Abstract: The invention relates to an autoinjector 59 for administering a fluid medicament to a subject comprising: a housing 1 for receiving a cartridge holder; a driver assembly 8; the driver assembly on actuation may move the cartridge 3 forward in the cartridge holder 2; a needle cover 4 may be coupled to the housing wherein the needle cover 4 travels in a linear or translational movement; said needle cover 4 is adapted to protect a needle when the needle cover may be in first locking position 17 and second locking position 18; the linear or translational movement may be achieved by a cam profile 13 and a cam follower 14; the cam profile 13 may be provided on outside surface of housing and the cam follower 14 located between the needle cover 4 and the housing 1; a first biasing member 15; and a second biasing member 16 configured to bias the cartridge 3 and the needle cover 4 respectively; and a safety cap 11 to control the actuation of the autoinjector.


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AUTOINJECTOR WITH A NEEDLE COVER

PRIORITY DOCUMENTS

This application claims priority from the Indian provisional patent application Nos. IN 201721006679 (filed on Feb 24, 2017) and IN 201721031188 (filed on Sep 4, 2017), both of which are incorporated herein by reference in their entirety for all purposes.

FIELD OF THE INVENTION

The application relates to an autoinjector for administering a fluid medicament to a subject.

BACKGROUND OF THE INVENTION

Autoinjector is used to inject a dose of medicament which may be contained in a container and deliver the medicament through a needle. The container may be a cartridge or a pre filled syringe and the like.

Many people have 'needle phobia' and are apprehensive of seeing a needle during medicament administration. As a result, people with 'needle phobia' may not regularly administer medicament as prescribed or may improperly administer an injection due to their apprehension.

The following patents disclose autoinjector with needle protection system:

U.S. 6,767,336 discloses autoinjector with a sharp protector that is manually or automatically deployable.
U.S. 7,449,012 discloses autoinjector with a needle cover at least partially received within the housing.
U.S. 6,805,686 discloses autoinjector with extendible needle protector shroud.
U.S. 8,617,119 discloses a safety device having a tubular support for a needle mount end and a protective shield slidably mounted on the support.
SUMMARY OF THE INVENTION

Some embodiments disclose an autoinjector for a medicament administration comprising: a housing having a proximal portion and a distal portion; a cartridge holder received within the housing; the cartridge holder having a proximal end and a distal end; an opening at the distal end; a cartridge; a plunger; a needle cover, wherein the housing is at least partially received within the needle cover; the autoinjector further comprises a needle cover locking mechanism, wherein the needle cover locking mechanism comprises a cam profile and cam follower, wherein the cam follower of locking mechanism is located between the needle cover and the distal portion of the housing in both first locking position and second locking position.

Some embodiments disclose an autoinjector for a medicament administration comprising: a housing having a proximal portion and a distal portion; a cartridge holder received within the housing; the cartridge holder is having a proximal end and a distal end; an opening at the distal end; a cartridge; the housing is having a first sleeve section and second sleeve section; the first sleeve section is having an inward transverse projections on the inner surface; a plunger; the plunger is having two wings provided on the outer surface; a needle cover, wherein the housing is at least partially received within the needle cover; the autoinjector further comprises a needle cover locking mechanism; wherein the needle cover locking mechanism comprises a cam profile, a cam follower; wherein the cam follower of the locking mechanism is located between the needle cover and the second sleeve section of the housing in both first locking position and second locking position; wherein the distal surfaces of the wings of the plunger engage the surface of the inward transverse stopping projections of the housing at the end of the medicament administration.

Some of the examples disclose the proximal portion of the housing; wherein the housing is having a first sleeve section; a first shoulder at the distal end of the first sleeve section; a second sleeve section extends distally from the first shoulder in the distal portion.

Some of the examples disclose a cartridge holder; wherein the cartridge holder is having slots provided on the proximal portion of the cartridge holder; openings are provided on the outer surface of the cartridge holder.
Some of the examples disclose the cam profile which comprises an angled contour surface in the proximal portion and cylindrical contour surface in the distal portion.

Some of the examples disclose the cam follower which comprises a cam follower protrusion on the distal portion; a cam follower button on the proximal portion; and a cam follower body extending between them.

Some of the examples disclose the autoinjector comprising the medicament selected from epinephrine or dihydroergotamine.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a longitudinal view of an autoinjector with a needle cover in the first locking position with structural details in a cross sectional view;

FIGURE 2 is a longitudinal view of an autoinjector with a needle cover in the first locking position during safety cap removal with structural details in a cross sectional view;

FIGURE 3 is a longitudinal view of an autoinjector with a needle cover in the second locking position with structural details in a cross sectional view;

FIGURE 4 is a side schematic view of distal end of housing with needle cover through the interaction between the cam profile and the cam follower in the first locking position;

FIGURE 5 is a side schematic view of distal end of housing with needle cover through the interaction between the cam profile and the cam follower when the needle cover is pressed on to an injection surface;

FIGURE 6 is a side exploded view of the cam follower and cam profile on the housing;

FIGURE 7 is a longitudinal view and bottom view of an autoinjector with a needle cover in the first locking position with structural details in a cross sectional view along line x-x;

FIGURE 8A shows side exploded view of the cam follower and cam profile on the fourth sleeve section of housing; FIGURE 8B; shows the exploded view of projections on fourth sleeve section;

FIGURE 9 is an exploded view of another embodiment of an autoinjector;

FIGURE 10 is a longitudinal view and bottom view of an autoinjector with a needle cover in the first locking position with structural details in a cross sectional view;

FIGURE 11A shows perspective view of needle cover top and needle cover bottom;
FIGURE 11B shows front view of cam follower; FIGURE 11C shows cross-sectional view of position of the cam follower on the second sleeve section of the housing after actuation and before needle cover extension;

FIGURE 12 shows a perspective view of the housing;

FIGURE 13 shows perspective view of the cartridge holder of the auto injector;

FIGURE 14 shows the position of the cam follower on the housing of an auto injector after needle cover extension;

FIGURE 15 shows a schematic view of cam profile on the housing;

FIGURE 16 shows a perspective view of the plunger;

FIGURE 17 shows a side view of the autoinjector with safety cap in place;

FIGURE 18 shows a perspective view of the autoinjector with safety cap removed;

FIGURE 19 shows a sectional view of the autoinjector with needle exposed from the needle cover bottom before medicament administration;

FIGURE 20 shows a sectional view of the autoinjector with needle exposed from the needle cover bottom after medicament administration;

FIGURE 21 shows a sectional view of the autoinjector with needle cover top and needle cover bottom in extended position protecting the exposed needle after medicament administration.

DETAILED DESCRIPTION OF THE INVENTION

The invention relates to an autoinjector for administering a fluid medicament to a subject.

As used herein, the proximal end of a component or component in an assembled autoinjector or the assembled autoinjector is the end that may correspond towards safety cap end. Distal end of a component or component in an assembled autoinjector or the assembled autoinjector may be the end that may correspond to the delivery end or towards the needle cover.

As used herein, the rearward end of a component or component in an assembled autoinjector or the assembled autoinjector is the end that may correspond towards safety cap end. Forward end of a component or component in an assembled autoinjector or the assembled autoinjector may be the end that may correspond to the delivery end or towards the needle cover.
As already described above a need was felt for an autoinjector with an improved needle protection system that may be easily used by a subject.

It may be advantageous if the needle is in a safe location before and after the use to prevent accidental injury or contamination.

