(54) Titre : INJECTEUR A UNE VOIE COMPRENANT AU MOINS UN CROCHET DE TRACTION
Title: SINGLE-USE INJECTOR WITH AT LEAST ONE DRAW HOOK

(57) Abrégé/Abstract:
The invention relates to a single-use injector comprising a housing (10), arranged in which are at least one mechanical spring energy store (50), at least one piston-cylinder unit (100), which can be effectively filled at least for a certain time, at least one piston-
actuating stem (60) and at least one triggering unit (80). The spring energy store comprises at least one pretensioned spring element. The spring-loaded piston-actuating stem has at least one draw rod, which can be moved transversely, at least in certain regions, and by means of a supporting portion supports the tensioned spring energy store on at least one resting surface of the housing. When actuation occurs, the triggering element releases the supporting portion to allow it to move away from the resting surface.
Abstract

The invention relates to a single-use injector comprising a housing (10), arranged in which are at least one mechanical spring energy store (50), at least one piston-cylinder unit (100), which can be effectively filled at least for a certain time, at least one piston-actuating stem (60) and at least one triggering unit (80). The spring energy store comprises at least one pretensioned spring element. The spring-loaded piston-actuating stem has at least one draw rod, which can be moved transversely, at least in certain regions, and by means of a supporting portion supports the tensioned spring energy store on at least one resting surface of the housing. When actuation occurs, the triggering element releases the supporting portion to allow it to move away from the resting surface.
Single-use injector with at least one draw hook

Description:

5 The invention relates to a needless disposable injector with a housing in which or on which are arranged, in each case at least in some areas, at least one mechanical spring energy reservoir, at least one cylinder/piston unit that can be filled at least temporarily with active substance, at least one piston-actuating ram and at least one trigger unit, in which the spring energy reservoir comprises at least one pretensioned spring element and in which at least part of the piston-actuating ram is positioned between the spring energy reservoir and the piston of the cylinder/piston unit.

An injector of this kind, among other things, is known from EP 0 710 130 B1. It is constructed in such a way that the individual structural groups, namely the spring energy reservoir, cylinder/piston unit and trigger unit, cannot be separated from one another or handled separately. The trigger unit has a catch mechanism in which a slide that is moved transversely with respect to the centre line of the injector blocks or releases the piston-actuating ram via a notch or a thread groove.

DE 10 2004 060 146 A1 discloses an autoinjector for automatic injection of an active substance, with an elongate housing, an injection needle which can be moved axially within the housing and which can be connected to an active-substance container, a piston which can be moved in order to discharge the active substance in the active-substance container, and a needle-protection tube which can be moved relative to the housing. A locking element, in a locking position, prevents the movement of the active-substance container
in relation to the housing. Moreover, by moving the needle-protection tube into the housing, it is possible to bring the locking element into a release position in which it allows the active-substance container to be moved in relation to the housing.

WO 03/092771 AI discloses an injection device comprising:
a housing for containing a syringe which has a bore extending from an end surface, a needle communicating with the bore through the end surface, and a dispensing or metering piston movable in said bore towards said end surface so as to expel the content of the syringe through the needle, the housing having an opening at one end, through which opening the needle can extend;
a resilient member for biasing the syringe and needle inwardly in relation to the housing;
a drive element movable towards said one end so as to move the needle of the syringe out of the opening and to move the dispensing or metering piston of the syringe towards the end surface;
a mechanism that can be actuated to release the syringe such that the needle moves inwardly in relation to the housing;
a drive coupling for extending from the drive element to the dispensing or metering piston of the syringe so as to transfer movement of the drive element to the dispensing or metering piston, wherein the drive coupling is compressible in length.

After the drive element has moved the dispensing or metering piston towards the end surface, the drive coupling gradually reduces in length and transfers sufficient force to maintain the needle in its deployed position, while the dispensing or metering piston is maintained at the end surface until the mechanism releases the syringe.
A further design of an injection device with a needle and with a number of corresponding springs is known from WO 2007/002052 A2.

