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- (73) Patenthaver: **Sanofi-Aventis Deutschland GmbH, Brüningstraße 50, 65929 Frankfurt am Main, Tyskland**
- (72) Opfinder: **HOORMAND, Yannick, 14 The Elms, Haslingfield, Cambridgeshire CB23 1ND, Storbritannien**
JENNINGS, Douglas Ivan, 73 Redwing Rise, Royston, Hertfordshire SG8 7XU, Storbritannien
EKMAN, Matthew, 59 Ecton Avenue, Macclesfield, Cheshire SK10 1RD, Storbritannien
- (74) Fuldmægtig i Danmark: **RWS Group, Europa House, Chiltern Park, Chiltern Hill, Chalfont St Peter, Bucks SL9 9FG, Storbritannien**
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DESCRIPTION

Technical Field

[0001] The invention relates to syringe carrier.

Background of the Invention

[0002] In a conventional medicament delivery device (e.g., an autoinjector), a pre-filled syringe is housed in a carrier which is axially movable to achieve needle penetration in an injection site and, optionally, needle withdrawal. A conventional carrier provides shoulders that are adapted to engage a neck on the syringe and prevent the syringe from disengaging the carrier. Because syringes are generally supplied with rigid needle shields covering the needle and those needle shields have a diameter greater than a diameter between the shoulders, a separate assembly step is required - inserting the syringe in the carrier and then attaching the rigid needle shield to the needle. Accordingly, there is a need for a syringe carrier which does not require this separate assembly step.

[0003] US 5 078 698 A discloses a hypodermic syringe holder adapted to receive a disposable carpule and eject it in an axial direction includes a pair of pivotable jaws disposed on pivots on opposite sides of the body of the holder and a sleeve element for opening and closing the jaws slidably disposed around the body of the holder. In the downward position, the sleeve element closes the jaws around the carpule and in the upward position, the sleeve opens the jaws, permitting the carpule to be safely and consistently ejected from the holder in an axial direction.

Summary of the Invention

[0004] It is an object of the present invention to provide an improved syringe carrier.

[0005] In an exemplary embodiment, a syringe carrier according to the present invention comprises a body adapted to receive a barrel of a syringe. The body includes two sections having distal ends with shoulder sections adapted to engage a circumferential gap between the barrel of the syringe and a needle shield covering a needle of the syringe.

[0006] In an exemplary embodiment, the sections are resiliently coupled to a collar on a proximal end of the body. The shoulder sections deflect when engaged by the needle shield and return to a non-deflected position when disengaged by the needle shield to engage the circumferential gap between the barrel of the syringe and the needle shield.

[0007] In an exemplary embodiment, the sections are resiliently coupled to a collar on a distal end of the body. The sections deflect when engaged by the needle shield and return to a non-deflected position when disengaged by the needle shield to engage a finger flange of the syringe. The body includes resilient arms having additional shoulder sections adapted to engage the circumferential gap between the barrel of the syringe and a needle shield covering a needle of the syringe. The arms deflect when engaged by the needle shield and return to a non-deflected position when disengaged by the needle shield to engage the circumferential gap between the barrel of the syringe and a needle shield.

[0008] In an exemplary embodiment, the sections are coupled via at least one hinge and are movable between an open position and a closed position. A first section includes a pin adapted to engage a hole on a second section to secure the sections in the closed position.

[0009] In an exemplary embodiment, the sections are coupled via at least one clip and are movable between an open position and a closed position. The at least one clip includes a hook on a first section adapted to engage an eye on a second section to secure the sections in the closed position.

[0010] In an exemplary embodiment, the sections include doors hingedly coupled to the body and additional shoulder sections are formed on distal ends of the doors.

[0011] In an exemplary embodiment, the shoulder sections include proximally-facing contoured surfaces to accommodate a

proximal portion of a neck of the syringe and distally-facing planar surfaces to abut the needle shield.

[0012] In an exemplary embodiment, the body includes one or more viewing windows.

[0013] In an exemplary embodiment, the body includes a retainer element adapted to provide an abutment surface to prevent the syringe from disengaging the syringe carrier in a proximal direction.