Usually, the autoinjector with a needle protection system may include a needle cover to move towards the injection end over the needle once the injection of the medicament is completed. The movement of the needle cover with respect to the needle may often be triggered by a spring in an automatic way when the autoinjector is withdrawn from the injection site. In general, the needle cover may be locked in its "after use" position to a locking system.

Referring to FIGURES 1-3, one embodiment discloses an autoinjector 59 comprising: a housing 1 having a proximal portion and a distal portion; a cartridge holder 2 received within the housing 1; the cartridge holder 2 having a proximal end 29 and a distal end 29a; a cartridge 3 received within the cartridge holder 2; a needle 5 fixed to the distal end of the cartridge 3; a driver assembly 8 comprises a collet 9 and a collapsible lock 10; and a needle cover 4, wherein the housing 1 is at least partially received within the needle cover 4, wherein the needle cover 4 comprises a groove 45 on the inner surface of needle cover 4; a first locking position 17 and a second locking position 18; a safety cap 11, said safety cap 11 controls the actuation of the driver assembly 8; a first biasing member 15, said biasing member configured to bias the driver assembly 8; a second biasing member 16, said second biasing member 16 configured to bias the needle cover 4; a driver assembly 8 configured to move from a proximal portion of the housing 1 to urge the first biasing member 15 upon the removal of safety cap 11 and thereby move the cartridge 3 towards the distal end in the cartridge holder 2 to project the needle 5 beyond the needle cover 4; a locking mechanism 60 for locking the needle cover 4 to the housing 1 in first locking position 17 and in second locking position 18; wherein the locking mechanism 60 comprises a cam profile 13, a cam follower 14; the cam follower 14 of locking mechanism 60 is located between the needle cover 4 and the housing 1 in both first locking position 17 and second locking position 18. The cam profile 13 may be provided in diametrically opposite directions on outer surface of the housing 1; similarly cam follower 14 may be provided in diametrically opposite directions and located between the needle cover 4 and the housing 1.
The autoinjector has possible advantages over the injectors already known in the art. The most possible advantages are amongst; the locking mechanism for locking of linearly moveable needle cover 4 both before and after medicament administration may be achieved by a cam follower 14 which is operably associated both with needle cover 4 and the housing 1, a stationary component.

There may be inconsistencies in medicament delivery and malfunctioning of autoinjector wherein if the component of a locking mechanism for locking of linearly moveable needle cover involves two or more moveable components. In the needle cover locking mechanism of the autoinjector 59, no locking tooth is employed. The cam follower 14 of the locking mechanism of the autoinjector does not interact with three moveable components e.g. needle cover, cartridge container and cartridge. The cam follower 14 interacts with the housing 1 and needle cover 4.

The details of various embodiments of the autoinjector 59 are described in the following paragraphs. In this regard, reference can also be made to the some of the embodiments depicted in FIGURES 1-6.

An angled contour surface 41 of the cam profile 13 comprises a frustum of a cone surface 42 in the proximal portion and a cylindrical or rectangular contour surface 42a running from proximal to distal portion. The advantage of this is that the distal portion of the frustum of a cone surface 42 facilitates locking of needle cover 4 before medicament administration e.g. in the first locking position and the distal portion of cylindrical or rectangular contour surface 42a facilitates locking of needle cover 4 after medicament administration e.g. second locking position. Since housing surface on which cam profile surfaces (41, 42, 42a) are provided in a stationary housing component helps in avoiding malfunctioning of device. The length of the frustum of a cone surface 42 is such that it ensures the desired extension of the needle 5 on actuation of the autoinjector 59 by pressing needle cover 4 on to the patient body.

It is preferred that the cam follower 14 comprises a cam follower protrusion 40 on the distal portion; a cam follower button 38 on the proximal portion; and a cam follower body 39 extending between them. This is advantageous because the cam follower button 38 and cam follower body 39 which constitute significant surface area of the cam follower 14 establishes
firm linkage with cam profile 13 provided on the outer surface on the distal portion of the housing 1, a stationary component.

Some of the embodiments disclose the protrusion 40 of the cam follower 14 mates with groove 45 provided on opposite surfaces shown in FIGURE 1 and FIGURE 3 on the inner surface of the needle cover 4 both in the first locking position 17 and the second locking position 18. The advantage thereof is that the protrusion 40 provided over the cam follower 14 establishes operable connection to corresponding groove 45 provide better stability between the needle cover 4 and housing surface 26. The protrusion 40 may extend around 80% to 100% of the width of the cam follower body 39.

The cam follower button 38 of the cam follower 14 mates with the distal portion of angled contour surface 44 of the cam profile 13 in the first locking position 17. This has the favourable effect that that there is no relative movement between the two components e.g. housing surface 26 which is stationary and needle cover 4 which is a moveable component. Further one sub component e.g. cam follower button 38 that establishes linkage with a surface of a stationary component e.g. the housing 1.

The cam follower button 38 of the cam follower 14 engages with distal portion cylindrical contour surface 48a of the cam profile 13 in the second locking position 18. This is particularly advantageous in view of the fact that cam follower button 38 continues its travel on a stationary component housing 1 ensures precise covering of needle cover 4 after medicament administration.

Referring to FIGURES 1-3, the housing may be of cylindrical, oval or elliptical shape. The housing 1 may be of such a length that it may accommodate the cartridge holder 2 in distal portion of the housing 1; the proximal portion of the housing 1 may receive the driver assembly 8. The driver assembly 8 may comprise a collet 9, a top cover 21, a first biasing member 15, a collapsible lock 10, a plunger 19 and a stopper 20. The collet 9 may be cylindrical in shape having a central aperture 27 at its proximal end to form a hole and an outer turned flange 28 at the distal end. The collet 9 may have a cylindrical section 28a extending from proximal portion to distal portion. The flange 28 of the collet may establish contact with proximal end surface 29 of the cartridge holder 2 when the driver assembly 8 may be inserted in the housing 1. There may be a transverse portion 33 at the proximal end of the collet 9.
A cartridge holder 2 may be received within the housing 1. The cartridge holder 2 having proximal and distal portions, the distal portion having a reduced conical portion 2a whose distal end having an opening 30 therein; further, cartridge holder 2 may comprise a outer tubular sleeve 6 extending circumferentially along the longitudinal axis from the conical portion 2a in the distal direction; the outer tubular sleeve 6 may be cylindrical structure emerging from a flange 2b like structure protruding out from the proximal portion of the conical section longitudinally; the distal end of the outer tubular sleeve 6 may be coupled to the proximal end 4a of tubular structure that may extend from the inner surface of the transverse portion of the needle cover 4.

Further referring to FIGURES 1-3, collapsible lock 10 may fit within the collet 9; said collapsible lock 10 may comprise longitudinal blades 31 extending radially outward from a common longitudinal axis in the proximal portion. There may be four to six longitudinal blades 31. The higher number of longitudinal blades 31 may offer better operating stability. The proximal portion of the longitudinal blades 31 have shoulder 32 extending outwardly; the distal end of the shoulder 32 may establish contact with the distal end transverse surface 33 of the proximal end of collet 9. The collapsible lock 10 proximal body portion 34 may fit within inner diameter of first biasing member 15. The proximal body portion of collapsible lock 10 towards proximal end may have cut out portion on its underside to thus form elongated fingers terminating in frusto-conical detent 56 sloping rearwardly.

