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.

An auto-injector is known from WO 2007/036676 which has a locking mechanism which must be disengaged before the release mechanism can be activated. In its locked position, the locking mechanism also prevents forward movement of the syringe out of the injection device against the bias of the return spring, for example when a cap gripping a boot covering the syringe needle, is removed. In the injection device described in WO 2007/036676, the locking mechanism comprises a sleeve which protrudes from an open end of the injection device. The sleeve is biased into its extended position by a resilient spring mechanism which must be overcome to disengage the locking mechanism. The locking mechanism can be disengaged by, for example, moving the sliding sleeve inwardly into the injection device (i.e. retracting the sleeve). This can be done by forcing the end of the sliding sleeve against tissue and then activating the release mechanism.

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.

WO2006/106293 discloses an injection device which addresses this problem. In that case, 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. 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.

It was found that 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 still further.

However, it has been found that users of injection devices, such as those described in WO2007/036676 and WO 2006/106293, struggle to operate the device correctly. In particular, users struggle to actuate the trigger when the sliding sleeve has been retracted, either because the sliding sleeve has not quite been retracted sufficiently, or because the overall force required to actuate the trigger is too great. Because tolerances for these components is often very tight, there is often a very small, or no, margin of error in the distance to which the sliding sleeve must be retracted before triggering is possible. This can be very frustrating for users, since they may make numerous unsuccessful attempts at activating the injection since they are unaware that the sliding sleeve has not been fully retracted. Further, the frustrated user may attempt to force the injection device, i.e. by applying excessive pressure to the trigger, and so damage the injection mechanism.

One solution to the aforementioned problem is to ensure that the user knows whether or not the sliding sleeve is fully retracted, such that he or she does not attempt to actuate the trigger too early. Such solutions are helpful, but often the effort required to fully retract the sliding sleeve is too great, or else it is sufficient for the sleeve to have been retracted to within a particular tolerance.

There is therefore a need to provide an injection device that facilitates triggering of the device. The present invention addresses such a problem.

Summary of the invention

The injection device of the present invention is designed to deal with this and other problems. In a first aspect, the present invention provides an injection device comprising an actuator adapted when actuated to cause commencement of an injection sequence. The injection device further comprises a locking mechanism adapted to be moved between a locked position in which the locking mechanism prevents the actuator from being actuated, and an unlocked position in which the actuator can be actuated to cause commencement of the injection sequence. The locking mechanism comprises a contact portion which in the locked position of the locking mechanism projects against the actuator. The contact portion comprises a curved surface.

In the present specification, the term 'curved' means any rounded surface which results in the contact between the contact portion and the actuator to be a substantially 1-dimensional line or a point, rather than a 2-dimensional surface. It is often easier to determine that the contact portion is out of contact with the actuator if the contact between the portion and the actuator is a 1-dimensional line or a point, rather than a 2-dimensional surface. This also facilitates the manufacturing process, since tolerances need not be so accurate.

The provision of a curved surface on a contact portion reduces the overall force necessary to actuate the actuator (e.g. trigger) when the locking mechanism (e.g. sliding sleeve) has been retracted, or nearly retracted, without materially affecting the safety of the device. It is also possible to retract the locking mechanism whilst a force is exerted on the actuator, which is often convenient for users with reduced dexterity.

Moreover, the curved surface of the contact portion may assist in retracting the locking mechanism. The curved surface may, for example, be arranged with respect to the actuator such that once the locking mechanism has been retracted sufficiently (by engagement with a user's skin, for example), the act of exerting a force on the actuator will result in the actuator retracting the locking mechanism still further, as described further below.

In certain embodiments, the locking mechanism is adapted such that the contact potion is not in contact with the engagement surface of the actuator when the locking mechanism is in its locked position. In other words, in certain embodiments, the contact portion is adapted to contact an engagement surface of the actuator when the locking mechanism is in its locked position. The engagement surface may be a planar surface, and may be perpendicular with respect to the longitudinal axis of the injection device, or inclined with respect to that axis. The angle of inclination may be tailored as desired to achieve the necessary force required to activate the

device. For example, the surface may be inclined toward a cut-out portion (mentioned above) so as to increase likelihood of successful engagement, or may be away from the cut-out portion so as to decrease the likelihood of accidental engagement.