Therefore, the problem addressed by the present invention is that of developing a needleless disposable injector of modular design which, with a small overall size, comprises only a small number of structural parts and, while being easy to handle, ensures safe storage and reliable operation.

This problem is solved by the features of the main claim. Accordingly, the spring-loaded piston-actuating ram has at least one tension bar which is transversely movable at least in some areas and which, by means of a support portion, supports the tensioned spring energy reservoir on at least one bearing surface of the housing. The trigger unit is or has at least one trigger element which, when actuated, causes or enables a movement of the support portion away from the bearing surface.

With the invention, a needleless disposable injector is made available whose piston-actuating ram, upon triggering of the disposable injector, executes a movement that is oriented transversely with respect to the longitudinal direction and/or transversely with respect to the centre line of the disposable injector. For pretensioning and holding the spring energy reservoir, one or more parts of the piston-actuating ram bear with at least one enclosure or a hook on the housing or on a structural part arranged on the housing. If appropriate, it is also possible for only certain parts or areas of the piston-actuating ram to be designed to be movable relative to the housing of the needleless disposable injector. To trigger the needleless disposable injector, the enclosures or hooks are pushed down from their bearing surface on the housing, such that the piston-actuating ram, under the
effect of the spring energy reservoir, can move at least approximately parallel to the centre line of the disposable injector.

5 Further details of the invention will become clear from the dependent claims and from the following descriptions of a number of illustrative embodiments represented schematically in the drawing, in which:

10 Figure 1 shows a disposable injector with a tension bar;
Figure 2 shows the same as Figure 1, but released and actuated;
Figure 3 shows the same as Figure 2, but after the medicament has been expelled;
Figure 4 shows a disposable injector with several tension bars;
Figure 5 shows the same as Figure 4, but released and actuated;
Figure 6 shows the same as Figure 5, but after the medicament has been expelled;
Figure 7 shows a plan view of the base of the disposable injector according to Figure 4, but without the stepped trigger sleeve;

Figure 8 shows a disposable injector with several tension bars, which have inwardly pointing tension hooks;
Figure 9 shows the same as Figure 8, but released and actuated;
Figure 10 shows the same as Figure 9, but after the medicament has been expelled;
Figure 11 shows a plan view of the securing element of the disposable injector according to Figure 8, but without the trigger element;

Figure 12 shows a disposable injector with several outwardly resilient tension bars;
Figure 13 shows the same as Figure 12, but released and actuated;
Figure 14 shows the same as Figure 13, but after the medicament has been expelled;
Figure 15 shows a side view of the disposable injector according to Figure 12, but before use;
Figure 16 shows a side view of the disposable injector according to Figure 12, but without the cylinder/piston unit and support sleeve;

Figure 17 shows a disposable injector with several inwardly resilient tension bars;
Figure 18 shows the same as Figure 17, but released and actuated;
Figure 19 shows the same as Figure 18, but after the medicament has been expelled;
Figure 20 shows a side view of the disposable injector according to Figure 17, but before use.

Figures 1 to 3 show the simplified principle of a disposable injector with a permanently charged spring energy reservoir. The disposable injector comprises a housing (10), a for example filled cylinder/piston unit (100), a piston-actuating ram (60) with tension hooks (62), and a helical compression spring (50) as spring reservoir. In addition, a trigger unit (80), in which a trigger element (82) and a securing element (95) are arranged, sits on the housing (10).

The housing is a pot-shaped hollow body open at the bottom and with a base (32) lying at the top. The base (32) has, for example, an eccentric opening (34) through which, according to Figure 1, the tension hook (62) is engaged. The tension hook (62) lies with its support portion (65) on the bearing surface (37) of the housing (10).

The piston-actuating ram (60) is divided into three areas. The lower area is the piston slide (76). Its diameter is slightly smaller than the internal diameter of the cylinder (101) of the cylinder/piston unit (100). The lower end face of the piston slide (76) acts directly on the piston (111).

The middle area is the ram plate (73). The ram plate (73) is a flat and in at least some areas cylindrical disc whose external diameter is a few tenths of a millimetre smaller than the internal diameter of the housing (10) in the jacket area (31). The upper area is the tension hook (62).

