

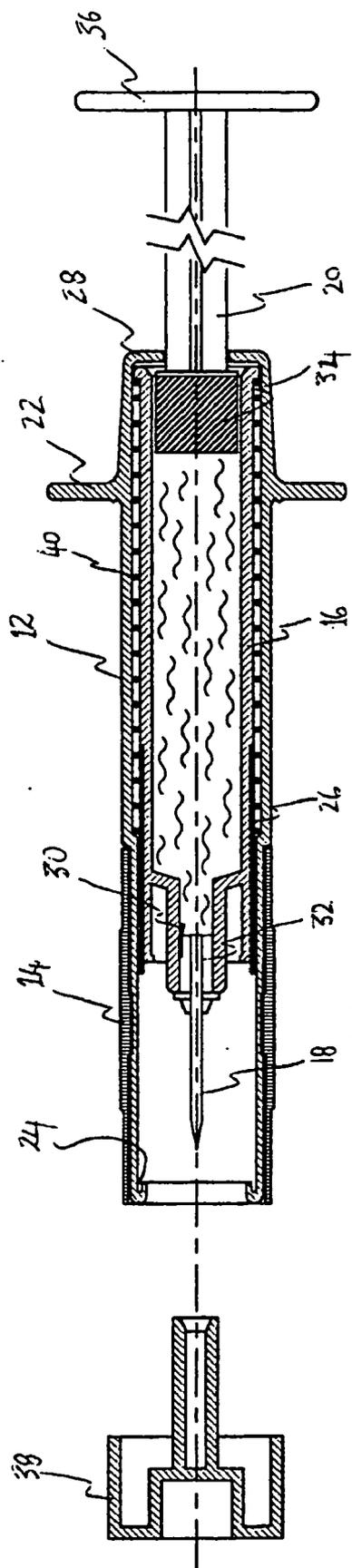


Fig. 3.

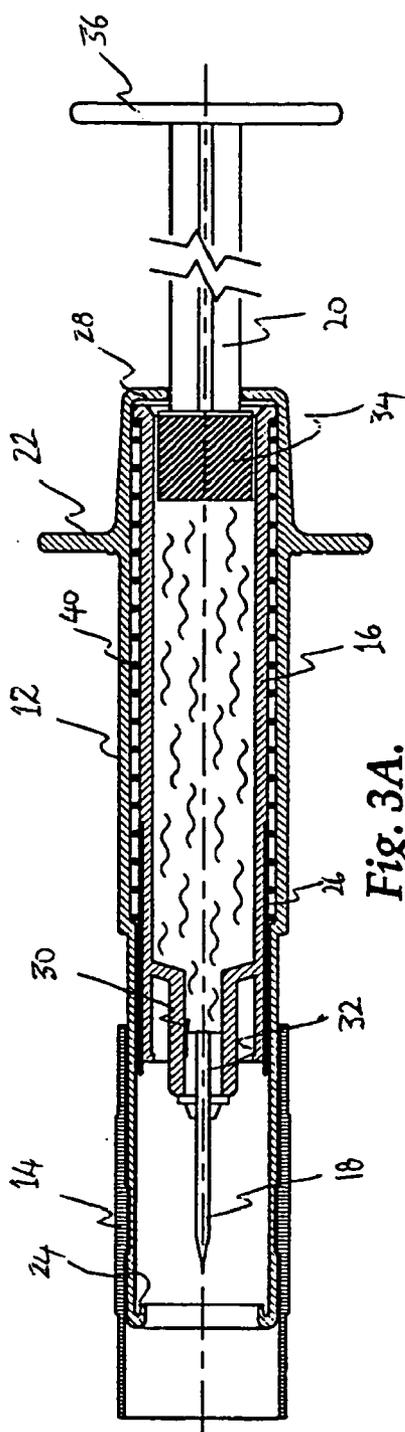


Fig. 3A.

