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

Previously known injection devices are shown in WO 95/35126 and EP-A-0 516 473 and tend to employ a drive spring and a trigger that, when activated, causes the drive spring to act on the syringe when a releasable locking mechanism is also engaged.

Generally, the trigger is rotatable about an axis so that when it is depressed at a first end, a second end (which normally engages the drive spring) is also rotated, thereby releasing the drive spring, extending the syringe and discharging its contents. The trigger comprises a protrusion which is engageable with a cut-out on the releasable locking mechanism when the releasable locking mechanism is engaged, thereby allowing the trigger to be activated. When the releasable locking mechanism is not engaged, the protrusion abuts a portion of the releasable locking mechanism preventing rotation of the trigger and release of the drive spring. This way, accidental activation of the trigger can be prevented.

A problem with an injection device of this type is that the protrusion on the trigger flexes when a force is applied to the trigger and the releasable locking mechanism is not engaged. A strong force applied to the trigger can cause enough flex in the protrusion that the end of the protrusion can engage the cut-out on the releasable locking mechanism, thereby allowing the trigger to be activated even when the releasable locking mechanism has not been engaged.

SUMMARY OF THE INVENTION

The injection device of the present invention is designed to deal with this and other problems.

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

a housing defining a first axis and adapted to receive a syringe having a discharge nozzle so that the syringe is movable between a retracted position in which the discharge nozzle is contained within the housing and an extended position in which the discharge nozzle extends from the housing through an exit aperture;

a drive that is acted upon and in turn acts upon the syringe;

a trigger movable from a rest position, in which it causes the drive to be retained, to an active position, in which it no longer causes the drive to be so retained, thus allowing the contents of the syringe to be discharged through the discharge nozzle; and

a releasable locking mechanism movable from a first position in which the trigger is prevented from moving into its active position to a second position in which the trigger can be moved into its active position,

wherein the trigger includes a first portion having a cut-out therein, the first portion extending from a first end of the trigger in a direction substantially parallel to the first axis; and the releasable locking mechanism includes a protrusion along a second axis for communicating with the first portion of the trigger when the releasable locking mechanism is in its first position and for communicating with the cut-out when the releasable locking mechanism is in its second position.

Thus, when a force is applied to the trigger when the locking mechanism is in its first position (i.e. engaged), the first portion of the trigger and the protrusion both flex in such a way that the protrusion is forced away from the cut-out, thereby decreasing the risk of accidental activation of the trigger.

In one embodiment of the invention, the protrusion comprises a first ridge adapted to communicate with an edge of the cut-out when the releasable locking mechanism is in its second position and the trigger is in its active position, thereby preventing movement of

the trigger from its active position to its rest position.

In addition, the trigger may further include a second portion which extends into the cut-out from the first portion of the trigger and which is arranged to communicate with the ridge when the releasable locking mechanism is in its second position and the trigger is in its active position.

Accordingly, the trigger can be maintained in a rotated position following activation, thereby serving to indicate that the injection device has been used.

Preferably, the releasable locking mechanism comprises biasing means arranged to bias the protrusion against the second portion.

Advantageously, the first portion of the trigger comprises a second ridge positioned on the first portion such that the protrusion is located between the cut-out and the second ridge when the trigger is in its rest position such that the second ridge communicates with the protrusion if an attempt is made to move the trigger from its rest position.

The second ridge prevents the first portion of the trigger and the protrusion flexing in such a way that the end of the protrusion extends beyond the end of the first portion which would result in the trigger being able to rotate.

The protrusion may comprise a sloped surface which is angled with respect to the second axis, thereby ensuring that the protrusion enters the cut-out smoothly when the locking mechanism is disengaged.

Preferably, the first axis and second axis are perpendicular to each other which ensures that the protrusion and first portion are optimally arranged to ensure that the protrusion enters the cut-out when the locking mechanism is disengaged, but also means that the protrusion and first portion will flex in such a way to avoid accidental activation of the trigger when the release mechanism is engaged.