The cylinder/piston unit (100) is secured in the lower part of the housing (10). The cylinder/piston unit (100) here consists of a cylinder (101) which is filled with an injection solution (1) and in which a piston
(111) lies in the rear position. Above the piston (111), the piston-actuating ram (60) is arranged in the housing (10) in such a way that, for example, although not touching the piston, it is laterally guided with its lower end in the upper area of the cylinder (101).

The helical compression spring (50) sits pretensioned between the ram plate (73) and the base (32) lying at the top of the housing (10).

The trigger unit (80) fits on the housing (10). In its for the most part closed end wall, it has a sleeve (85) in which a pin-shaped securing element (95) fits. The securing element (95) is positioned in combination with the housing (10) such that it holds the tension hook (62) on the edge (36) of the opening (34) adjoined by the bearing surface (37). In the inserted state, the securing element (95) prevents accidental displacement of the tension hook (62) transverse to the longitudinal direction of the piston-actuating ram (60).

In the trigger unit (80), the trigger element (82) is mounted so as to be longitudinally displaceable transversely relative to the centre line (5) of the housing (10) for example. To actuate the disposable injector, the securing element (95) is pulled as in Figure 2, the disposable injector is brought into position relative to the patient, and the trigger element (82) is then pressed, for example with a finger of the hand that is supporting the disposable injector. The trigger element (82) pushes the support portion (65) off from the support surface (37), with a slight tilting of the whole piston-actuating ram (60). The sliding movement takes place transverse to the longitudinal axis or centre line (5) of the disposable injector. Thereafter, the support portion (65), under the action of the helical compression spring (50), slips through the opening (34) into the interior (11)
of the housing (10). In doing so, the cylinder/piston unit (100) is emptied, cf. Figure 3.

In this principle, the piston slide (76) can also be designed as a separate structural part. For this purpose, it is then guided on the inside wall of the housing (10). It is also possible to form the piston slide (76) as piston rod integrally on the piston (111) and thus to guide the piston rod only by the piston (111) and/or by a contact in some areas for example, on the inside wall of the cylinder (101). Of course, the piston slide (76) and the piston rod can share the space between the ram plate (73) and the piston (111) in any desired way.

The triggering operation is not restricted to the variant described here. Instead of the transversely displaceable trigger element (82), it is possible, for example, to use an eccentric gear, a screw gear or a lever gear.

Figures 4 to 6 show a refinement of the principle according to Figures 1 to 3. The piston-actuating ram (60) comprises, for example, two structurally identical tension hooks (62) above the ram plate (73). Both tension hooks (62) lie opposite each other in mirror symmetry. They are made, for example, of a resiliently elastic material. Both tension hooks (62) lie back to back and seek to force themselves apart in the manner of a leaf spring, such that they bear on the edge (36) of the opening (34), for example with pretensioning. Their spring direction is symbolized by a helical compression spring (64) lying transversely between them as an alternative.

Of course, such a helical compression spring (64) can also really be used if, for example, the tension hooks (62) are articulated on the ram plate (73) by means of pivot hinges. The pivot axes of these pivot hinges
would then lie transverse to the centre line (5) of the housing and perpendicular to the plane of the drawing according to Figures 4 to 6.

In this variant, the support portions (65) via which the tension hooks (62) bear on the for example plane outer face (33) of the base (32) have a wedge-shaped or frustoconical outer contour (66). Here, the cross section of the support portions (65) narrows upwards along the centre line (5). In Figures 4 to 6, the outer contours (66) are parts of pyramid surfaces that have a theoretical pyramid tip lying above the base (32) on the centre line (5), cf. Figures 4, 5 and 7.

A pin-shaped securing element (95) fits between the ends of the tension hooks (62), see also Figure 7. Here, it has a rectangular cross section, for example. The securing element (95), which is mounted for example in the housing (81) of the trigger unit (80), blocks the tension hooks (62) mechanically in their locked position.

The trigger housing (81) has a pot-shaped design and sits longitudinally displaceably on the rear part of the housing (10). A rectangular tube (86), for example, is mounted on the base of the trigger housing (81) and at the same time guides the securing element (95). At the transition from the base to the rectangular tube (86), the latter has bevelled areas (88). The bevelled areas (88) form the wedge surfaces on the trigger housing side.