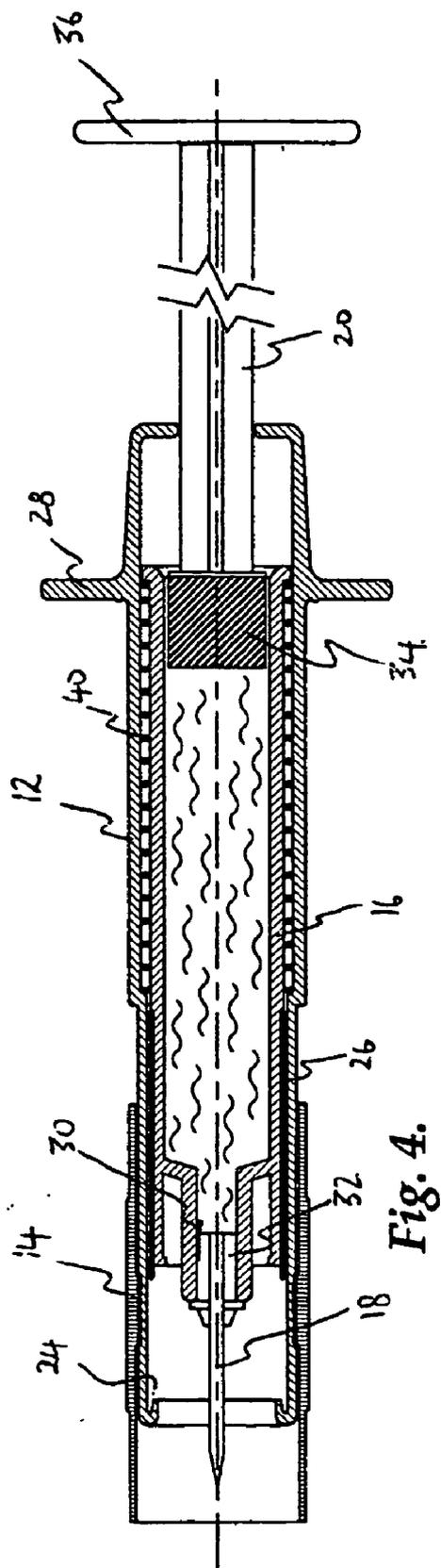


Fig. 4.