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;

Figure 2 shows a side view of the injection device of figure 1 with an upper section of its housing not shown;

Figure 3 shows a side view of the injection device of figure 2 with further components not shown;

Figure 4 shows a top plan view of the injection device of figure 2;

Figure 5 shows a perspective view of a trigger and releasable locking mechanism according to an embodiment of the present invention; and

Figure 6 shows an alternative perspective view of the trigger and releasable locking mechanism of Figure 5.

DETAILED DESCRIPTION OF THE DRAWINGS

Figures 1 to 4 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 122 is contained in the housing 112. The injection device 110 comprises trigger 114 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.

As can be seen from Figures 5 and 6, 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 154.

When the releasable locking mechanism 116 is in its first position, an end 154a of the protrusion 154 abuts an under-surface 156 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.

The protrusion 154 comprises a first ridge 160. The trigger 114 includes a second portion 162 which extends into the cut-out 152 from the first portion 150 of the trigger 114 and which is arranged to communicate with the second portion 162 following rotation of the trigger 114 so that the first ridge 160 is locked over the second portion 162, thereby preventing movement of the trigger 114 from its active position back to its rest position.

The locking mechanism 116 includes biasing means, in the form of resilient arms 171, which act against the internal surface of the housing 112 to bias the locking mechanism 116 and sliding sleeve 126 in a direction out of aperture 118. This way, following activation of the trigger 112, the first ridge 160 is locked over the second portion 162 of the trigger 112, thereby holding the trigger 112 in its active position.

The first portion 150 of the trigger comprises a second ridge 164 on the under-surface 156 of the first portion 150 which is positioned between the cut-out 152 and the end of the first portion 150. The second ridge 164 abuts the protrusion 154 when force is applied to the trigger 114 in a direction R and the release mechanism is in its first (i.e. engaged) position. This prevents the protrusion 154 from moving into a position in which its end 154a moves over the end of the first portion 150 which would allow the trigger 114 to rotate whilst the releasable locking mechanism 116 was still engaged, thereby accidentally "firing" the injection device 110.

The protrusion 154 has a sloped surface 166 which is angled with respect to the second axis 181 which allows the second portion 162 of the trigger 114 to pass over the protrusion 154 more effectively when the trigger 114 is rotated and the releasable locking mechanism 116 is disengaged.

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 defining a first axis and adapted to receive a syringe having a discharge nozzle so that the syringe is movable between a retracted position in which the discharge nozzle is contained within the housing and an extended position in which the discharge nozzle extends from the housing through an exit aperture;

a drive that is acted upon and in turn acts upon the syringe;

a trigger movable from a rest position, in which it causes the drive to be retained, to an active position, in which it no longer causes the drive to be so retained, thus allowing the contents of the syringe to be discharged through the discharge nozzle; and

a releasable locking mechanism movable from a first position in which the trigger is prevented from moving into its active position to a second position in which the trigger can be moved into its active position,

wherein the trigger includes a first portion having a cut-out therein, the first portion extending from a first end of the trigger in a direction substantially parallel to the first axis; and the releasable locking mechanism includes a protrusion along a second axis for communicating with the first portion of the trigger when the releasable locking mechanism is in its first position and for communicating with the cut-out when the releasable locking mechanism is in its second position.

2. The injection device of claim 1 wherein the protrusion comprises a ridge adapted to communicate with an edge of the cut-out when the releasable locking mechanism is in its second position and the trigger is in its active position, thereby preventing movement of the trigger from its active position to its rest position.

3. The injection device of claim 2 wherein the trigger further includes a second portion which extends into the cut-out from the first portion of the trigger and which is arranged to communicate with the ridge when the releasable locking mechanism is in its second position and the trigger is in its active position.

4. The injection device of claim 3, wherein the releasable locking mechanism comprises biasing means arranged to biase the protrusion against the second portion.

5. The injection device of any one of the preceding claims wherein the first portion of the trigger comprises a ridge positioned on the first portion such that the protrusion is located between the cut-out and the ridge when the trigger is in its rest position such that the ridge communicates with the protrusion if an attempt is made to move the trigger from its rest position.

6. The injection device of any one of the preceding claims, wherein the protrusion comprises a sloped surface which is angled with respect to the second axis.

7. The injection device of any one of the preceding claims, wherein the first axis and second axis are perpendicular to each other.

8. An injection device substantially as hereinbefore described with reference to and as shown in the attached drawings.