After removal of the securing element (95), the trigger housing (81), like a press-button, can be moved downwards. In the process, the wedge surfaces (88) on the trigger housing side bear on the tension hooks (62) and press these together, counter to the action of the symbolically indicated compression spring (64), such that the support portions (65) pass through the opening
(34). The support portions (65) and the wedge surfaces (88) on the trigger housing side thus form a spline gear. If appropriate, the wedge surfaces (88) and/or the surfaces of the wedge-shaped outer contour (66) of the support portions (65) can be curved with one or more axes, e.g. cylindrically or spherically, such that a curved surface slides along a plane surface or a surface of different curvature.

As soon as the for example elastically deformed tension hooks (62), as parts of the piston-actuating ram (60), have reached the interior (11) of the housing (10), they spring back apart from each other.

With reference to Figures 8 to 11, a variant is described in which the tension hooks (62) lie facing each other, for example in pairs, i.e. the support portions (65) are directed towards each other. The tension hooks (62) in this case spring closed onto one another.

According to Figure 8, the base (32) of the housing (10) in this variant has two for example rectangular recesses (34), which are separated by a housing web (35). The housing web (35), on which the support portions (65) of the tension hooks (62) bear in the locked position of the disposable injector, is part of the housing base (32). In order to hold the tension hooks (62) securely on the housing web (35), they are partially enclosed above the housing base (32). For this purpose, a securing element (95) is used, cf. also Figure 11. This securing element (95) is essentially a fork-shaped structural part with three prongs and a grip part that is guided in the trigger housing (81). The rear faces of the support portions (65) each bear on the outer prongs (93). The central prong (94) of the fork is located between the support portions (65) facing each other.
A trigger element (82) in the form of a press-button is also guided longitudinally in the trigger housing (81). A spreading rod (89) is formed integrally on the trigger element, for example centrally. According to Figure 8, it bears on the central prong (94) of the securing element (95). The trigger element (82) is thus blocked until removal of the securing element (95).

To trigger the disposable injector, the securing element (95) is first of all pulled sideways completely out of the trigger housing (81). The press-button (82) is then depressed until it bears on the housing web (35), cf. Figure 9. The spreading rod (89) and the wedge surface (66) interact in this process as a spline gear. The tension hooks (62) are spread apart from each other, such that they can slide unimpeded through the recesses (34) into the housing interior (11), cf. Figure 10, in order to act there, as part of the piston-actuating ram (60), on the piston (111).

Figures 12 to 16 show an embodiment of the principle described in Figures 4 to 7. Here, the supporting structural part is the housing (10). It has a substantially tubular shape and is divided up into three functional areas (21, 31, 41). According to Figure 12, the upper area is the trigger area (21). This is adjoined by the jacket area (31). An intermediate base (32) is arranged between the two areas and also protrudes slightly radially past the jacket area (31). The intermediate base (32) has a central recess (34), the diameter of which widens slightly, for example towards the bottom.

In the trigger area (21) of the housing (10), a dimensionally rigid, for example metal, apertured disc (39) is located on the intermediate base (32). It is adhesively bonded or injection moulded therein. Instead of the apertured disc (39), it is also possible to use a ceramic reinforcement. The apertured disc (39) or the
reinforcement protects the intermediate base (32) from pressures and/or other deformations. It also prevents sticking of the structural parts (32) and (66) that are otherwise in contact there.

The fixing area (41) for receiving the insertable cylinder/piston unit (100) is arranged below the jacket area (31). The fixing area (41) has for example three longitudinal slits, cf. Figure 16. The inner wall of this area carries, for example, a trapezoidal thread (46). According to Figures 12 and 15, the fixing area (41) is enclosed by a support sleeve (49) that is locked on the housing (10).

A cylinder/piston unit (100) is screwed into the trapezoidal thread (46). Said unit consists of a cylinder (101) and a piston (111). The cylinder (101) is a thick-walled pot, for example, of which the cylindrical outer wall at least in some areas also carries a trapezoidal thread (104).