Referring FIGURE 2, the needle cover 4 may be a cylindrical, oval or elliptical part with a first sleeve section 35, a second sleeve section 36 at the proximal end and a frusto conical base 37 at distal end; the second sleeve section 36 may be located in between frusto conical base 37 and first sleeve section 35. The first sleeve section 35 of the needle cover 4 may have an internal circumference that may be slightly larger than the external circumference of the housing 1 which facilitates the travelling of needle cover 4 on the outer surface of housing 1 towards proximal direction when pressed on to the injection site.. The second sleeve section 36 of the needle cover 4 may have an internal circumference that may be slightly larger than the external circumference of the second sleeve section 25 of the housing 1 to allow the second sleeve section 25 of the housing 1 to pass through internal circumference of the second sleeve section 36. In a preferred embodiment, the housing 1 is at least partially received within needle cover 4.
The locking of the needle cover 4 in a first locking position 17 and a second locking position 18 with respect to the housing 1 may be attained by a locking mechanism 60. The locking mechanism 60 may comprise a cam profile 13 on the outer surface of the housing 1 and a cam follower 14. Further details of cam profile 13 and cam follower 14 are provided herein.

The needle cover 4 may be mounted on to the distal portion of housing 1. The needle cover has a linear movement both during the actuation and needle cover extension after medicament administration. A cam profile 13 may be provided on the outer surface of sleeve section 25 of the housing 1. The cam follower 14 may be located radially between the cam profile 13 and groove 45 of the inner portion of the needle cover 4. Referring to FIGURE 6, the cam follower 14 may comprise a cam follower protrusion 40 in the distal portion, a cam follower body 39 extending towards proximal portion and a cam follower button 38 in the proximal portion. The cam follower protrusion 40 and cam follower button 38 may be located on opposite surfaces of the cam follower body 39. The shape of the cam follower protrusion 40 of the cam follower 14 may be cylindrical, conical, square, rectangular, trapezoid and the like. The shape of the cam follower button 38 of the cam follower 13 may be cylindrical, conical, square, rectangular, trapezoid and the like.

In some of the embodiments, the translational movement of cam follower 14 may be considered as a combination of both linear and rotational movement corresponding to movement traced by the cam follower on cam surface.

Referring to FIGURE 6, the cam profile 13 provided on the outer surface of second sleeve section 25 of the housing 1 on its distal portion may be described as follows. An angled contour surface 41 of the cam profile 13 may have a frustum of a cone contour surface 42 in the proximal portion and cylindrical or rectangular contour surface 42a towards the distal portion as shown in FIGURE 4, FIGURE 5, and FIGURE 6. Cam profile 13 may be a groove 43 in the housing 1 to facilitate engagement or interaction of cam follower button 38, on to housing 1. It could also be that cam profile 13 may be a protrusion on the housing to facilitate engagement or interaction of cam follower button 38, on to housing 1. The engagement or interaction may be by snap fit, a butt joint, a bayonet coupling, welding or other known methods of attachment.
As shown in FIGURE 1, on the inner surface of the second sleeve section 36 of the needle cover 4, a groove 45 may be provided in the transverse direction radially. The groove 45 may be provided on opposing surfaces on the inner surface of the second sleeve section 36 of the needle cover 4. The cam follower protrusion 40 may be engaged or interaction with the needle cover groove 45. The interaction may be by snap fit, a butt joint, a bayonet coupling, welding or other known methods of attachment.

The cam follower 14 may maintain the first locking position 17 with the cam profile 13 provided on the housing 1 by the engagement or interaction of cam follower button 38 to the distal portion angled contour surface of 44 of the frustum of a cone contour surface 42. The pressing of needle cover 4 flat portion 46 against the injection site, causes the cam follower button 38 of the cam follower 14 to move in the frustum of a cone contour surface 42 translationally along the cam profile 13 on the housing 1 in the initial position and may reach the proximal portion of angled contour surface 47. The needle cover 4 interacts with protrusion 40 of cam follower 14 via groove 45. The proximal force is at least partially transferred to the cam follower 14. In response to the proximal force, the cam follower 14 moves proximally in the cam profile 13. The needle cover 4 may have only linear movement toward the housing 1. At the end of the actuation, the cam follower button 38 movement may stop, when the proximal surface of cam follower button 38 mates with proximal end of surface of the proximal portion of angled contour surface 41. The traverse distance of cam follower 14 through cam profile angled contour surface 41 from the distal portion angled contour surface of 44 of the frustum of a cone contour surface 42 to the proximal portion of angled contour surface 47 of the frustum of cone surface 42 may correspond to exposed length of the needle 5.

Referring to FIGURES 1-3, safety cap 11 may comprise top cylindrical, elliptical or oval shaped sleeve sized to fit over the end portion of the proximal end of housing 1. A safety pin 12 may extend distally from the centre of the cap 11 into the opening formed by inner ends of the collapsible lock 10 fingers to thereby prevent inward movement.

Referring to FIGURES 1-3, a first biasing member 15 may be positioned between the transverse portion of the collet 9 and the collapsible lock 10 and configured to bias the driver assembly 8. The proximal end of the first biasing member 15 may bias the inside surface of the proximal end of the collet 9. The distal end of the first biasing member 15 may bias the
proximal portion of the distal end of the collapsible lock 10. The second biasing member 16 may be positioned between the outer tubular sleeve 6 of the cartridge holder 2 and the transverse portion of the needle cover 4. The proximal end of the second biasing member 16 may be configured to bias the proximal end of outer sleeve 6 of the cartridge holder 2 and the distal end of the second biasing member 16 may bias proximal end of the transverse surface of the needle cover 4.

Referring to FIGURES 1-3, a top cover 21 may be fitted in the proximal end of the housing 1. The fitting of top cover 21 into the housing may be by any of the following methods. The top cover 21 may be cylindrical, elliptical or oval shape comprising two to four outward projections 50 provided on the outer surfaces 53 diagonally opposite or located perpendicularly to the top cover 21 towards the proximal portion. There may be provided plurality of corresponding grooves 51 towards the proximal portion on the inner surface of the housing 1 so as to allow mating of the projections 50 with the grooves 51. Additionally, the top cover 21 outer diameter may be slightly lower than the inner diameter of the housing 1 to have a snap fit on the outer surface cylindrical or oval shape of the housing 1. Snap fit may ensure the interaction or engagement between the top cover 21 and the housing 1 may be firm. The top cover 21 inner sleeve projections 54 may be of higher diameter than the collet 9. The shape of sleeve projections 54 may be of cylindrical, oval or elliptical shape emerging from the inner surface of the top cover 54. The top cover inner cylindrical projection 54, oval or elliptical shape may be integrally molded or welded or screwed attachment to inside surface of the top cover 21 top surface 57. The collet 9 may be fitted inside top cover 21 inner sleeve projections 54. The inner sleeve projection 54 may be cylindrical, oval or elliptical shape. Extending from distal end 55 of the top cover 21 inner portion of the top surface of the top cover 57 may be a frusto-conical cam surface 58 sized and shaped to cooperate with frusto-conical detents 56 to during actuation of the autoinjector 59.