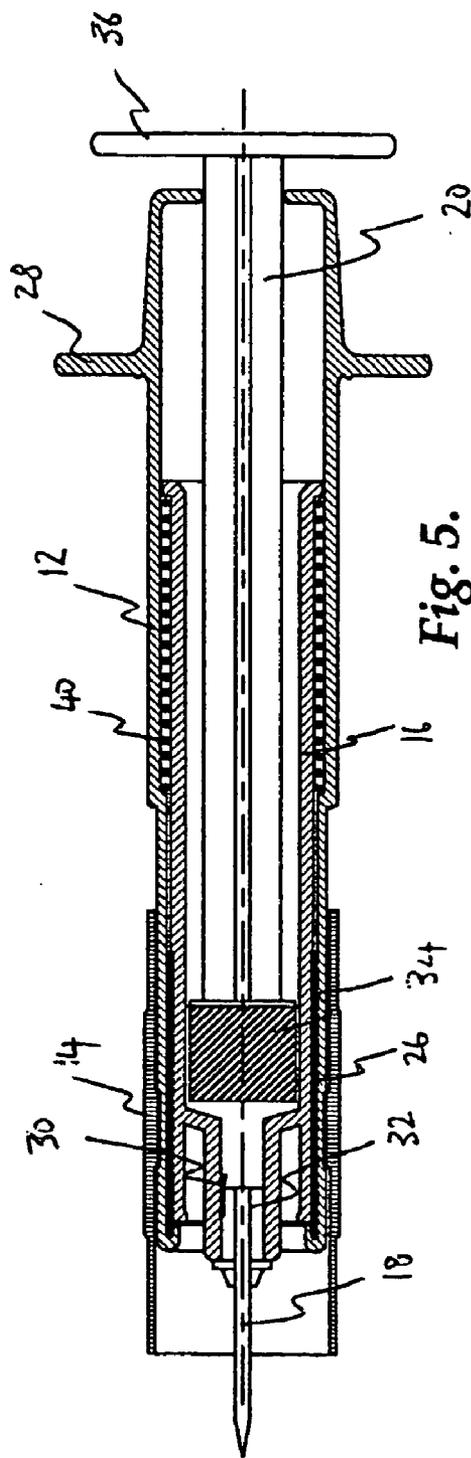


Fig. 5.

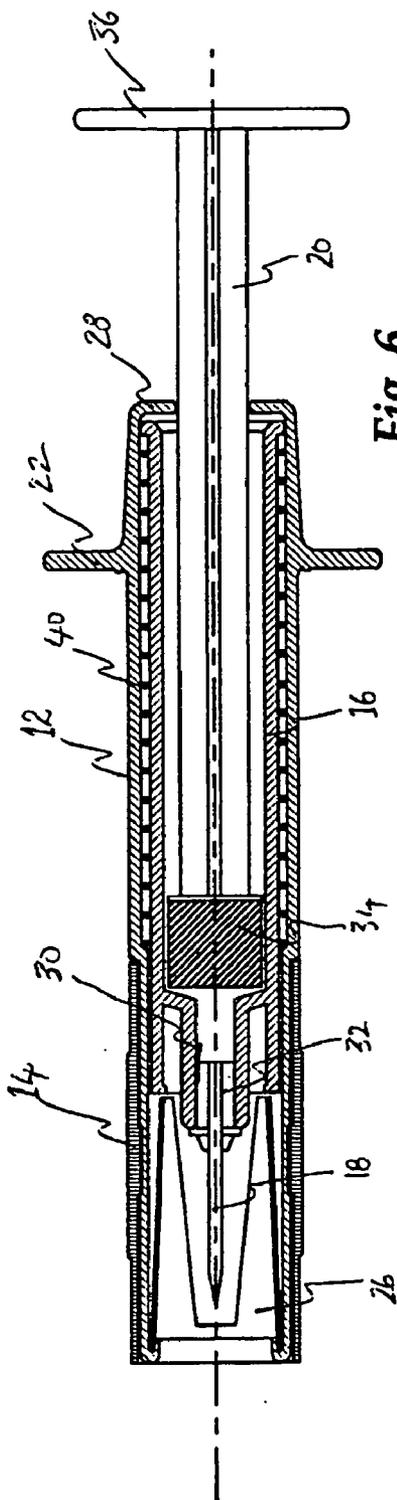


Fig. 6.