The rodless piston (111) sits in the for example cylindrical bore of the cylinder (101). At its front end face, of at least approximately conical configuration, the piston (111) has an axial annular groove (112) for receiving a sealing ring (114) or a permanently elastic sealing compound. A cylindrical metal plate (116) is let into the rear end face of the piston (111), for example.

A short cylindrical, nozzle-like bore (106) is located at the centre of the bore of the cylinder (101), whose cylinder base is adapted at least approximately to the contour of the front end face of the piston. The diameter of the bore (106) is approx. 0.1 to 0.5 millimetre. This bore (106) is one to five times as long as its diameter. It opens out in a cylindrical recess (107) of the outer end face (103) at the bottom of the cylinder (101).
The spring energy reservoir (50) or the drive unit of the disposable injector is arranged between the piston (111) and the trigger area (21). The spring energy reservoir (50) is a helical compression spring arranged on a piston-actuating ram (60) with four tension hooks (62). By means of the support portions (65) of the tension hooks (62), the helical compression spring (50) sits tensioned in the housing (10). It is supported between the inside face of the intermediate base (32) and an upper end face of the piston-actuating ram (60).

The piston-actuating ram (60) is divided into three areas. The lower area is the piston slide (76), the middle area is the ram plate (73) bearing the spring element (50), and the upper area is the bundle of for example four tension hooks (62), see also the description of Figures 1 to 3.

In the jacket area (31) of the housing (10), the tension hooks (62) have at least approximately a cylindrical envelope surface (63), i.e. their outer walls have the curvature of a cylinder jacket area. The support portion (65) has a frustoconical jacket as its envelope surface. The envelope surface is also designated as wedge contour (66).

The inner walls of the tension hooks (62) are parts of an envelope surface (68) having the shape of a frustoconical jacket. This envelope surface (68) encloses the frustoconical jacket-shaped hollow space (67) located between the tension hooks. The cross sections of the hollow space (67) increase the further they are from the ram plate (73). The radial slits (69) lying between adjacent tension hooks (62) increase in size towards the top, according to Figure 12, to approx. twice the width.
In contrast to Figure 1, the ram plate (73) according to Figure 12 has for example two grooves (74) lying opposite each other.

5 The tension hooks (62) lie with their support portions (65) in the trigger area (21). The support portions (65) lie secured on the apertured disc (39).

In the trigger area (21), a trigger unit (80) sits as a one-piece trigger element (82) in its upper position. The trigger element (82) is a pot-shaped body in whose interior a trigger tube (87) is integrally formed. At the lower end of the outer contour, the trigger element (82) has a peripheral, slightly protruding edge (83).

15 The latter engages behind a peripheral bead (22) present on the inside wall of the trigger portion (21).

The base of the trigger element (82) has a circular recess (84) in which a securing element (95) is inserted. The trigger tube (87) has a frustoconical wedge contour (88) at the lower end, in the area of the inside wall. In the illustrative embodiment, its cone angle is between 20 and 45 degrees. With the disposable injector in the unactuated and secured state, the wedge contour (88) bears in the upper area of the wedge contour (66) of the tension hooks (62).

The securing element (95) is, like the trigger element (82), a rotationally symmetrical structural part. It consists of a plate (96) and of a locking pin (97). The locking pin (97) has a locking area (99) and a support area (98). The two areas (98, 99) are frustoconical. They both have the same cone angle, for example. At least the cone angle of the locking area (99) corresponds to the cone angle of the hollow space (67). The support area (98) bears with its annular end face on the upper end faces of the tension hooks (62).
Figure 13 shows the disposable injector with the securing element (95) removed and with the trigger element (82) actuated, i.e. pressed down. After the in this case vertical withdrawal of the securing element (95), the pressing down of the trigger element (82) causes the wedge contour (88) of the trigger tube (87) to slide along the wedge contours (66) of the tension hooks (62). In this process, the tension hooks (62) are bent elastically and/or plastically in the radial direction towards the centre line (5). The gap space between the individual tension hooks (62) is substantially used up at least in the area of the support portions (65). The maximum external diameters of the support portions (65) are now smaller than the diameter of the bore of the apertured disc (39). The tension hooks (62) can move downwards under the effect of the spring element (50) and displace the piston (111) by way of the piston slide (76), cf. Figure 14.