[0014] Further scope of applicability of the present invention will become apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

Brief Description of the Drawings

[0015] The present invention will become more fully understood from the detailed description given hereinbelow and the accompanying drawings which are given by way of illustration only, and thus, are not limitive of the present invention, and wherein:

Figure 1

is a top view of an exemplary embodiment of a syringe carrier according to the present invention,

Figure 2

is a lateral view of the syringe carrier of figure 1,

Figure 3

is a longitudinal section of the syringe carrier of figure 1 in the section plane A-A,

Figure 4

is a perspective view of the syringe carrier of figure 1,

Figure 5

is a top view of another exemplary embodiment of a syringe carrier according to the present invention,

Figure 6

is a lateral view of the syringe carrier of figure 5,

Figure 7

is a longitudinal section of the syringe carrier of figure 5 in the section plane A-A,

Figure 8

is a perspective view of the syringe carrier of figure 5,

Figure 9

is a top view of yet another exemplary embodiment of a syringe carrier according to the present invention,

Figure 10

is a lateral view of the syringe carrier of figure 9,

Figure 11

is a longitudinal section of the syringe carrier of figure 9 in the section plane A-A,

Figure 12

is a perspective view of the syringe carrier of figure 9,

Figure 13

is another perspective view of the syringe carrier of figure 9 with a syringe inserted,

Figure 14

is a top view of yet another exemplary embodiment of a syringe carrier according to the present invention,

Figure 15

is a lateral view of the syringe carrier of figure 14,

Figure 16

is a longitudinal section of the syringe carrier of figure 14 in the section plane A-A,

Figure 17

is a perspective view of the syringe carrier of figure 14,

Figure 18

is another perspective view of the syringe carrier of figure 14 with a syringe inserted,

Figure 19

is a top view of yet another exemplary embodiment of a syringe carrier according to the present invention,

Figure 20

is a lateral view of the syringe carrier of figure 19,

Figure 21

is a longitudinal section of the syringe carrier of figure 19 in the section plane A-A,

Figure 22

is a perspective view of the syringe carrier of figure 19,

Figure 23

is another perspective view of the syringe carrier of figure 19 with a syringe inserted,

Figure 24

is a top view of yet another exemplary embodiment of a syringe carrier according to the present invention,

Figure 25

is a lateral view of the syringe carrier of figure 24,

Figure 26

is a longitudinal section of the syringe carrier of figure 24 in the section plane A-A,

Figure 27

is a perspective view of the syringe carrier of figure 24,

Figure 28

is another perspective view of the syringe carrier of figure 24 with a syringe inserted,

Figure 29

is a top view of yet another exemplary embodiment of a syringe carrier according to the present invention,

Figure 30

is a lateral view of the syringe carrier of figure 29,

Figure 31

is a longitudinal section of the syringe carrier of figure 29 in the section plane A-A,

Figure 32

is a perspective view of the syringe carrier of figure 29,

Figure 33

is another perspective view of the syringe carrier of figure 29 with a syringe inserted,

Figure 34

is a top view of yet another exemplary embodiment of a syringe carrier according to the present invention,

Figure 35

is a lateral view of the syringe carrier of figure 34,

Figure 36

is a longitudinal section of the syringe carrier of figure 34 in the section plane A-A,

Figure 37

is a perspective view of the syringe carrier of figure 34,

Figure 38

is another perspective view of the syringe carrier of figure 34 with a syringe inserted,

Figure 39

is a top view of yet another exemplary embodiment of a syringe carrier according to the present invention,

Figure 40

is a lateral view of the syringe carrier of figure 39,

Figure 41

is a longitudinal section of the syringe carrier of figure 39 in the section plane B-B,

Figure 42

is a perspective view of the syringe carrier of figure 39,

Figure 43

is another perspective view of the syringe carrier of figure 39 with a syringe inserted,

Figure 44

is a top view of yet another exemplary embodiment of a syringe carrier according to the present invention,

Figure 45

is a lateral view of the syringe carrier of figure 44,

Figure 46

is a longitudinal section of the syringe carrier of figure 44 in the section plane B-B,

Figure 47

is a perspective view of the syringe carrier of figure 44, and

Figure 48

is another perspective view of the syringe carrier of figure 44 with a syringe inserted.

