INJECTION DEVICE

FIELD OF THE INVENTION

The present invention relates to an injection device of the type that receives a syringe, extends it, discharges its contents and then retracts it automatically.

BACKGROUND OF THE INVENTION

Known injection devices are shown in WO 95/35126 and EP-A-0 516 473 and tend to employ a drive spring and some form of release mechanism that releases the syringe from the influence of the drive spring once its contents are supposed to have been discharged, to allow it to be retracted by a return spring.

It is known to provide a safety interlock around the needle of such injection devices.

Such a safety interlock prevents accidental activation of a trigger of the injection device by preventing rotation of the trigger. The interlock is sprung loaded out of the aperture through which the syringe extends once activated. The interlock is disengaged by pressing it in towards the aperture by, for example, pressing it against a user's body, thereby allowing the trigger to be activated and the syringe to be extended.

The interlock has to be biased out of the aperture so that it can be activated. Known devices use small coil springs positioned between the housing of the injection device and the interlock. These small springs are costly to assemble and introduce a risk that they may be missed out all together during the manufacturing process.

SUMMARY OF THE INVENTION

The injection device of the present invention is designed to deal with the aforementioned problems.

In view of the foregoing, there is provided, in a first aspect of the present invention, an injection device comprising:

a housing adapted to receive a syringe having a discharge nozzle;

an actuator;

a drive acted upon by the actuator and in turn acting on the syringe to advance it from a retracted position in which the discharge nozzle is contained within the housing to an extended position in which the discharge nozzle extends form the housing;

a locking mechanism in communication with the actuator and activatable to be moved from a locked position in which the actuator is prevented from releasing the drive to an unlocked position in which the actuator is operable to act upon the drive to advance the syringe;

characterised in that the locking mechanism or the housing includes integrally formed biasing means adapted to return the locking mechanism to a locked position when it is not activated.

Hence, there is no need to provide small springs to bias the locking mechanism into its locked position. This reduces the cost and complexity of assembly of the injection device.

In one embodiment of the present invention, the locking mechanism includes the integrally formed biasing means.

Preferably, the biasing means comprises at least one resilient arm integrally formed with the locking mechanism.

The locking mechanism can be arranged in the housing such that the resilient arm is biased against a surface of the housing on activation.

Generally, the locking mechanism is arranged in the housing such that it extends from the housing when it is in its unlocked position and slides into the housing on activation.

In one embodiment of the present invention, the internal surface of the housing comprises a cam against which the resilient arm is biased on activation such that the spring force in the resilient arm increases according to the distance by which the locking mechanism is slid into the housing from its unlocked position.

The cam provides a mechanical advantage so that the arms can be designed for a higher spring rate with shorter travel than that necessarily required to disengage the locking mechanism.

Preferably, the locking mechanism comprises a plurality of resilient arms, wherein the housing includes a corresponding cam surface on the internal surface of the housing against which each resilient arm is biased on activation. Most preferably, the locking mechanism comprises two arms.

BRIEF DESCRIPTION OF THE DRAWINGS

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

Figure 1 shows a perspective view of an injection device according to the present invention without an upper section of its housing;

Figure 2 shows a top-side view of the injection device shown in figure 1;

Figure 3 shows an expanded perspective view of the housing and releasable locking mechanism of the injection device of the present invention; and

Figure 4 shows an alternative expanded perspective view of the housing and releasable locking mechanism of the injection device of the present invention.

DETAILED DESCRIPTION OF THE DRAWINGS

Figures 1 and 2 show an injection device 110 according to a first embodiment of the present invention. The injection device 110 has an injection device housing 112 and a longitudinal axis 101.

A syringe (not shown) is contained in the housing 112. The injection device 110 comprises trigger 114 (actuator) and a releasable locking mechanism 116. The trigger 114 has a first end 114a and a second end 114b. The trigger 114 is rotatable about a pivot 115 from a rest position (as shown in Figure 2) to an active position. The second end 114b of the trigger 114 connects with a drive coupling 121 which is acted upon by a drive spring 120. The drive coupling 121 is in communication with the syringe 122.

Rotation of the trigger 114 about the pivot 115 in a direction R (i.e. downwards into the housing 112 at its first end 114a) causes the second end 114b of the trigger 114 to disengage from the drive coupling 121, thereby letting the drive spring 120 drive the syringe 122 (via the drive coupling 121) along the longitudinal axis 101 and out of an aperture 118 in the housing 112.