Figure 15 shows the as yet unactuated disposable injector in the commercially available format. The securing element (95) is inserted, and the lower end face of the cylinder/piston unit (100) is sealed in a sterile manner by means of a tear-off adhesive seal (120).

Figures 17 to 20 show a disposable injector variant in which the tension hooks (62) spring elastically towards the centre line (5) of the disposable injector. The housing (10) is essentially a smooth tube with a flat base (32) located at the top. A central bore (34) for passage of the piston-actuating ram (60) is formed in the base (32).

The fixing area (41) for receiving the insertable cylinder/piston unit (100) is located in the lower area of the housing (10). The fixing area (41) comprises for example six resilient hooks (42), which each end in an inwardly directed hook tip (43). Towards the lower end
face (12) of the housing, the hook tips (43) have a bevel (44) that extends over the full thickness of the hook. The length and spring rate of the resilient hooks (42) is dimensioned such that the inserts (50, 100) required for the function of the disposable injector can be installed without plastic deformation of the resilient hooks (42).

One of these inserts is the cylinder/piston unit (100), cf. Figure 6. It consists of a cylinder (101) and a piston (111), cf. also Figure 12. The cylinder (101) is for example a thick-walled pot, of which the optionally cylindrical outer wall has for example five peripheral locking ribs (102). The sum of the locking ribs (102) has, in cross section, a saw tooth-shaped profile, for example, the division between the tooth-like locking ribs (102) being equidistant. The maximum diameter of the locking ribs (102) is slightly smaller than the internal diameter of the housing (10) in the fixing area (41). The diameter of the areas lying between adjacent locking ribs (102) corresponds to the minimum diameter of the housing (10) in the area of the hook tips (43).

The piston-actuating ram (60) sits between the base (32) and the cylinder/piston unit (100) in the housing (10). The two lower end areas (73, 76) of the piston-actuating ram (60) are known from Figure 12. The upper area is formed by for example four tension hooks (62), which for example do not reach as far as the ram plate (73). Between the ram plate (73) and the tension hooks (62) there is a cylindrical portion which, according to Figure 16, serves among other things to guide the spring element (50). For this purpose, it has for example four short, radially protruding ribs, which fix the bottom winding of the spring element (50).

Each tension hook (62) has a support portion (65). In the case of a triggered disposable injector, the bundle
of tension hooks has a cylindrical envelope surface (63), cf. Figures 18 and 19. The envelope surface (66) can also be cylindrical in the area of the support portions (65).

In the upper area of the tension hooks (62), each tension hook (62) includes a part of an annular groove (71) whose centre line is congruent with the centre line (5) of the disposable injector. According to Figures 18 and 19, a for example cylindrical spreading disc (91) of a trigger element (82) sits in this annular groove (71). The bottom of the respective annular groove portions bears resiliently on the radial outer contour of the spreading disc (91). In the unloaded state, the tension hooks (62) spring in the direction of the centre line (5). For example, on letting go the trigger element (82), they would touch at their upper ends.

The trigger element (82) shown in Figure 17 has a mushroom shape as rotationally symmetrical structural part. A narrow web arranged on the spreading disc (91) has its upper end integrally formed on a trigger disc (92).

To protect the trigger element (82), a securing element (95) in the form of a cap is fitted on the base (32) of the housing (10).

Figure 20 shows this disposable injector in a side view, with the cap (95) shown in cross section on one side. The cylinder/piston unit (100) is closed with a tear-off protective film (120). According to Figure 16, the trigger element (82) is in an upper position when the disposable injector is locked. The spreading disc (91) sits above the annular groove (71). The tension hooks (62) adopt a spread-open position, with the support portions (65) bearing on the top (33) of the base (32).
If, after removal of the cap (95) and withdrawal of the protective film (120), the trigger element (82) is pressed into the piston-actuating ram (60), the spreading disc (91) of the trigger element (82) locks in the annular groove (71). The tension hooks (62) spring back, such that the maximum external diameter of the envelope surface (66) of the support portions (65) is smaller than the diameter of the bore (34), cf. Figure 18. The spring element (50) now drives the piston-actuating ram (60) downwards, cf. Figure 19. With the delivery of the medicament via the cylinder/piston unit (100), the injection procedure is concluded.

