Claims:

1. A needle safety shield assembly for an injector, comprising: a needle shield for shielding a needle of the injector; and a shield locking means; in which the needle shield is arranged to be movable between:

a first shield position in which the needle is shielded and the shield is capable of being moved to expose the needle;

a second shield position in which the needle is exposed for use and the shield is capable of being moved to re-shield the needle; and

a third shield position in which the needle is re-shielded and the needle shield is prevented from further movement to expose the needle; wherein:

the shield locking means comprises a first track having a first unidirectional barrier and a second track having a second unidirectional barrier, the first and second tracks adapted to engage with the runner, movement of the needle shield being associated with movement of the runner such that in the first shield position the runner is engaged with the first track, on movement between the first shield position and the second shield position the runner passes along the first track and through the first unidirectional barrier into the second track, and on movement between the second shield position and the third shield position the runner passes along the second track and through the second unidirectional barrier into a locked position in which further movement of the runner and needle shield is prevented;

wherein the first unidirectional barrier is a flexible arm or flexible wall, and the second unidirectional barrier is a flexible arm or flexible wall.

2. A needle safety shield assembly according to claim 1 in which movement of shield is reciprocal along the needle axis.

3. A needle safety shield assembly according to claim 1 in which the first unidirectional barrier is a flexible arm and the second unidirectional barrier is also a flexible arm, wherein each flexible arm can deflect to allow passage of the runner in one direction, but prevents passage of the runner in the opposite direction.

4. A needle safety shield assembly according to claim 3 in which one or both of the flexible arms are spring-loaded.

5. A needle safety shield assembly according to claim 1 in which the first unidirectional barrier is a flexible wall and the second unidirectional barrier is also a flexible wall, wherein each flexible wall can deflect to allow passage of the runner in one direction, but prevents passage of the runner in the opposite direction.

6. A needle safety shield assembly according to any of the preceding claims in which the safety shield is made of moulded plastic.

7. A needle safety shield assembly according to any of the preceding claims, which is moulded as one, two or three parts.

8. A single-use injector comprising a needle and a needle safety shield assembly according to any one of the preceding claims.

9. A single-use injector according to claim 8 in which the track or tracks are defined in the needle shield and the runner is defined on the injector body or on a second member.

10. A single-use injector according to claim 9 in which the track or tracks are movable with respect to the needle; and the runner is static with respect to the needle.

11. A single-use injector according to any of claims 8-10 in which the runner is a pin which is attached to the injector body.

12. A single-use injector according to any of claims 8-11 in which the injector is a manual needle insertion injector or an automatic needle insertion injector.

13. A single-use injector according to any of claims 8-12 in which the single-use injector comprises actuation means, wherein a liquid medicament is delivered from the single-use injector upon actuation of the actuation means.

14. A single-use injector according to claim 13 in which the actuation means comprises a button.

15. A single-use injector according to any one of claims 8-14 comprising:

a medicament container defining a substantially cylindrical chamber containing a liquid medicament, a proximal end of the chamber being closed by a piston slidably located within the cylindrical chamber, and a distal end of the chamber being closed by a normally-closed valve, for example an aerosol valve or a container seal spanning an opening at a distal end of the medicament container;

biasing means coupled to the piston and acting to bias the piston towards the normally-closed valve, thereby pressurising the liquid medicament;

a hypodermic needle for parenteral administration of the liquid medicament;

a needle safety shield assembly according to any one of claims 1-13; and

means for establishing fluid communication between the chamber and the hypodermic needle such that the pressurised liquid medicament is automatically delivered through the hypodermic needle when communication has been established.

16. A single-use injector according to claim 15 in which the normally-closed valve is a container seal having a pierceable septum spanning the opening at the distal end of the container and the means for establishing fluid communication is a valve comprising a valve housing defining a bore, the valve housing coupled to the distal end of the container such that the pierceable septum is located at a proximal end of the bore, and a shuttle slidably retained within the bore, the shuttle comprising a piercing element for piercing the pierceable septum when the shuttle is moved towards the proximal end of the bore to establish fluid communication between the chamber and the hypodermic needle.

17. A single-use injector according to claim 16 in which the needle safety shield assembly engages with the piercing element when the needle shield is moved from the first shield position to the second shield position, wherein engagement with the piercing element causes the piercing element to penetrate the pierceable septum.

18. A method of operating a single-use injector according to any one of 13-17 comprising the steps of:

(1) moving the needle shield from the first shield position to the second shield position;

(2) actuating the actuation means such that a liquid medicament is delivered from the single-use injector; and

(3) upon completion of liquid medicament delivery, moving the needle shield from the second shield position to the third shield position.

19. A method of operating the needle safety shield assembly according to any one of the preceding claims comprising the steps of moving the needle shield to expose the needle for use; and moving the needle shield to re-shield the needle.

20. A method of operating a needle safety shield assembly for an injector, said needle safety shield comprising: a needle shield for shielding a needle of the injector; and
a shield locking means comprising a track adapted to engage with a runner, the track comprising at least one unidirectional barrier through which the runner can pass; said method comprising:

(a) moving the needle shield to expose the needle for use; and

(b) moving the needle shield to re-shield the needle,

wherein steps (a) and (b) cause movement of the runner along the track through the at least one unidirectional barrier and into a locked position in which further movement of the runner and needle shield is prevented.