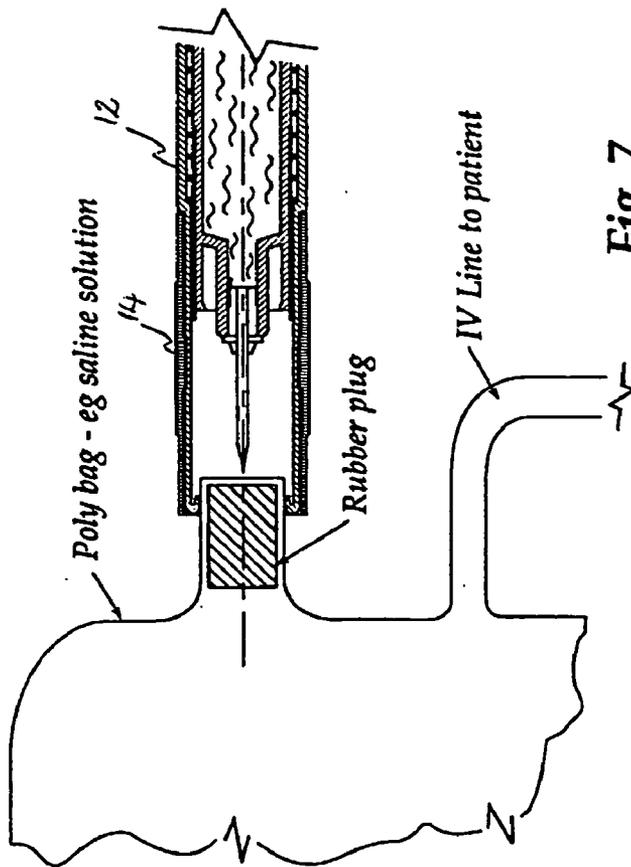


Fig. 7.

SINGLE-USE SYRINGE**RELATED APPLICATIONS**

[0001] This application is a continuation of U.S. patent application Ser. No.: 10/206,868, filed Jul. 26, 2002, which is a continuation under 35 U.S.C. 1.111 (a) of International Application No. PCT/AU00/01027 filed Aug. 30, 2000 and published in English as WO 01/54758 A1 on Aug. 2, 2001, which claimed priority from Australian Applications PQ 5249 filed Jan. 27, 2000, and PQ 8484 filed Jul. 3, 2000, which applications and publication are incorporated herein by reference.

FIELD OF INVENTION

[0002] The present invention relates to single-use syringes.

BACKGROUND OF THE INVENTION

[0003] In recent times there has been a proliferation of single-use syringe designs which incorporate shields that can be moved to a forward position to shield the needle after use. In most instances, the shield is locked in the forward position after use to prevent multiple uses of the syringe and/or to prevent inadvertent needle-stick injury.

[0004] Examples of syringe designs incorporating shields can be found in U.S. Pat. No. 5,584,818 to Morrison, U.S. Pat. No. 5,492,536 to Mascia, U.S. Pat. No. 5,527,294 to Weatherford, U.S. Pat. No. 5,591,138 to Vaillancourt, U.S. Pat. No. 6,099,504 to Gross, U.S. Pat. No. 4,820,275 to Haber, U.S. Pat. No. 5,269,761 to Stehrenberger, U.S. Pat. No. 5,562,626 to Sanpietro, U.S. Pat. No. 4,863,434 to Bayless, U.S. Pat. No. 4,985,021 to Straw, U.S. Pat. No. 5,057,079 to Tiemann, U.S. Pat. No. 5,057,086 to Dillard, U.S. Pat. No. 5,092,851 to Ragner, U.S. Pat. No. 5,201,720 to Borgia, U.S. Pat. No. 5,215,534 to De Harde, U.S. Pat. No. 5,215,535 to Gettig, U.S. Pat. No. 5,222,945 to Basnight, U.S. Pat. No. 5,290,256 to Weatherford, U.S. Pat. No. 5,312,372 to De Harde, and U.S. Pat. No. 5,360,408 to Vaillancourt.

[0005] Most of these shielded-syringe designs are provided to the user with the shield in the retracted position and thus some triggering or manual manipulation of the shield is required to release the shield to the forward position after use. In many designs, the movement of the shield to the forward position after use is assisted by a spring.

[0006] Only a few of these known designs are provided to the user with the shield initially in the forward position. In these cases, it is necessary for the user to manipulate some form of release mechanism to enable the shield to be moved to the rearward position to expose the needle for use, and after use it is again necessary to manipulate some form of release mechanism to release the shield to the forward position. Again, many of these designs incorporate a spring which biases the shield to the forward position.

SUMMARY OF INVENTION

[0007] According to one aspect the invention resides in a single-use syringe which is provided to the user with the shield in a forward position, yet requires no manual manipulation of release mechanisms or the like to release the shield

to the rearward position for use, nor further manual manipulation to release and lock the shield in the forward position after use.