[0016] Corresponding parts are marked with the same reference symbols in all figures.

Detailed Description

[0017] Generally, and applicable to all exemplary embodiments of the present invention, the syringe 2 comprises a barrel 2.1 and a neck 2.2 which has a smaller diameter than the barrel 2.1. A needle 3 is mounted to the neck 2.2 and a rigid needle shield (RNS) 4 is removably arranged on the needle 3. When coupled to the needle 3, a portion of the RNS may cover a portion of the neck 2.2, leaving a circumferential gap between the barrel 2.1 and the RNS 4. The RNS 4 has a diameter substantially equal to the diameter of the barrel 2.1.

[0018] Figures 1-4 show a first exemplary embodiment of a syringe carrier 1 according to the present invention. Figure 1 is a top view of the syringe carrier 1 for supporting a syringe 2. Figure 2 is a lateral view of the syringe carrier of figure 1. Figure 3 is a longitudinal section of the syringe carrier of figure 1 in the section plane A-A. Figure 4 is a perspective view of the syringe carrier of figure 1 without the syringe 2.

[0019] As shown in Figures 1-4, the syringe carrier 1 comprises an elongate body 1.1 arranged to receive the barrel 2.1. In this exemplary embodiment, the body 1.1 has a cylindrical shape with an internal diameter corresponding to the diameter of the barrel 2.1. The body 1.1 comprises a collar 1.2 at a proximal end dimensioned to allow axial insertion of the syringe 2 into the syringe carrier 1 in a distal direction D. Resilient sections 1.1.1 extend distally from the collar 1.2. Distal ends of the sections 1.1.1 include shoulder sections 1.4 shaped as portions of a circle arranged in a transverse plane with respect to a longitudinal axis of the carrier 1. The shoulder sections include facing surfaces 6. When the sections 1.1.1 are in a non-deflected position, the facing surfaces 6 may abut each other, and the shoulder sections 1.4 form a circular shoulder (because the facing surfaces 6 abut each other) adapted to engage the circumferential gap between the barrel 2.1 and the RNS 4.

[0020] The syringe 2, with RNS 4 attached to the needle 3, may be loaded into the syringe carrier 1 by sliding the syringe 2 in the distal direction D into the syringe carrier 2. When the RNS 4 abuts the shoulder sections 1.4, additional axial force may be applied to cause the arms 1.3 to deflect radially. When the RNS 4 has bypassed the shoulder sections 1.4, the sections 1.1.1 may return to the non-deflected position, and the shoulder sections 1.4 may engage the circumferential gap between the barrel 2.1 and the RNS 4 and prevent the syringe 2 from moving in the distal direction D relative to the syringe carrier 1.

[0021] In an exemplary embodiment, the proximal end 1.5 of the body 1.1 may be arranged to receive a finger flange 2.3 of the syringe 2.

[0022] In an exemplary embodiment, the shoulder sections 1.4 may include proximally-facing contoured surfaces to accommodate a proximal portion of the neck 2.2 of the syringe 2 and distally-facing planar surfaces to abut the RNS 4.

[0023] In an exemplary embodiment, viewing windows 5 may be arranged in the body 1.1 for allowing visual access to the barrel 2.1 of the syringe 2 when the syringe 2 is in the syringe carrier 2. In an exemplary embodiment, the windows 5 are formed when cut-outs in the resilient sections (1.1.1) are substantially contiguous when the resilient sections (1.1.1) are in the non-deflected position (as shown in Figure 1). A projection 1.6 may be formed around each cut-out, and when the sections 1.1.1 are in the non-deflected position, the projections 1.6 may form an outline for the window 5. In another exemplary embodiment, the windows 5 may be formed in the sections 1.1.1.

[0024] Figures 5-8 show a second exemplary embodiment of a syringe carrier 1 according to the present invention. Figure 6 is a lateral view of the syringe carrier 1 of figure 5. Figure 7 is a longitudinal section of the syringe carrier 1 of figure 5 in the section plane A-A. Figure 8 is a perspective view of the syringe carrier of figure 5 without the syringe 2.