21. A method of operating a needle safety shield assembly according to claim 1, comprising the steps of:

(a) moving the needle shield from the first shield position in which the needle is shielded to the second shield position in which the needle is exposed for use, wherein on movement between the first shield position and the second shield position the runner passes along the first track and through the first unidirectional barrier into the second track; and

(b) moving the needle shield from the second shield position to a third shield position in which the needle is re-shielded and the needle shield is prevented from further movement to expose the needle, wherein on movement between the second shield position and the third shield position the runner passes along the second track and through the second unidirectional barrier into a locked position in which further movement of the runner and needle shield is prevented.

22. A method of operating the needle safety shield assembly of claim 1, comprising the steps of:

(a) moving the needle shield from the first shield position in which the needle is shielded to the second shield position in which the needle is exposed for use, wherein on movement between the first shield position and the second shield

position the runner passes along the first track and through the first unidirectional barrier into the second track; and

(b) moving the needle shield from the second shield position to a third shield position in which the needle is re-shielded and the needle shield is prevented from further movement to expose the needle; wherein on movement between the second shield position and the third shield position the runner passes along the second track and through the second unidirectional barrier into a locked position in which further movement of the runner and needle shield is prevented.

Claims:

1. A needle safety shield assembly for an injector, comprising: a needle shield for shielding a needle of the injector; and a shield locking means; in which the needle shield is arranged to be movable between:

a first shield position in which the needle is shielded and the shield is capable of being moved to expose the needle;

a second shield position in which the needle is exposed for use and the shield is capable of being moved to re-shield the needle; and

a third shield position in which the needle is re-shielded and the needle shield is prevented from further movement to expose the needle; wherein:

the shield locking means comprises a first track having a first unidirectional barrier and a second track having a second unidirectional barrier, the first and second tracks adapted to engage with the runner, movement of the needle shield being associated with movement of the runner such that in the first shield position the runner is engaged with the first track, on movement between the first shield position and the second shield position the runner passes along the first track and through the first unidirectional barrier into the second track, and on movement between the second shield position and the third shield position the runner passes along the second track and through the second unidirectional barrier into a locked position in which further movement of the runner and needle shield is prevented;

wherein the first unidirectional barrier is a flexible arm or flexible wall, and the second unidirectional barrier is a flexible arm or flexible wall.

2. A needle safety shield assembly according to claim 1 in which movement of shield is reciprocal along the needle axis.

3. A needle safety shield assembly according to claim 1 in which the first unidirectional barrier is a flexible arm and the second unidirectional barrier is also a flexible arm, wherein each flexible arm can deflect to allow passage of the runner in one direction, but prevents passage of the runner in the opposite direction.

4. A needle safety shield assembly according to claim 3 in which one or both of the flexible arms are spring-loaded.

5. A needle safety shield assembly according to claim 1 in which the first unidirectional barrier is a flexible wall and the second unidirectional barrier is also a flexible wall, wherein each flexible wall can deflect to allow passage of the runner in one direction, but prevents passage of the runner in the opposite direction.

6. A needle safety shield assembly according to any of the preceding claims in which the safety shield is made of moulded plastic.

7. A needle safety shield assembly according to any of the preceding claims, which is moulded as one, two or three parts.

8. A single-use injector comprising a needle and a needle safety shield assembly according to any one of the preceding claims.

9. A single-use injector according to claim 8 in which the track or tracks are defined in the needle shield and the runner is defined on the injector body or on a second member.

10. A single-use injector according to claim 9 in which the track or tracks are movable with respect to the needle; and the runner is static with respect to the needle.

11. A single-use injector according to any of claims 8-10 in which the runner is a pin which is attached to the injector body.

12. A single-use injector according to any of claims 8-11 in which the injector is a manual needle insertion injector or an automatic needle insertion injector.

13. A single-use injector according to any of claims 8-12 in which the single-use injector comprises actuation means, wherein a liquid medicament is delivered from the single-use injector upon actuation of the actuation means.

14. A single-use injector according to claim 13 in which the actuation means comprises a button.

15. A single-use injector according to any one of claims 8-14 comprising:

a medicament container defining a substantially cylindrical chamber containing a liquid medicament, a proximal end of the chamber being closed by a piston slidably located within the cylindrical chamber, and a distal end of the chamber being closed by a normally-closed valve, for example an aerosol valve or a container seal spanning an opening at a distal end of the medicament container;

biasing means coupled to the piston and acting to bias the piston towards the normally-closed valve, thereby pressurising the liquid medicament;

a hypodermic needle for parenteral administration of the liquid medicament;

a needle safety shield assembly according to any one of claims 1-13; and

means for establishing fluid communication between the chamber and the hypodermic needle such that the pressurised liquid medicament is automatically delivered through the hypodermic needle when communication has been established.

16. A single-use injector according to claim 15 in which the normally-closed valve is a container seal having a pierceable septum spanning the opening at the distal end of the container and the means for establishing fluid communication is a valve comprising a valve housing defining a bore, the valve housing coupled to the distal end of the container such that the pierceable septum is located at a proximal end of the bore, and a shuttle slidably retained within the bore, the shuttle comprising a piercing element for piercing the pierceable septum when the shuttle is moved towards the proximal end of the bore to establish fluid communication between the chamber and the hypodermic needle.

17. A single-use injector according to claim 16 in which the needle safety shield assembly engages with the piercing element when the needle shield is moved from the first shield position to the second shield position, wherein engagement with the piercing element causes the piercing element to penetrate the pierceable septum.