To inject the medicament, as shown in FIGURE 2, the safety cap 11 of the autoinjector 59 has to be removed. Upon the removal of safety cap 11, the driver assembly 8 may be of the autoinjector 59 device may be ready for use. The needle cover 4 may be pressed against injection site. The needle cover 4 may move towards the housing 1 and then may push the cartridge holder 2 in the proximal direction. This movement is due to the abutment of the cartridge holder 2 and the collet 9 described below. Since the proximal end surface 29 of cartridge holder 2 may have a simple butt joint with the collet distal flange 28 of the collet 9,
the collet 9 may move in proximal direction. Since the distal end of the shoulder 32 of collapsible lock 10 may have contact with the distal end transverse surface 33 of the proximal end of collet 9, the collet may move proximally. Movement of collet 9 in proximal direction may move frusto-conical detents 56 of collapsible lock 10 towards frusto-conical cam surface 58 of the top cover 21. This movement may unlock the collet 9 and collapsible lock 10. The interaction between the tapered surfaces of the blades 31 and the tapered surface of the cam surface 58 causes blades 31 to move radially inward to the point that the blades 31 can fit through the central aperture 27. Once the blades 31 slide proximally through the central aperture 27, there are no forces countering the first biasing member, so the collet 9 and the collapsible lock 10 are unlocked. The unlocking of collet 9 and collapsible lock 10 may initiate the first biasing member 15 to expand and thereby move the cartridge 3 towards the distal end in the cartridge holder 2 to project the needle 5 beyond the needle cover, and then to a forward position to deliver a dose through the needle 5 at the injection site. Once the medicament is injected and upon removal of autoinjector 59 from the injection site, the needle cover 4 may move from the first locking position 17 to the second locking position 18 along the cam profile 13 and may cover the extended needle. The cam follower button 38 may traverse either on the frustum of a cone contour surface 42 or cylindrical or rectangular contour surface 42a of the cam profile 13 from the proximal portion to the distal portion due to the energy released by the second biasing member 16. The mating of the distal end of cam follower body 39 with the distal portion of either a frustum of a cone contour surface 48 or distal portion of cylindrical contour surface 48a may ensure no further movement of the needle cover 4 occurs. In FIGURE 6 the cylindrical contour surface 48a on the cam profile 13 is shown.

There may be two diametrically opposite projections 88, 88a provided on the second sleeve section 25 towards the distal end as shown in FIGURE 6. While the projection 88 is shown in the FIGURE 6 the projection 88a is not shown. Fool proof locking of the needle cover 4 may be achieved by the abutment of projections 88, 88a provided on the second sleeve section 25 towards the distal end with the diametrically opposite grooves 87a, 87b (not shown in any of the FIGURES 1 to 6) provided on the inner surface of the needle cover 4 due to the force of the relaxation of the second biasing member 16. This ensures the cam profile 14 does not move back on the cam profile 13 of the housing 1.
Referring to FIGURE 1, needle sheath 7 may be positioned over the needle 5 such that the open end of the sheath 7 may fit around needle and may abut the shoulder formed by hub portions.

When the needle 5 fully extended as shown in FIGURE 3, the needle sheath 7 may be compressed the greatest amount hence the largest reactionary force may exist in the compressed needle sheath 7 in such position. The needle sheath 7 is positioned over the needle 7 such that the open end of the sheath fits over and around the needle 5. The length of the sheath 7 is such that its closed end is slightly beyond or spaced from the end of needle 5. The cartridge 3 moves forward whereby the needle sheath 7 is compressed the most between the cartridge holder 2 and the needle cover 4. The stored energy released by the relaxation of the first biasing member 15 to drive the needle 5 and cartridge 3 during medicament dispensing operation may be transmitted to the needle cover 4 and the needle sheath 5 is compressed between the cartridge 3 and the needle cover 4. When the cartridge 3 completed its travel under the force of first biasing member 15, the forward movement of stopper 20 towards the distal end may commence under the action of driver assembly 8 to dispense the medicament.

Some embodiments of an auto injector 59 may be described with reference to FIGURE 7 and FIGURE 8 as follows. The auto injector 59 of FIGURE 7 comprises a housing 1, a cartridge holder 2, a top cover 21, a safety cap 11, a collet 9, a first biasing member 15 associated with cartridge movement and medicament administration, a second biasing member 16 associated with needle cover locking mechanism 60 during the operation and medicament administration, needle cover 4 comprising a needle cover top 64, a needle cover bottom 65, a plunger 19 provided with two oppositely located wings 68, 68a (not shown in figure) towards the distal portion, an indicator sleeve 69 a cartridge 3 and a needle sheath 7 over the needle 5.

FIGURE 7 discloses an auto injector 59 for a medicament administration that comprises: a housing 1 having a proximal portion and a distal portion, said proximal portion of housing is having a first sleeve section 22, a first shoulder 23 at the distal end of the first sleeve section 22, a second sleeve section 25 extends distally from the first shoulder 23 in the distal portion, a second shoulder 24 at the distal end of the second sleeve section 25, a third sleeve section 26 extends distally from the second shoulder 24, a third shoulder 62 at the distal end of the third sleeve section 26, a fourth sleeve section 61 extends distally from the distal end of the

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third shoulder 62; a cartridge holder 2 is received within the housing 1; cartridge holder 2 is
having a proximal end and a distal end; the cartridge holder 2 having an opening at the distal
end; a cartridge 3; a plunger 19; a needle 5 fixed to the distal end of the cartridge 3; a needle
cover 4, wherein the housing 1 is at least partially received within the needle cover 4; the
auto injector 59 further comprises a needle cover locking mechanism 60; and the needle
cover locking mechanism 60 comprises a cam profile 13; a cam follower 14; the cam
follower 14 of locking mechanism 60 is located between the needle cover 4 and the fourth
sleeve section 61 of the housing 1 in both first locking position 17 and second locking
position 18. The cam profile 13 may be provided in diametrically opposite directions on outer
surface of the housing 1; similarly cam follower 14 may be provided in diametrically
opposite directions and located between the needle cover 4 and the housing 1.

The needle cover may comprise a needle cover top 64 and needle cover bottom 65; cam
follower 14 of the needle cover locking mechanism 60 and the position of the cam follower
14 on the fourth sleeve section 61 of the housing in some of the embodiments of an auto
injector is shown in FIGURE 7 and FIGURE 8.

Referring FIGURE 7, the first sleeve section 22 of the housing 1 may be having an inward
transverse projection 70b, 70a extending from the inner surface 71 of the housing.

Referring FIGURE 7, the fourth sleeve section 61 of the housing 1 may have the following
configuration. A shoulder 72 may extend internally from the distal portion of the fourth
sleeve section 61 in the transverse direction. Further from the inner surface 73 of the shoulder
72, there may be two or more protrusions extend in the transverse direction towards the
proximal portion. In some of the embodiments as shown in FIGURE 7, there are four
protrusions 74, 74a, 74b and 74c extending in the transverse direction.

Furthermore, structural changes may be carried out on both the cartridge holder 2 and the
housing 1. In the initial position the medicament may be visible through the windows on the
outer surface of the housing 1 and the openings on the cartridge holder 2. The working of the
autoinjector 59 involves removal of safety cap, actuation on the body surface of the patient
and removal of the autoinjector from the body surface accompanied by the needle cover
extension as explained in the some of the embodiments of FIGURES 1 to 6.
FIGURE 8 is a side exploded view of locking mechanism 60 comprising the cam follower 14 and cam profile 13 provided on the fourth sleeve section 61 of housing. Referring to FIGURE 8, cam follower 14 may comprise a cam follower protrusion 40 in the distal portion, a cam follower body 39 extending towards proximal portion and a cam follower button 38 in the proximal portion. The cam follower protrusion 40 and cam follower button 38 may be located on opposite surfaces of the cam follower body 39. The shape of the cam follower protrusion 40 and cam follower button 38 may be cylindrical, conical, square, rectangular, trapezoid and the like.