[0008] The above ergonomic advantages are achieved by a single-use syringe as defined in the attached claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The invention will now be described with reference to an example for illustrative purposes and wherein:—

[0010] FIGS. 1 to 6 are a series of sequential longitudinal sectioned views of a single-use syringe demonstrating operation of the single-use syringe; and

[0011] FIG. 7 shows the single-use syringe engaging the male port of an IV fluid bag.

DETAILED DESCRIPTION

[0012] Referring firstly to FIG. 1, there is illustrated a pre-filled single-use syringe 10 including a shield 12 having a shield extender 14, a barrel 16 mounted for reciprocation within the shield 12 and having a needle 18 at its forward end, and a plunger assembly 20 mounted for reciprocation within the barrel 16.

[0013] The shield 12 is generally cylindrical in shape and includes a generally cylindrical shield extender 14 at its forward end. The shield extender 14 can be selectively extended to control the depth of penetration of the needle during use as will be described in more detail later. Conventional finger receiving portions 22 are defined towards the rear end of the shield 12, the finger receiving portions 22 adapted to receive a user's fingers in the conventional manner during use. The forward end of the shield includes a circular slot 24 which engages and retains a locking member 26 during use as will be described later. The rearward end of the shield includes a rear collar flange 28 which limits the barrel's 16 rearward travel within the shield 12.

[0014] The barrel 16 is pre-filled with medicament and is sealed at its rearward end by the plunger assembly 20 and at the forward end by a frangible seal 30 which can be broken by the needle mount 32 prior to use as will be discussed later. The needle 18 extends forwardly from the needle mount 32 which is itself located immediately forward of the frangible seal 30. The barrel 16 bears a generally cylindrical bifurcated locking member 26 about its forward end which is adapted to engage and be retained by the circular slot 24 in the shield 12 as will be described in greater detail later.

[0015] The plunger assembly 20 is conventional in construction and includes a piston 34 at its forward end which sealingly engages the internal bore of the barrel 16.

[0016] The plunger assembly 20 also defines a conventional thumb engaging portion 36 at its rearward end.

[0017] Referring firstly to FIG. 1 there is illustrated a pre-filled single-use syringe in the form in which it would be supplied to a user. Normally, the pre-filled single-use syringe 10 would be individually packaged and supplied in a sterile plastic package which is not illustrated. Both the packaging and syringe itself would identify the medicament and volume of medicament present in the barrel of the syringe.

[0018] As mentioned above, the medicament is sealed within the barrel 16 by the piston 34 of the plunger assembly

20 at the rearward end of the barrel **16** and by a frangible seal **30** at the forward end of the barrel **16**.

[0019] The first step in the use of the syringe is the breaking of the frangible seal **30** and this is best understood with comparative reference to **FIGS. 1 and 2**.

[0020] Shield extender **14** is mounted via a coarse screw thread on the forward end of shield **12** such that rotation of shield extender **14** relative to shield **12** causes the shield extender to reciprocate in the forward or aft direction relative to shield **12**.

[0021] As can be seen with reference to **FIG. 1**, the syringe is provided with the shield extender **14** in a slightly forward position, i.e. the shield extender **14** extends slightly forward beyond the forward-most extent of the shield **12**.

[0022] A cap **38** is provided, and the cap **38** has an outer skirt which is frictionally seated on the shield extender **14** as shown. The shield extender **14** also has a small outwardly extending shoulder which is engaged by the outer skirt and prevents rearward movement of the cap **38** relative to the shield extender **14**. The cap **38** also encloses the needle **18** with a rearwardly extending inner skirt which seats on the tapered forward end of the needle mount **32** as shown.

[0023] With reference now to **FIG. 2**, the cap **38** and shield extender **14** have been rotated relative to shield **12** such that the shield extender **14** and cap have moved in unison rearwardly relative to shield **12** until the rear end of the shield extender **14** has abutted a small outwardly extending shoulder formed on the shield **12** which prevents further rearward movement of the shield extender **14** relative to the shield **12**. Simultaneously, the needle mount **32** has been driven rearwardly by the inner skirt of the cap **38** such that the frangible seal **30** has been broken and the needle **18** is thus now in fluid communication with the interior of the barrel **16**. The frangible seal **30** is designed to have a portion of its circumference form a "live" or integral hinge about which the remainder of the frangible seal **30** pivots. A frangible seal and live hinge per se is known from PCT/AU99/00422.