The locking mechanism may be adapted such that the curved surface of the contact portion is in contact with the engagement surface over only a sub part of the contact portion when the locking mechanism is not in its unlocked position. In other words, when the locking mechanism is not in its unlocked position, the curved surface of the contact portion may be adapted to contact the engagement surface over only a sub-part of the contact portion. The size of the sub-part may be adjusted depending on the force required to activate the device.

The locking mechanism may be adapted such that the contact position is not in contact with the engagement surface of the actuator when the locking mechanism is in its unlocked position. In other words, the contact portion may be adapted not to contact an engagement surface of the actuator when the locking mechanism is in its unlocked position. In other words, when the locking mechanism is fully retracted, the contact surface may be entirely clear of the engagement surface.

The locking mechanism is preferably moveable between its locked position and its unlocked position such that the contact portion moves from a position in which it contacts the engagement surface of the actuator to a position in which it no longer contacts the engagement surface of the actuator.

In preferred arrangements, the locking mechanism slides between its locked position and unlocked position along a first axis A. For example, the locking mechanism may be a sliding sleeve which is slidable upon engagement with a user's skin. The first axis A may be parallel with the longitudinal axis of the injection device.

The contact portion may comprise a first projection which extends from the locking mechanism. Preferably, the first projection extends along a second axis B.

The engagement surface may be a surface on a first portion which extends from the actuator. Preferably, the first projection extends along third axis C.

In particularly preferred embodiments, the second axis B and third axis C intersect each other with an intersection angle of between 45 and 90 degrees, 60 and 90 degrees, 80 and 90 degrees, or 90 degrees. Moreover, in a further preferred embodiment, the first axis A and third axis C are parallel to each other. In a further preferred embodiment the second axis B intersects both the first axis A

and the third axis C. The relationships between the axes described above may be provided independently of each other.

The actuator may be configured to move between a first position, in which commencement of the injection sequence is prevented, and a second position in which commencement of the injection sequence occurs. For example, the injection device may further comprise a drive mechanism, wherein the actuator comprises a locking surface which inhibits the drive mechanism when the actuator is in its first position and which does not inhibit the drive mechanism when the drive mechanism is in its second position. A direct relationship between the actuator and a drive mechanism is a convenient and reliable implementation.

Preferably the actuator rotates between its first and second positions about a pivot. This facilitates actuation of the actuator, particularly for those with reduced dexterity. Where a pivot is provided, it is particularly preferred if the axis of the pivot and the second axis B substantially intersect each other with an intersection angle of between 45 and 90 degrees, 60 and 90 degrees, 80 and 90 degrees, or 90 degrees.

Preferably the injection device further comprises a syringe which is moveable by the drive mechanism on commencement of the injection sequence from a position in which the syringe is wholly contained within a body of the injection device to a position in which a needle of the syringe extends from the body of the injection device via an opening. The drive mechanism may be adapted to expel contents of the syringe via the needle when the syringe is in its extended position.

In any embodiment, the injection device may contain a substance selected from the group consisting of: golimumab, hormones, antitoxins, substances for the control of pain, substances for the control of thrombosis, substances for the control or elimination of infection, peptides, proteins, human insulin or a human insulin analogue or derivative, polysaccharide, DNA, RNA, enzymes, antibodies, oligonucleotide, antiallergics, antihistamines, anti-inflammatories, corticosteroids, disease modifying anti-rheumatic drugs, erythropoietin, or vaccines, for use in the treatment or prevention of rheumatoid arthritis, psoriatic arthritis, ankylosing spondylitis, ulcerative colitis, hormone deficiency, toxicity, pain, thrombosis, infection, diabetes mellitus, diabetic retinopathy, acute coronary syndrome, angina, myocardial infarction, atherosclerosis, cancer, macular degeneration, allergy, hay fever, inflammation, anaemia, or myelodysplasia, or in the expression of protective immunity.