[0025] As shown in Figures 5-8, the syringe carrier 1 comprises an elongate body 1.1 arranged to receive the barrel 2.1. In this exemplary embodiment, the body 1.1 is comprised of two resilient sections 1.1.1 which, when together, have a cylindrical shape with an internal diameter corresponding to the diameter of the barrel 2.1. Distal ends of the sections 1.1.1 of the body 1.1 comprise part of a collar 1.2 dimensioned to allow axial insertion of the syringe 2 into the syringe carrier 1. Resilient arms 1.3 are formed in the body 1.1. Distal ends of the arms 1.3 include shoulder sections 1.4 shaped as portions of a circle arranged in a transverse plane with respect to a longitudinal axis of the carrier 1. The shoulder sections include facing surfaces 6. When the arms 1.3 are in a non-deflected position, the facing surfaces 6 may abut the distal ends of the sections 1.1.1 of the body 1.1 to

form a circular shoulder adapted to engage the circumferential gap between the barrel 2.1 and the RNS 4.

[0026] The syringe 2, with RNS 4 attached to the needle 3, may be loaded into the syringe carrier 1 by sliding the syringe 2 in the distal direction D into the syringe carrier 2. When the RNS 4 abuts proximal ends of the sections 1.1.1, the sections 1.1.1 may deflect radially. When the RNS 4 has bypassed the proximal ends of the section 1.1.1, the sections 1.1.1 may return to the non-deflected position. When the RNS 4 abuts the shoulder sections 1.4, the arms 1.3 may deflect until the RNS 4 bypasses the shoulder sections 1.4. Then, the arms 1.3 may return to the non-deflected position, and the shoulder sections 1.4 and the collar 1.2 may engage the circumferential gap between the barrel 2.1 and the RNS 4 and prevent the syringe 2 from moving in the distal direction D relative to the syringe carrier 1.

[0027] In an exemplary embodiment, the proximal end 1.5 of the body 1.1 may be arranged to receive a finger flange 2.3 of the syringe 2. The proximal end 1.5 may also include a retainer element 1.7 which is adapted to provide an abutment surface to prevent the syringe 2 from disengaging the syringe carrier 1 in the proximal direction D.

[0028] In an exemplary embodiment, the shoulder sections 1.4 may include proximally-facing contoured surfaces to accommodate a proximal portion of the neck 2.2 of the syringe 2 and distally-facing planar surfaces to abut the RNS 4.

[0029] In an exemplary embodiment, viewing windows 5 may be arranged in the body 1.1 for allowing visual access to the barrel 2.1 of the syringe 2 when the syringe 2 is in the syringe carrier 2. In an exemplary embodiment, the windows 5 are formed when cut-outs in the sections 1.1.1 are substantially contiguous when the sections 1.1.1 are in the non-deflected position (as shown in Figure 5). A projection 1.6 may be formed around each cut-out, and when the sections 1.1.1 are in the non-deflected position, the projections 1.6 may form an outline for the window 5.

[0030] Figures 9-13 show a third exemplary embodiment of a syringe carrier 1 according to the present invention. Figure 9 is a top view of a third embodiment of a syringe carrier 1 for supporting a syringe 2. Figure 10 is a lateral view of the syringe carrier 1 of figure 9. Figure 11 is a longitudinal section of the syringe carrier 1 of figure 9 in the section plane A-A. Figure 12 is a perspective view of the syringe carrier of figure 9 without the syringe 2. Figure 13 is another perspective view of the syringe carrier of figure 9.