[0024] It will be noted that the needle mount **32** is non-conventional in construction in that it is cylindrical and fully contained within the seal-containing bore of the spigot-shaped nose of the barrel **16**. In contrast, conventional needle mounts include a rearwardly projecting skirt which surrounds the exterior of the spigot-shaped nose of the barrel **16**. It is for this reason that the syringe disclosed in PCT/AU99/00422 utilised a cylindrical tube **21** intermediate the conventional needle mount **7** and frangible seal **9** for the purpose of breaking the frangible seal **9**.

[0025] With reference to **FIG. 3**, cap **38** has been removed and the needle is now ready for use with the needle being shielded, but in fluid communication with the interior of the barrel **16** which accommodates the medicament.

[0026] Referring to **FIG. 3A**, the shield extender **14** has been rotated in the reverse direction relative to the shield **12** such that the shield extender **14** has moved forwardly relative to shield **12** from its fully retracted position and it now extends forwardly beyond the forward-most extent of shield **12**. Selective rotation of shield extender **14** relative to shield **12** allows the user to control the depth of penetration of the needle **18** during use. The further the shield extender

14 is extended beyond the shield **12**, the shallower the penetration of the needle **18** in the patient.

[0027] With reference now to **FIG. 4**, the user has begun squeezing together thumb receiving portion **36** of the plunger assembly **20** and finger-receiving portions **22** of the shield **12** in the conventional manner thereby compressing compression spring **40** which is provided between a small outwardly extending shoulder formed on the rear end of barrel **16** and a small inwardly directed shoulder formed midway along the length of shield **12**.

[0028] As shown in **FIG. 4**, the plunger assembly **20** has not yet moved forwardly relative to barrel **16** to express medicament from the needle **18**. Rather, plunger assembly **20** and barrel **16** have moved forwardly in unison within shield **12** and shield extender **14**. Plunger assembly **20** and barrel **16** will continue to move forward in unison until the forward end of barrel **16** engages the forward end of shield **12** whereat the compression spring **40** reaches its maximum compression.

[0029] With reference now to **FIG. 5**, the barrel **16** has moved to the fully forward position relative to shield **12** such that the forward end of barrel **16** engages the forward end of shield **12** and the needle **18** is maximally exposed. Thereafter, any further squeezing together of the thumb receiving portion **36** and finger receiving portions **22** in the conventional manner causes the plunger assembly **20** to move forward relative to barrel **16** thereby expressing the medicament from the interior of the barrel **16**.

[0030] With reference to **FIG. 5**, it should be noted that the forward end of locking member **26** (which has been carried forward on the forward end of barrel **16**) has engaged the circular slot **24** defined in the forward end of shield **12**. The locking member **26** is thereafter retained in this position by virtue of its engagement with the slot **24**.

[0031] With reference to **FIG. 6**, the squeezing force applied by the user has been discontinued and the barrel **16** and plunger assembly **20** have moved rearwardly in unison under the influence of compression spring **20**. It will be noted that locking member **26** is retained in the circular slot **24** defined in the forward end of shield **12**. As barrel **16** moves rearwardly relative to shield **12**, locking member **26** slides or is pulled off the forward end of barrel **16** until it is fully clear of barrel **16** as shown in **FIG. 6**. At this stage, the rear end of locking member **26**, which is formed of a resilient plastics material having a memory, snaps inwardly to adopt a truncated and bifurcated cone-like shape as shown in **FIG. 6**. Of course, previously whilst the locking member **26** was encircling barrel **16**, it adopted a bifurcated cylindrical shape. Thus, the resilient memory of the locking member **26** causes the locking member to change shape from a generally cylindrical shape to a generally truncated cone-like shape when it is "pulled" off the forward end of the barrel **16** via its engagement with slot **24**.