The cam profile 13 may be provided on the outer surface of fourth sleeve section 61 on the distal portion of the housing 1. An angled contour 41 surface of the cam profile 13 may be in the proximal portion a frustum of a cone contour 42 (not shown in FIGURE 8) or cylindrical or rectangular contour 42a towards the distal portion. The distal portion contour surface 42a shown in FIGURE 8 may be a cylindrical one. Cam profile 13 may be formed out as a groove 43 in the housing to facilitate interaction or engagement of cam follower button 38, on to the housing 1. In some embodiment, the cam profile 13 may be formed out as a protrusion on the fourth sleeve section 61 of the housing 1 with a void space defining the boundaries of the protrusion to facilitate an interaction of cam follower button 38 into the void space (not shown in the FIGURE 8). The interaction may be by snap fit, a bayonet coupling or other methods of attachment that may facilitate free movement of the cam follower button 38.

Further the protrusion 40 of the cam follower 14 may mate with groove 45 (not shown in the FIGURE 8) on the inner surface of the needle cover 4 both in the first locking position 17 and the second locking position 18. It may be considered that groove 45 on the inner surface of the needle cover 4 traverses both in the needle cover top 64 and the needle cover bottom 65. The advantage thereof may be that the protrusion 40 provided over the width of the cam follower 14 component may establish effective operable connection to the corresponding groove 45 provide better stability between the needle cover 4 and the fourth sleeve section 61 of the housing.

Some embodiments of an auto injector 59 may be described with reference to FIGURE 8 to FIGURE 21 as follows. FIGURE 9 gives an exploded view of some of the embodiments of an auto injector 59. The auto injector comprises a housing 1, a cartridge holder 2, a top cover 21, a safety cap 11, a collet 9, a first biasing member 15 associated with cartridge movement and medicament administration, a second biasing member 16 associated with needle cover...
locking mechanism 60 during the operation and medicament administration, needle cover 4 comprising a needle cover top 64, a needle cover bottom 65, a plunger 19 provided with two oppositely located wings 68, 68a towards the distal portion on its outer surface, a cartridge 3 and a needle sheath 7 over the needle 5.

Some of the embodiments of an autoinjector 59 comprises a driver assembly 8; a first biasing member 15; a second biasing member 16; a safety cap 11; and a top cover 21; the first biasing member 15 configured to bias the driver assembly 8; the drive assembly 8 comprises a collet 9 and a collapsible lock 10 of the plunger 19.

FIGURE 10 and FIGURE 11 discloses an auto injector 59 for a medicament administration that comprises: a housing 1 having a proximal portion and a distal portion, said proximal portion of housing is having a first sleeve section 22, a first shoulder 23 at the distal end of the first sleeve section 22, a second sleeve section 25 extends distally from the first shoulder 23 towards the distal portion of housing 1; a cartridge holder 2 received within the housing 1; the cartridge holder 2 is having a proximal end and a distal end; the cartridge holder 2 having an opening at the distal end; a cartridge 3; a plunger 19; a needle 5 fixed to the distal end of the cartridge 3; a needle cover 4, wherein the housing 1 is at least partially received within the needle cover 4; the auto injector further comprises a needle cover locking mechanism 60; and the needle cover locking mechanism comprises a cam profile 13, and a cam follower 14; the cam follower 14 of locking mechanism 60 is located between the needle cover 4 and the second sleeve section 25 of the housing 1 in both first locking position 17 and second locking position 18. The cam profile 13 may be provided in diametrically opposite directions on outer surface of the housing 1; similarly cam follower 14 may be provided in diametrically opposite directions and located between the needle cover 4 and the housing 1.

The auto injector 59 for a medicament administration comprises a needle cover locking mechanism 60. FIGURE 11A shows perspective view of needle cover top 64 and needle cover bottom 65; FIGURE 11B shows front view of cam follower 14; FIGURE 11C shows sectional view of position of the cam follower 14 on the second sleeve section 25 of the housing 1 after actuation and before needle cover extension; Referring to FIGURE 11B and FIGURE 11C, the needle cover 4 of the locking mechanism 60 may comprise a cam profile 13 and a cam follower 14. The cam follower 14 of the locking mechanism 60 may be located between the needle cover 4 and the second sleeve section 25 of the housing 1 in both the first
locking position 17 and the second locking position 18. The needle cover 4 may be of cylindrical, oval or elliptical shape. The needle cover 4 may be considered to be made up of a proximal portion needle cover top 64 and a distal portion needle cover bottom 65. There may be provided a plurality of projections 66a on the needle cover top 64 towards the distal portion. The projections 66a may be over the entire circumference. There may be ribs 67a provided over the inner surface of the needle cover bottom 65 towards the proximal portion. The outer surface of the plurality of projections 66a can be slightly smaller than the inner surface of the proximal portion of the needle cover bottom 65 as to make a firm snap fit between the needle cover top 64 and needle cover bottom 65. Further the distal end of the plurality of projections 66a abut the proximal end of the ribs 67a to indicate that both needle cover top 64 and needle cover bottom 65 have firmly snapped up. Alternatively, the needle cover top 64 and needle cover bottom 65 may be ultrasonically welded. There may be a needle cover groove 45 that runs on the inner surfaces of both needle cover top 64 and needle cover bottom 65 and positioned in an aligned manner. The purpose of the needle cover groove 45 may be to provide a path for the cam follower protrusion 40 of the cam follower 14 to traverse both during the actuation and medicament administration.

FIGURE 12 shows a perspective view of the housing. Referring FIGURE 12, the housing 1 may comprise a proximal portion and a distal portion. The proximal portion of the housing 1 may have a first sleeve section 22. A first shoulder 23 may be formed at the distal end of the first sleeve section 22. The first shoulder 23 may be due to reduced diameter of the housing 1 extending in the inward direction. A second sleeve section 25 may extend in the distal direction from the end of the first shoulder 23. The housing 1 of FIGURE 12 may be of cylindrical, oval or elliptical shape. The first sleeve section 22 at the proximal end is having end surface to receive the safety cap 4 and the distal portion is having a peripheral ridge 22a. The peripheral ridge 22a may be positioned proximal to first shoulder 23. The peripheral ridge 22a is having front end 22aa and rear end 22ab portions, whereas the first sleeve section 22 is affixed into the front end portion 22aa and the second sleeve section 25 is extending from the rear end portion 22ab. At the rear end 22ab, a pair of diametrically opposed rectangular shaped like projection heads 93a, 93b, 93c, 93d extending downwardly on the surface of second sleeve section 25 (93c and 93d not shown in FIGURE 12). The peripheral ridge may facilitate sliding of needle cover 4.
There may be plurality of inward transverse projections extending from the inner surface 71 of the housing 1 towards the distal portion. Referring to FIGURE 10, in the preferred embodiment the first sleeve section 22 of the housing 1 may be having an inward transverse projections 70b, 70a extending from the inner surface 71 of the housing. The inward transverse projections 70b, 70a may be provided in diametrically opposite directions. The inward transverse projections 70a, 70b may be rectangular in shape.

Some of the examples of an autoinjector 59 disclose wherein the second sleeve section 25 at distal end comprises a diametrically opposite cutting arms 89, 89a having flank surfaces 90, 90a as shown in FIGURE 12.

Some of the examples of an autoinjector 59 disclose wherein second sleeve section 25 comprises locking projections 88, 88a diametrically opposite to flank surfaces 90, 90a of cutting arms 89, 89a.

Some of the examples of an autoinjector 59 disclose wherein flank surfaces 90, 90a of cutting arms 89, 89a comprises cam profile 13.