The releasable locking mechanism 116 is in communication with sliding sleeve 126 which protrudes, when in a first position, from the aperture 118 in the housing 112. The locking mechanism 116 is deactivated by movement of the sliding sleeve 126 along the longitudinal axis 101 into the housing 112 into a second position.

A first end 126a of the sliding sleeve 126 can be placed against a body into which drug is being delivered, thereby deactivating the releasable locking mechanism 116 and allowing the trigger 114 to rotate in direction R from its rest position to its active position.

The trigger 114 is provided at its first end 114a with a first portion 150 having a cut-out 152. The first portion 150 extends from the first end 114a of the trigger 114a in a direction substantially parallel to the longitudinal axis 101.

The releasable locking mechanism 116 includes a protrusion 154 which projects in a direction along a perpendicular axis 181 which is perpendicular to the longitudinal axis 101. The cut-out 152 is dimensioned to receive the protrusion.

When the releasable locking mechanism 116 is in its first position, an end of the protrusion abuts an under-surface of the first portion 150, thereby preventing rotation of the trigger 114.

When the releasable locking mechanism 116 is in its second position (not shown) following movement of the sliding sleeve 126 into the housing 112, the cut-out 152 is positioned above the end of the protrusion 154 allowing it to pass over the protrusion 154 when a downwards force is applied the trigger 112. Hence, the trigger 112 is no longer prevented from rotating and disengages itself from the drive coupling 121, thereby extending the syringe 122.

As can be seen in figures 3 and 4, the releasable locking mechanism 116 is provided with a pair of integrally formed resilient arms 201. The resilient arms 201 flex resiliently in a direction away and towards the releasable locking mechanism 116.

The housing 112 comprises a pair of camming surfaces 210 which are positioned in line with the resilient arms 201 towards the end of the point in the housing 112 at which the locking mechanism 116 is disengaged.

The resilient arms 201 communicate with the camming surfaces 210 such that, as the sleeve 126 is pressed into the housing 112, the arms 201 bias the releasable locking mechanism 116 and sleeve 126 out of the opening 126. In this way, when no force is applied to the end 126a of the sleeve, the releasable locking mechanism 116 remains engaged preventing actuation of the trigger.

It will be appreciated that any configuration of integrally-formed resilient biasing may be used in place of the arms 201.

The present invention provides the significant advantage that the biasing of the releasable locking mechanism 116 is integral with the mechanism itself, thereby obviating the need for small springs which are complex and costly to assemble. Alternatively, the skilled person will appreciate that the resilient arms 201 could be mounted on the housing 112 and communicate with a surface of the releasable locking mechanism 116.

It will of course be understood that the present invention has been described above purely by way of example and modifications of detail can be made within the scope of the invention.

CLAIMS

1. An injection device comprising:

a housing adapted to receive a syringe having a discharge nozzle;

an actuator;

a drive acted upon by the actuator and in turn acting on the syringe to advance it from a retracted position in which the discharge nozzle is contained within the housing to an extended position in which the discharge nozzle extends form the housing;

a locking mechanism in communication with the actuator and activatable to be moved from a locked position in which the actuator is prevented from releasing the drive to an unlocked position in which the actuator is operable to act upon the drive to advance the syringe;

characterised in that the locking mechanism or the housing includes integrally formed biasing means adapted to return the locking mechanism to a locked position when it is not activated.

2. The injection device of claim 1, wherein the locking mechanism includes the integrally formed biasing means.

3. The injection device of claim 2, wherein the biasing means comprises at least one resilient arm integrally formed with the locking mechanism.

4. The injection device of claim 3, wherein the locking mechanism is arranged in the housing such that the resilient arm is biased against a surface of the housing on activation.

5. The injection device of claim 4, wherein the locking mechanism is arranged in the housing such that it extends from the housing when it is in its unlocked position and slides into the housing on activation.

6. The injection device of claim 5, wherein the internal surface of the housing comprises a cam against which the resilient arm is biased on activation such that the

spring force in the resilient arm increases according to the distance by which the locking mechanism is slid into the housing from its unlocked position.

7. The injection device of claim 6, wherein the locking mechanism comprises a plurality of resilient arms, wherein the housing includes a corresponding cam surface on the internal surface of the housing against which each resilient arm is biased on activation.

8. The injection device, substantially as hereinbefore described with reference to the accompanying drawings.