[0032] Once the locking member **26** has adopted the truncated cone-like shape as shown in **FIG. 6**, subsequent forward movement of the barrel **16** relative to the shield **12** is prevented by virtue of physical interference with the locking member **26** and hence the locking member **26** prevents subsequent unshielding of the needle **18**.

[0033] Referring to **FIG. 7**, the single-use syringe can also be conveniently used in a safe manner with intravenous

polybags as shown. In this regard, the forward end of the shield 12 is sized so as to closely receive the male port of a polybag as shown. Typically, these male ports are sealed by a rubber plug as shown. The needle can penetrate through the rubber plug and the medicament can then be injected into the polybag for IV feed to the patient via an established catheter or the like. After injection of the medicament into the polybag, the needle is withdrawn and the rubber plug is sufficiently resilient to be reseal the male port of the poly bag.

[0034] The present invention provides a single-use syringe which is supplied to the user with the shield in the forward or shielding position, yet requires no non-conventional manipulation or activation of release mechanisms or the like to move the shield back to the needle-exposed position for use. Furthermore, no non-conventional manipulation of release mechanisms or the like is required to release the shield to the forward protective position after use. The user simply squeezes their thumb and fingers together in the conventional manner and this single, conventional action exposes the needle 18, activates the locking member 26 via its engagement with the slot 24, and expresses the medicament. Discontinuation of the squeezing force cause the shield to return to its forward or protective position under spring bias whereat it is locked to prevent subsequent use or inadvertent needle-stick injuries.

[0035] It will of course be realised that whilst the above has been given by way of an illustrative example of this invention, all such and other modifications and variations hereto, as would be apparent to persons skilled in the art, are deemed to fall within the broad scope and ambit of this invention as is herein set forth.

What is claimed is:

1. A single-use syringe, comprising:

- a shield;
- a barrel adapted to contain a medicament and mounted for axial reciprocation within the shield; and
- a locking member initially mounted on the barrel, wherein the locking member engages the shield during expression of medicament from the barrel, and subsequent to said engagement is dismounted from the barrel, the dismounted locking member thereafter preventing reciprocation of the barrel within the shield.

2. A single-use syringe as claimed in claim 1, wherein the locking member initially encircles a forward end of the barrel, and is dismounted from the forward end of the barrel during rearward reciprocation of the barrel within the shield.

3. A single-use syringe as claimed in claim 1, wherein the shield includes a slot, and wherein the locking member engages, and is retained by, the slot.

4. A single-use syringe, comprising:

- a shield;
- a barrel adapted to contain medicament and mounted for axial reciprocation within the shield; and
- a locking member initially mounted relative to the barrel for reciprocation therewith, wherein the locking member engages and is retained by the shield during expression of medicament from the barrel, and as a result of said engagement and retention the locking member is translated relative to the barrel during rearward reciprocation of the barrel within the shield, the locking member then preventing subsequent reciprocation of the barrel within the shield.

5. A single-use syringe comprising:

- a shield with a forward end and a rearward end;
- a barrel with a forward end and a rearward end, the barrel mounted for axial reciprocation within the shield between a rearward position and a forward position;
- a needle mounted on the forward end of the barrel such that when the barrel is in the forward position the needle is exposed;
- a locking member adapted to prevent exposure of the needle by forward reciprocation of the barrel when the locking member is dismounted from the barrel, the locking member being removably mounted to the forward end of the barrel and adapted to engage the forward end of the shield when the needle is exposed by forward reciprocation of the barrel, the engagement being sufficient to dismount the locking member from the forward end of the barrel during rearward reciprocation of the barrel, the locking member thereafter preventing further exposure of the needle by forward reciprocation of the barrel.

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