Referring to FIGURE 13, in some of the embodiments of an autoinjector wherein slots 76, 76a may be formed on the proximal portion of the cartridge holder 2 carved out of the proximal portion of the cartridge holder 2. The slots 76, 76a may be positioned diametrically opposite. The slot 76 may have two opposite surfaces 76b, 76c. Similarly the slot 76a may have two opposite surfaces 76d, 76e. There may be diametrically opposite openings 77, 77a distal to the slots 76, 76a as shown in FIGURE 13 positioned on the cartridge holder 2. The distal portion of the cartridge holder 2 may have conical portion 2a and further distal to it a cylindrical portion 2c. The cartridge holder 2 may have plurality of ledges provided towards the distal portion. In one of the preferred embodiments the cartridge holder 2 may have on the distal portion diametrically opposite ledges 91, 92 provided on the outer surface. Each of the ledges 91, 92 may be described as follows. The ledge 91 may have been formed due to two parallel projections 91a, 91b spaced apart. The shape of the projections 91a, 91b may be rectangular one. Similarly ledge 92 may have been formed due to two parallel projections 92a, 92b spaced apart. (Projections 92a and 92b are not shown in the FIGURE 13). The thickness of inward transverse projections 70b, 70a of the housing 1 is smaller than the gap between the two projections 91a, 91b. Hence the inward transverse projection 70b is allowed.
to pass through the spatial gap between the projections 91a, 91b of ledge 91. Similarly inward transverse projection 70a is allowed to pass through the spatial gap between the projections 92a, 92b of ledge 92. This feature of traverse of the inward transverse projections 70b, 70a of the housing 1 in the spatial gap between the projections 91a, 91b of ledge 91 and the projections 92a, 92b of ledge 92 allow proper alignment of the cartridge holder 2 and the housing 1.

Some examples of the autoinjector disclose wherein the cartridge holder 2 is having slots 76, 76a provided on the proximal portion of the cartridge holder 2; openings 77, 77a are provided on the outer surface of the cartridge holder 2.

Some examples of the autoinjector disclose wherein the slots 76, 76a are having four surfaces 76b, 76c, 76d and 76e.

Some examples of autoinjector 59 disclose wherein the distal closed end of the cartridge holder 2 abuts the inside surface of needle cover 4 in the first locking position 17.

FIGURE 14 shows the position of the cam follower 14 on the second sleeve section 25 of the housing 1 of an auto injector 59 after needle cover 4 extensions in the second locking position 18.

Referring to FIGURE 15 the cam profile 13 provided on the outer surface of second sleeve section 25 on the distal portion of the housing 1 may be described as follows. An angled contour surface 41 of the cam profile 13 may have 41 a frustum of a cone contour surface 42 in the proximal portion and cylindrical or rectangular contour surface 42a towards the distal portion. Cam profile 13 may be formed out as a groove 43 in the housing to facilitate engagement or coupling of cam follower button 38, on to housing 1. It could also be that Cam profile 13 may be formed out as a protrusion on the housing 1 to facilitate engagement or interaction of cam follower button 38, on to housing 1 (not shown in the FIGURE). The engagement or interaction may be by snap fit, a butt joint, a bayonet coupling, welding or other methods of attachment.

Referring to FIGURE 16, diametrically opposite wings 68, 68a have been provided on the distal portion of the plunger 19 on the outer surface. The wings 68, 68a may also be known as
the left wing 68 and the right wing 68a. The wings 68, 68a may be a sort of a diametrically opposite protrusions extending from a circular flange 79 like structure in the distal portion of the plunger 19. The wings 68, 68a may be of any geometrical shape such as rectangular, circular, square and trapezoidal and the like. The wings 68, 68a shown in FIGURE 16 may be of rectangular shape with a distal surfaces 80, 80a and proximal surfaces 81, 81a. Wings 68, 68a having a rectangular shape may also have two opposite side surfaces 82, 83 connecting the distal and proximal surfaces for the left wing 68 and 82a, 83a for the right wing 68a. The proximal portion of the plunger 19 may have two diametrically opposite longitudinal blades 85, 85a. The proximal portion of the longitudinal blades 85, 85a may have collapsible lock potion 86, 86a. It may be that the collapsible lock portion 86, 86a may have the appearance of a frustum of a cone and the like.

FIGURE 17 shows a side view of an auto injector 59 with safety cap 11 in place. In some of the embodiments window 84, 84a (only 84 is shown in the FIGURE 17); 84a not shown in the FIGURE 17) may be provided on the outer surface of the first sleeve section 22 of the housing 1. In some other embodiments, windows 84, 84a may be provided on the outer surface of the first sleeve section 22 towards the distal portion of the housing 1.

The working of the auto injector 59 may further be illustrated referring FIGURE 17 to FIGURE 21 and FIGURE 10. In the initial position the safety cap 11 may be in the proximal end of the auto injector 59 mounted over the housing 1 as shown in FIGURE 17. In this initial position the medicament may be visible through the windows 84, 84a on the outer surface of the housing 1 and due to the openings 77, 77a on the cartridge holder 2. The windows 84, 84a on the outer surface of the housing 1 may be formed by virtue of the unwrapped label over the transparent housing 1 portion corresponding to the shape of window. The transparent windows 84, 84a and the openings 77, 77a may be in an alignment. The purpose of the window 84, 84a may be to ensure visibility of stopper 20 on completion of medicament administration. The safety pin 12 of the safety cap 11 may pass through the top cover 21 central aperture 52. The positioning of the safety pin 12 inside the central aperture 52 may prevent the collapsible lock portion 86, 86a of the plunger 19 access to the frusto conical cam surface 58 of the top cover 21. Further collapsible lock portion 86, 86a of the plunger 19 may be locked with the collet 9 by the first biasing member 15. This can help the auto injector 59 to be on a non activated position. Further insertion of safety cap 11 through the collapsible snap lock 10 may prevent accidental unlocking of the drive assembly
8. In the initial position, the needle cover top 64 and needle cover bottom 65 of the needle cover 4 may be biased by the second biasing member 16. The second biasing member 16 may be biased from the housing 1. The distal end of the cylindrical portion of the cartridge holder 2 may have an engagement with the proximal end of the inner cover bottom 65. The engagement may be a simple butt joint. However, the proximal end 29 of the cartridge holder 2 does not have any engagement with the collet 9. There may be a gap between the proximal end of the cartridge holder 2 and the collet 9 as shown in FIGURE 10.

FIGURE 18 shows a perspective view of the auto injector 59 with safety cap 11 removed. To actuate the auto injector 59, the next step is to pull out the safety cap 11 by holding the ridges of the safety cap 11. This action may place the auto injector 59 in an activating position as a result of collapsible lock portion 86, 86a of the plunger 19 finding access to the frusto conical cam surface 58 of the top cover 21.