By 'the injection device may contain a substance' it is meant that the substance may be contained within a suitable medicament container, such as a vial or syringe, within the injection device. Such medicament container may contain other substances, such as further active or inactive ingredients.

In a further aspect of the invention, a substance is provided, the substance being selected from the group consisting of: golimumab, hormones, antitoxins, substances for the control of pain, substances for the control of thrombosis, substances for the control or elimination of infection, peptides, proteins, human insulin or a human insulin analogue or derivative, polysaccharide, DNA, RNA, enzymes, antibodies, oligonucleotide, antiallergics, antihistamines, anti-inflammatories, corticosteroids, disease modifying anti-rheumatic drugs, erythropoietin, or vaccines, for use in the treatment or prevention of rheumatoid arthritis, psoriatic arthritis, ankylosing spondylitis, ulcerative colitis, hormone deficiency, toxicity, pain, thrombosis, infection, diabetes mellitus, diabetic retinopathy, acute coronary syndrome, angina, myocardial infarction, atherosclerosis, cancer, macular degeneration, allergy, hay fever, inflammation, anaemia, or myelodysplasia, or in the expression of protective immunity, by delivery of said substance to a human subject using an injection device according to any of the above embodiments.

In yet another aspect of the invention, an injection device is provided for use in the treatment or prevention of rheumatoid arthritis, psoriatic arthritis, ankylosing spondylitis, ulcerative colitis, hormone deficiency, toxicity, pain, thrombosis, infection, diabetes mellitus, diabetic retinopathy, acute coronary syndrome, angina, myocardial infarction, atherosclerosis, cancer, macular degeneration, allergy, hay fever, inflammation, anaemia, or myelodysplasia, or in the expression of protective immunity, by delivery of a substance selected from the group consisting of: golimumab, hormones, antitoxins, substances for the control of pain, substances for the control of thrombosis, substances for the control or elimination of infection, peptides, proteins, human insulin or a human insulin analogue or derivative, polysaccharide, DNA, RNA, enzymes, antibodies, oligonucleotide, antiallergics, antihistamines, anti-inflammatories, corticosteroids, disease modifying anti-rheumatic drugs, erythropoietin, or vaccines, to a human subject by using the injection device, where the injection device is an injection device of any of the above embodiments.

By 'delivery of a substance' it is meant that the injection device is used to inject said substance into the human subject, for example by subcutaneous, intradermal or intramuscular injection. Said substance may be administered in combination with other substances, such as further active or inactive ingredients.

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 exemplary injection device;

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 an exemplary trigger and releasable locking mechanism;

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

Figure 7 shows a side view of the trigger and releasable locking mechanism of Figure 5; and

Figure 8 shows a side view of a trigger and releasable locking mechanism according to the present invention.

Detailed Description of the Drawings

Figures 1 to 4 show an exemplary injection device 110. 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.

The first portion 150 is angled away from the cut-out 152 such that cut-out is deflected away from the cut-out when a force is applied to the trigger 114 and the locking mechanism is disengaged.

Figure 4 shows two axes. Axis 'A' is parallel to the longitudinal axis of the injection device and along which the sliding sleeve 126 slides in the manner described above. Axis 'T' is a trigger axis which is the axis about which trigger 114 is configured to rotate.

Figure 7 shows the first portion 150, cut out 152 and protrusion 154 in more detail. As can be seen, the protrusion comprises only flat surfaces, albeit sloped and angled as described above. As can be seen, the distal part of the first portion 150 is angled away from the cut out 152.

Figure 8 shows a first portion 850, cut out 852 and protrusion 854 of an injection device according to the present invention. In all other respects, the injection device according to the present invention is the same as described above. The protrusion 854 terminates in a curved surface 853, which engages the first portion 850. Because the protrusion is curved where it contacts the actuator, the contact between the protrusion 854 and the actuator is a line (or in some embodiments, a point) rather than a surface.