Except for the spring elements (50, 64), all parts of the disposable injector are made of plastics or of materials similar to plastic or to rubber.
List of reference numbers:

1  injection solution; medicament
5  centre line of disposable injector
10 housing, in one piece
11 housing interior
12 housing end face, bottom
20 trigger area
22 bead
31 jacket area
32 base, intermediate base
15 outer face, end face, top
34 opening, bore, recess
35 web, housing web
36 housing edge
37 bearing surface
20 39 apertured disc
41 fixing area for the cylinder/piston unit
42 resilient hook
43 hook tip
25 44 bevel
46 trapezoidal thread
49 support sleeve
30 50 spring element, helical compression spring, spring energy reservoir
60 piston-actuating ram
61 tension bar
35 62 tension hook
63 envelope surface, bottom
64 helical compression spring, symbolic
65 support portion
outer contour, wedge-shaped; wedge surface; wedge contour; envelope surface, top
hollow space between the tension hooks
envelope surface of the hollow space
slits between the tension hooks
annular groove
ram plate
grooves
piston slide
trigger unit
trigger housing, press-button
trigger element
edge
recess for securing element
sleeve
rectangular tube
trigger tube
wedge surfaces, areas, bevelled; wedge contour
spreading rod
spreading disc
trigger disc
outer prongs of (95)
middle prong of (95)
securing element, cap, fork
plate
locking pin
support area
locking area
cylinder/piston unit
cylinder
locking ribs, outside
end face
trapezoidal thread
bore, nozzle
107 recess in the end face

111 piston

112 annular groove

5 114 sealing ring, sealing means

116 metal plate

120 protective film, adhesive seal
New Patent Claims:

1. Needleless disposable injector with a housing (10) in which or on which are arranged, in each case at least in some areas, at least one mechanical spring energy reservoir, at least one cylinder/piston unit (100) that can be filled at least temporarily with active substance, at least one piston-actuating ram (60) and at least one trigger unit (80), in which the spring energy reservoir (50) comprises at least one pretensioned spring element and in which at least part of the piston-actuating ram (60) is positioned between the spring energy reservoir (50) and the piston (111) of the cylinder/piston unit (100),
   - in which the spring-loaded piston-actuating ram (60) has at least one tension bar (61) which is transversely movable at least in some areas and which, by means of a support portion (65), supports the tensioned spring energy reservoir (50) on at least one bearing surface (37) of the housing (10),
   - in which the trigger unit (80) is or has at least one trigger element (82) which, when actuated, causes or enables a movement of the support portion (65) away from the bearing surface (37).

2. Disposable injector according to Claim 1, characterized in that the tension bar (61) forms, together with the support portion (65), a tension hook (62) which, in a locked position, engages over the housing edge (36).

3. Disposable injector according to Claim 2, characterized in that a securing element (95), that secures the tension hook or tension hooks
(62) in a locked position, is arranged on the housing (10) or on the trigger unit (80).

4. Disposable injector according to Claim 1, characterized in that the trigger unit (80) is mechanically connected to the piston-actuating ram (60) via a spline gear (66, 68).

5. Disposable injector according to Claim 2, characterized in that at least one bundle of two or more tension hooks (62) is arranged on the piston-actuating ram (60).

6. Disposable injector according to Claim 2, characterized in that the individual tension hook (62) has a length greater than half the length of the piston-actuating ram (60).

7. Disposable injector according to Claim 2, characterized in that, in a piston-actuating ram (60) with at least two tension hooks (62), the centres of gravity of the support portions (65) of the tension hooks (62) lie further apart from one another in the non-deformed state than they do in the case of a piston-actuating ram (60) fitted in the disposable injector and not triggered.