FIGURE 19 shows a sectional view of the autoinjector 59 with needle 5 exposed from the needle cover bottom 65 of the needle cover 4 before the medicament administration. After the safety cap 11 is removed the user may hold the auto injector 59 first sleeve section 22 of the housing 1 in the hand and press the needle cover bottom 65 on to the body for actuation. The needle cover bottom 65 and needle cover top 64 of the needle cover 4 may move in the proximal direction towards the housing 1 and may push the cartridge holder 2 backward due to the butt joint between the needle cover bottom 65 and the cartridge holder 2 and butt against the collet 9. The cartridge holder 2 may push back the collet 9 due to the butt joint between the needle cover 4 and the cartridge holder 2 which in turn may push the collapsible lock portion 86, 86a to release the first biasing member 15. The first biasing member 15 and the second biasing member 16 may be spring. The collapsible lock portion 86, 86a may move inward through the chamfer provided on the top cover 21 resulting in unlocking of the collet 9 of the drive assembly 8 and collapsible lock 10 of the plunger 19. The first biasing member 15 may relax and hold the collet 9 against the top cover 21 at the proximal end and may push the cartridge 3 along with the needle on the distal end. As a consequence the needle 5 may get enough force from the first biasing member 15 to pierce the needle sheath 7, clothing of the patient and finally though the skin. While the needle cover bottom 65 and the needle cover top 64 may be pushed against the housing 1, the cam follower 14 may move along the cam profile angled contour surface 41 and may occupy the proximal position. The cam follower 14 may have both rotational and linear movement with respect to the needle cover
bottom 65 and needle cover top 64 of the needle cover 4 while the needle cover 4 may have only linear motion.

The needle sheath 7 is positioned over the needle 7 such that the open end of the sheath fits over and around the needle 5. The length of the sheath 7 is such that its closed end is slightly beyond or spaced from the end of needle 5. The cartridge 3 moves forward whereby the needle sheath 7 is compressed the most between the cartridge holder 2 and the cartridge 3. At this juncture, the cartridge 3 may move forward and the distal surface of the cartridge 3 may have an engagement with the proximal surface of the compressed needle sheath 7.

Some of the examples of auto injector 59 disclose wherein the proximal end of the cartridge holder 2 abuts the distal end of the collet 9 on actuation of the auto injector 59 by pressing the needle cover 4 against the body after the removal of the safety cap 12 due to backward movement of the cartridge holder 2.

Some of examples of an autoinjector 59 disclose wherein the top cover 21 inner surface is having a chamfer shape; the collapsible lock 10 is having a collapsible lock portion 86, 86a towards the proximal end; the collapsible lock portion 86, 86a moves inward through the chamfer on actuation of the auto injector 59 by pressing the needle cover 4 against the body after the removal of the safety cap 12 due to backward movement of the cartridge holder 2 resulting in unlocking of the collet 9 and collapsible lock 10 of the plunger 19.

FIGURE 20 shows a sectional view of the autoinjector 59 with needle 5 exposed from the needle cover bottom 65 after medicament administration. Once the needle 5 may be pierced into the skin of the patient, due to the spring force of the first biasing member 15 the plunger 19 may move forward and may deliver the predefined volume of medicament through the needle 5. The plunger 19 may move forward and may deliver the predefined volume of medicament through the needle 5. The plunger 19 may move from the position with respect to the housing 1 as shown in FIGURE 19 and the distal surface of the left wing 80 of the plunger 19 and distal surface of the right wing 80a of the plunger 19 may engage the proximal surface of the inward transverse projections 70b, 70a of the first sleeve section 22 of the housing 1 thus preventing the plunger 19 from hitting the cartridge 3 surface, inducing no stress on the cartridge 3. During this stage the stopper 20 may move toward the distal end and the stopper 20 position may correspond with the window 84, 84a provided on the distal portion of the first sleeve.
section 22 of the housing 1 and thus providing a visual indication for the user that the medicament is delivered.

Some of the examples of an autoinjector disclose wherein the distal surfaces 80, 80a of the wings 68, 68a of the plunger 19 engage the surface of the inward transverse projection 70b, 70a of the housing 1 at the end of the medicament administration; contacting surfaces 82, 83 of wing 68 engage with the surfaces of the slots 76c, 76b of the cartridge holder 2; and contacting surfaces 82a, 83a of wing 68a engage with the surfaces of the slots 76e, 76d of the cartridge holder 2.

FIGURE 21 shows a sectional view of the autoinjector 59 with needle cover top 64 and needle cover bottom 65 of the needle cover 4 in extended position protecting the exposed needle 5 after the medicament administration. After the medicament may be delivered, the auto injector 59 may be held against the body for the desired period before the auto injector 59 may be withdrawn from the body. Simultaneously, the needle cover 4 comprising needle cover top 64 and needle cover bottom 65 may extend forward due to the tension of the second biasing member 16. The cam follower 14 may follow the cylindrical contour surface 42a of the cam profile 13. The cylindrical contour surface 42a being longer than cam profile angled contour surface 41 the longer travel of the cam follower 14 leading to longer extension of the needle cover 4. During this stage the needle cover 4 may extend forward and may get locked with the housing 1 at the second locking position 18. There may also be a fool-proof locking of the needle cover 4 with housing 1 such that both forward and backward movement of needle cover 4 may be restricted.

FIGURE 8 is a side exploded view of locking mechanism 60 comprising the cam follower 14 and cam profile 13 provided on the second sleeve section 25 of housing 1. Projections 88, 88a may be provided on the distal portion of the second sleeve section 25 of the housing 1. Projection corresponding to numeral 88 is shown in FIGURE 8 whereas the opposite projection numeral 88a is not shown. Fool proof locking of the needle cover 4 may be achieved by the abutment of projections 88, 88a provided on the second sleeve section 25 towards the distal end with the diametrically opposite grooves 87a, 87b (not shown in FIGURE 8) provided on the inner surface of the needle cover top 64 due to the force of the relaxation of the second biasing member 16. Referring to FIGURE 8 cam follower 14 may comprise a cam follower protrusion 40 in the distal portion, a cam follower body 39.
extending towards proximal portion and a cam follower button 38 in the proximal portion. The cam follower protrusion 40 and cam follower button 38 may be located on opposite surfaces of the cam follower body 39. The shape of the cam follower protrusion 40 and cam follower button 38 may be cylindrical, conical, square, rectangular, trapezoid and the like.

The cam profile 13 may be provided on the outer surface of second sleeve section 25 on the distal portion of the housing 1. An angled contour 41 of Cam profile 13 may have in the proximal portion a frustum of a cone contour 42 (not shown in FIGURE 8) and cylindrical contour 42a towards the distal portion. The distal portion contour surface 42a shown in FIGURE 8 may be a cylindrical one. Cam profile 13 may be formed out as a groove 43 in the housing to facilitate a coupling of cam follower button 38, on to housing 1. It could also be that Cam profile 13 may be formed out as a protrusion (not shown in FIGURE 8) on the second sleeve section 25 of the housing 1 with a void space defining the boundaries of the protrusion to facilitate interaction of cam follower button 38 into the void space. The interaction may be by snap fit, a bayonet coupling or other methods of attachment that may facilitate free movement of the cam follower button 38. Further the protrusion 40 of the cam follower 14 may mate with groove 45 on the inner surface of the needle cover 4 both in the first locking position 17 and the second locking position 18. It may be considered that groove 45 on the inner surface of the needle cover 4 traverses both in the needle cover top 64 and the needle cover bottom 65. The advantage thereof may be that the protrusion 40 provided over the width of the cam follower 14 component may establish effective operable connection to the corresponding groove 45 provides better stability between the needle cover 4 and second sleeve section surface 25 of the housing 1.

Some of the embodiments of auto injector 59 disclose wherein the cam profile 13 comprises an angled contour surface 47 in the proximal portion and cylindrical contour surface 42a in the distal portion.

Some of the embodiments of autoinjector disclose wherein the cam follower button 38 of the cam follower 14 mates with cylindrical contour surface 48a of the cam profile 13 in the second locking position 18.
Some of the embodiments of autoinjector 59 disclose wherein various medicaments may be administered. Some of the embodiments of the autoinjector 59 are particularly suitable for the administration of medicaments such as dihydroergotamine or epinephrine.