The curved surface extends substantially over 180° of the end of the protrusion 854 engaging the first portion 850. However, the curved surface could extend substantially over different angles, including 160°, 140°, 120°, 90°, 60° or 40°. Preferably, the curved surface extends over the protrusion enough to ensure that the edge of first portion 850 only ever contacts the protrusion at a curved surface. The curved surface may either be in line or offset or with the centre of the protrusion 854, depending on the preferred implementation.

As shown, the first portion 850 extending from the actuator is substantially planar with respect to the actuator, and with respect to axis A. However, the first portion 850 may be alternatively be angled as shown in Figure 7, or else could be angled toward the cut-out such that the force required to activate the device if the locking mechanism is not quite in the unlocked portion is reduced.

Axis 'B' is shown in figure 8. Axis B is the axis along which protrusion 854 extends from the locking mechanism. Axis B is at an angle of approximately 90° with respect to axis A mentioned above, although other angles of between 45 and 90 degrees, 60 and 90 degrees, 80 and 90 degrees are possible, depending on the preferred implementation.

Axis 'C' is shown in figure 8. Axis C is the axis along which first portion 850 extends from the actuator. Axis C is approximately parallel with respect to axis A mentioned above, although other angles of between 0 and 45 degrees, 0 and 20 degrees, 0 and 10 degrees, 0 and 5 degrees are possible, depending on the preferred implementation. Moreover, axis C is at an angle of approximately 90° with respect to axis B mentioned above, although other angles of between 45 and 90 degrees, 60 and 90 degrees, 80 and 90 degrees are possible, depending on the preferred implementation.

It will be appreciated that as the locking mechanism is retracted (by engagement of the sliding sleeve on the body), the curved surface of the protrusion 854 is moved closer to the cut-out 852 in the first portion 850 of the actuator. At some point in this movement, the line (or point, in certain embodiments) of contact between the protrusion and the actuator reaches the edge where the cut-out begins. Here, as the protrusion is moved further in the same direction of retraction, the normal force between the actuator and the locking mechanism moves from being substantially perpendicular to the longitudinal axis, to being at least partly in the direction of retraction because of the arrangement of the curved surface on the protrusion. Thus, when a force is exerted on the actuator when the protrusion is in this position, that force acts to retract the locking mechanism still further, and assist the movement of the locking mechanism into the unlocked position.

In use, such an injection device as described above might be used to deliver substances such as: golimumab, hormones, antitoxins, substances for the control of pain, substances for the control of thrombosis, substances for the control or elimination of infection, peptides, proteins, human insulin or a human insulin analogue or derivative, polysaccharide, DNA, RNA, enzymes, antibodies, oligonucleotide, antiallergics, antihistamines, anti-inflammatories, corticosteroids, disease modifying anti-rheumatic drugs, erythropoietin, or vaccines, for use in the treatment or prevention of rheumatoid arthritis, psoriatic arthritis, ankylosing spondylitis, ulcerative colitis, hormone deficiency, toxicity, pain, thrombosis, infection, diabetes mellitus, diabetic retinopathy, acute coronary syndrome, angina, myocardial infarction, atherosclerosis, cancer, macular degeneration, allergy, hay fever, inflammation, anaemia, or myelodysplasia, or in the expression of protective immunity. In addition to these substances, any medicament contained within the injection device may also include other substances, such as inactive ingredients, as a skilled person would appreciate.

It will of course be understood by the person skilled in the art that particular substances are efficacious for use in the treatment or prevention of particular conditions, as is well known in the art. For instance, it is known that antiallergics are efficacious for use in the treatment or prevention of allergies; antihistamines are efficacious for use in the treatment or prevention of hay fever; anti-inflammatories are efficacious for use in the treatment or prevention of inflammation; and so on. Accordingly, any selection of one or more substances listed herein or in the claims for use in the treatment or prevention of one or more conditions for which those substance(s) are known to be efficacious is envisaged.