Various modifications and variations to the above described autoinjector of the various embodiments can be made without departing from the scope of the present invention. It is intended that the present invention encompasses all such modifications.
CLAIMS

1. An autoinjector 59 for administering a fluid medicament to a subject comprising: a housing 1 having a proximal portion and a distal portion; a cartridge holder 2 received within the housing 1; the cartridge holder 2 is having a proximal end and a distal end; an opening at the distal end; a cartridge 3; a plunger 19; a needle cover 4, wherein the housing 1 is at least partially received within the needle cover 4; the auto injector 59 further comprises a needle cover locking mechanism 60; wherein the needle cover locking mechanism 60 comprises a cam profile 13, a cam follower 14; and wherein the cam follower 14 of locking mechanism 60 is located between the needle cover 4 and the distal portion of the housing 1 in both first locking position 17 and second locking position 18.

2. The auto injector of claim 1, wherein the proximal portion of the housing 1 is having a first sleeve section 22 and the distal portion of the housing is having second sleeve section 25.

3. The auto injector of claim 2, wherein the second sleeve section 25 at distal end comprises a diametrically opposite cutting arms 89, 89a having flank surfaces 90, 90a.

4. The autoinjector of claim 3, wherein the second sleeve section 25 comprises locking projections 88, 88a diametrically opposite to flank surfaces 90, 90a of cutting arms 89, 89a.

5. The autoinjector of claim 3, wherein the flank surfaces 90, 90a of cutting arms 89, 89a comprises cam profile 13.

6. The autoinjector of claim 2, wherein the first sleeve section 22 of the housing 1 is having inward transverse stopping projections 70b, 70a on the inner surface 71.

7. The auto injector of claim 1, wherein the proximal portion of the housing 1 is having a first sleeve section 22; a first shoulder 23 at the distal end of the first sleeve section 22;
a second sleeve section 25 extends distally from the first shoulder 23 in the distal portion.

8. The autoinjector of claim 1, wherein the cam profile 13 comprises an angled contour surface 47 in the proximal portion and cylindrical contour surface 42a in the distal portion.

9. The autoinjector of claim 1, wherein the cam follower 14 comprises a cam follower protrusion 40 on the distal portion; a cam follower button 38 on the proximal portion; and a cam follower body 39 extending between them.

10. The autoinjector of claim 9, wherein the protrusion 40 of the cam follower 14 mates with groove 45 on the inner surface of the needle cover 4 both in the first locking position 17 and the second locking position 18.

11. The autoinjector of claim 10, wherein the cam follower button 38 of the cam follower 14 mates with the distal portion of angled contour surface 44 of the cam profile 13 in the first locking position 17.

12. The autoinjector of claim 11, wherein the cam follower button 38 of the cam follower 14 mates with cylindrical contour surface 48a of the cam profile 13 in the second locking position 18.

13. The autoinjector of claim 1, wherein the distal closed end of the cartridge holder 2 abuts the inside surface of needle cover 4 in the first locking position 17.

14. The autoinjector of claim 1, further comprising a driver assembly 8; a first biasing member 15; a second biasing member 16; a safety cap 11; and a top cover 21; the first biasing member 15 configured to bias the driver assembly 8; the drive assembly 8 comprises a collet 9 and a collapsible lock 10.

15. The autoinjector of claim 1, wherein the proximal end of the cartridge holder 2 abuts the distal end of the collet 9 on actuation of the auto injector 59 by pressing the needle
cover 4 against the body after the removal of the safety cap 12 due to backward movement of the cartridge holder 2.

16. The auto injector of claim 14, wherein the top cover 21 having inner surface comprising a chamfer; the collapsible lock 10 is having a collapsible lock portion 86, 86a towards the proximal end; the collapsible lock portion 86, 86a moves inward through the chamfer on actuation of the auto injector 59 by pressing the needle cover 4 against the body after the removal of the safety cap 12 due to backward movement of the cartridge holder 2 resulting in unlocking of the collet 9 and collapsible lock 10 of the plunger 19.

17. The auto injector of claim 1, wherein the cartridge holder 2 is having slots 76, 76a provided on the proximal portion of the cartridge holder 2; openings 77, 77a are provided on the outer surface of the cartridge holder 2.

18. The autoinjector of claim 17, wherein the slots 76, 76a are having four surfaces 76b, 76c, 76d and 76e.

19. The auto injector of claim 1, wherein the plunger 19 is having two wings 68, 68a provided on the outer surface of the plunger 19.

20. The auto injector of claim 19, wherein the distal surfaces 80, 80a of the wings 68, 68a of the plunger 19 engage the surface of the inward transverse projection 70b, 70a of the housing 1 at the end of the medicament administration; contacting surfaces 82, 83 of wing 68 engage with the surfaces of the slots 76c, 76b of the cartridge holder 2; and contacting surfaces 82a, 83a of wing 68a engage with the surfaces of the slots 76e, 76d of the cartridge holder 2.

21. The auto injector of claim 1, further comprising windows 84, 84a provided on the outer surface of the first sleeve section 22 of the housing 1 towards the distal portion.

22. An autoinjector 59 for administering a fluid medicament to a subject comprising: a housing 1 having a proximal portion and a distal portion, a cartridge holder 2 received within the housing 1, the cartridge holder 2 is having a proximal end and a distal end;
an opening at the distal end; a cartridge 3; the housing 1 is having a first sleeve section 22; first sleeve section 22 is having inward transverse projections 70b, 70a on the inner surface 71; a plunger 19; the plunger 19 is having two wings 68, 68a provided on the outer surface; a needle cover 4, wherein the housing 1 is at least partially received within the needle cover 4; the auto injector 59 further comprises a needle cover locking mechanism 60; wherein the needle cover locking mechanism 60 comprises a cam profile 13, a cam follower 14; wherein the cam follower 14 of locking mechanism 60 is located between the needle cover 4 and the second sleeve section 25 of the housing 1 in both first locking position 17 and second locking position 18; wherein the distal surfaces 80, 80a of the wings 68, 68a of the plunger 19 engage the surface of the inward transverse stopping projection 70b, 70a of the housing 1 at the end of the medicament administration.

23. The autoinjector of claim 22, wherein the cam profile 13 comprises an angled contour surface 47 in the proximal portion and cylindrical contour surface 42a in the distal portion.

24. The autoinjector of claim 22, wherein the cam follower 14 comprises a cam follower protrusion 40 on the distal portion; a cam follower button 38 on the proximal portion; and a cam follower body 39 extending between them.

25. The autoinjector of claim 24, wherein the protrusion 40 of the cam follower 14 mates with groove 45 on the inner surface of the needle cover 4 both in the first locking position 17 and the second locking position 18.

26. The autoinjector of claim 24, wherein the cam follower button 38 of the cam follower 14 mates with the distal portion of the angled contour surface 44 of the cam profile 13 in the first locking position 17.

27. The autoinjector of claim 25, wherein the cam follower button 38 of the cam follower 14 mates with cylindrical contour surface 48a of the Cam profile 13 in the second locking position 18.
A. CLASSIFICATION OF SUBJECT MATTER

INV. A61M5/20 A61M5/32

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A61M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database consulted during the international search (name of database and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<td>Wo 93/13819 AI (STI INT LTD [GB]) 22 July 1993 (1993-07-22) page 22, lines 17-31 figures 26, 28A-C</td>
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Date of the actual completion of the international search

17 May 2018

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Date of mailing of the international search report

28/05/2018

Authorized officer

Walther, Manuel
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