In a particular example, however, golimumab is known to be efficacious for use in the treatment or prevention of one or more of rheumatoid arthritis, psoriatic arthritis, ankylosing spondylitis or ulcerative colitis, or any combination of rheumatoid arthritis, psoriatic arthritis, ankylosing spondylitis and ulcerative colitis, or all of rheumatoid arthritis, psoriatic arthritis, ankylosing spondylitis and ulcerative colitis.

Golimumab may optionally be used in combination with one or more inactive ingredients such as any or all of L-histidine, L-histidine monohydrochloride monohydrate, sorbitol, polysorbate 80, and water. Golimumab may present in a composition in which golimumab is the only active ingredient. For example, golimumab may administered as SIMPONI®.

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:

an actuator adapted when actuated to cause commencement of an injection sequence;

a locking mechanism adapted to be moved between a locked position in which the locking mechanism prevents the actuator from being actuated, and an unlocked position in which the actuator can be actuated to cause commencement of the injection sequence,

wherein the locking mechanism comprises a contact portion which in the locked position of the locking mechanism projects against the actuator, wherein the contact portion comprises a curved surface,

wherein the locking mechanism is adapted such that the contact portion is not in contact with an engagement surface of the actuator when the locking mechanism is in its unlocked position.

2. The injection device of claim 1, wherein the locking mechanism is adapted such that the contact portion is in contact with an engagement surface of the actuator when the locking mechanism is in it locked position.

3. The injection device of claim 2, wherein the engagement surface is a planar surface.

4. The injection device of claim 2 or claim 3, wherein, when the locking mechanism is not in its unlocked position, the curved surface of the contact portion is in contact with the engagement surface over only a sub-part of the contact portion.

5. The injection device of claims 2 and 3, wherein the locking mechanism is moveable between its locked position and its unlocked position such that the contact portion moves from a position in which it contacts the engagement surface of the actuator to a position in which is no longer contacts the engagement surface of the actuator.

6. The injection device of claim 5, wherein the locking mechanism slides between its locked position and unlocked position along a first axis A.

7. The injection device of any one of claims 2 to 6, wherein the contact portion comprises a protrusion which extends from the locking mechanism.

8. The injection device of claim 7, wherein the protrusion extends along a second axis B.

9. The injection device of any one of claims 2 to 8, wherein the engagement surface is a surface on a first portion which extends from the actuator.

10. The injection device of claim 9, wherein the first portion extends along third axis C.

11. The injection device of claim 10 when dependent on claim 8, wherein the second axis B and third axis C intersect each other with an intersection angle of between 45 and 90 degrees, 60 and 90 degrees, 80 and 90 degrees, or 90 degrees.

12. The injection device of claim 11 when dependent on claim 6, wherein the first axis A and third axis C are parallel to each other.

13. The injection device of claim 12, wherein the second axis B intersects both the first axis A and the third axis C.

14. The injection device of any one of the preceding claims, wherein the actuator moves between a first position in which commencement of the injection sequence is prevented, and a second position in which commencement of the injection sequence occurs.

15. The injection device of claim 14, further comprising a drive mechanism, wherein the actuator comprises a locking surface which inhibits the drive mechanism when the actuator is in its first position and which does not inhibit the drive mechanism when the drive mechanism is in its second position.

16. The injection device of claim 15, wherein the actuator rotates between its first and second positions about a pivot.

17. The injection device of claim 16 when dependent on claim 9, wherein the axis of the pivot and the second axis B substantially intersect each other with an intersection angle of between 45 and 90 degrees, 60 and 90 degrees, 80 and 90 degrees, or 90 degrees.

18. The injection device of any one of the preceding claims when dependent on claim 15, further comprising a syringe which is moveable by the drive mechanism on commencement of the injection sequence from a position in which the syringe is wholly contained within a body of the injection device to a position in which a needle of the syringe extends from the body of the injection device via an opening, wherein the drive mechanism is adapted to expel contents of the syringe via the needle when the syringe is in its extended position.