[0031] As shown in Figures 9-13, the syringe carrier 1 comprises an elongate body 1.1 arranged to receive the barrel 2.1. In this exemplary embodiment, the body 1.1 is comprised of two sections 1.1.1 which, when together, have a cylindrical shape with an internal diameter corresponding to the diameter of the barrel 2.1. The sections 1.1.1 may be coupled by a side hinge which allows the section 1.1.1 to rotate relative to each other sufficient to receive the syringe 2. Proximal and distal ends of the sections 1.1.1 include shoulder sections 1.4 shaped as portions of a circle arranged in a transverse plane with respect to a longitudinal axis of the carrier 1. The shoulder sections include facing surfaces 6. When the sections 1.1.1 are in a closed position, the facing surfaces 6 may abut each other so that the shoulder sections 1.4 form circular shoulders adapted to proximally abut a finger flange 2.3 on the syringe 2 and to distally engage the circumferential gap between the barrel 2.1 and the RNS 4. The facing surfaces 6 of one section 1.1.1 may include holes 1.10 and the facing surfaces 6 of the other section 1.1.1 may include pins 1.11 adapted to engage (e.g., frictionally, snap-fit, etc.) the holes 1.10 to secure the sections 1.1.1 in the closed position.

[0032] The syringe 2, with RNS 4 attached to the needle 3, may be loaded into the syringe carrier 1 by opening the sections 1.1.1 about the hinge and placing the syringe 2 in the syringe carrier 2. When the sections 1.1.1 are closed, the pins 1.11 engage the holes 1.10, and the proximal shoulder sections 1.4 form circular shoulders adapted to proximally abut a finger flange 2.3 on the syringe 2 and the distal shoulder sections 1.4 to distally engage the circumferential gap between the barrel 2.1 and the RNS 4. Thus, the syringe 2 is prevented from moving axially relative to the syringe carrier 1.

[0033] In an exemplary embodiment, the proximal end 1.5 may include a retainer element 1.7 which is adapted to provide an abutment surface to prevent the syringe 2 from disengaging the syringe carrier 1 in the proximal direction D.

[0034] In an exemplary embodiment, the shoulder sections 1.4 may include proximally-facing contoured surfaces to accommodate a proximal portion of the neck 2.2 of the syringe 2 and distally-facing planar surfaces to abut the RNS 4.

[0035] In an exemplary embodiment, viewing windows 5 may be arranged in the body 1.1 for allowing visual access to the barrel 2.1 of the syringe 2 when the syringe 2 is in the syringe carrier 2. In an exemplary embodiment, the windows 5 are formed when cut-outs in the sections 1.1.1 are substantially contiguous when the sections 1.1.1 are in the closed position. A projection 1.6 may be formed around each cut-out, and when the sections 1.1.1 are in the non-deflected position, the projections 1.6 may form an outline for the window 5.

[0036] Figures 14-18 show a fourth exemplary embodiment of a syringe carrier 1 according to the present invention. Figure 14 is a top view of a fourth embodiment of a syringe carrier 1 for supporting a syringe 2. Figure 15 is a lateral view of the syringe carrier 1 of figure 14. Figure 16 is a longitudinal section of the syringe carrier 1 of figure 14 in the section plane A-A. Figure 17 is a perspective view of the syringe carrier of figure 14 without the syringe 2. Figure 18 is another perspective view of the syringe carrier of figure 14.

[0037] As shown in Figures 14-18, the syringe carrier 1 comprises an elongate body 1.1 arranged to receive the barrel 2.1. In this exemplary embodiment, the body 1.1 has a cylindrical shape with an internal diameter corresponding to the diameter of the barrel 2.1. A distal end of the body 1.1 includes a shoulder sections 1.4 shaped as a portion of a circle arranged in a transverse plane with respect to a longitudinal axis of the carrier 1, and at least one door 1.12 hingedly coupled to the body 1.1 and including a shoulder section 1.4. A hinge 1.9 coupling the door 1.12 to the body 1.1 may be provided on an axis parallel to the longitudinal axis of the syringe carrier 1 or on an axis transverse to the longitudinal axis of the syringe carrier 1. The shoulder section 1.4 includes facing surfaces 6 which abut facing surfaces 6 of the door 1.12 when the door 1.12 is in a closed position (as shown in Figure 14). When the door 1.12 is in the closed position, the facing surfaces 6 may abut each other so that the shoulder sections 1.4 on the body 1.1 and the door 1.12 to form a circular shoulder adapted to engage the circumferential gap between the barrel 2.1 and the RNS 4. The facing surfaces 6 of the door 1.12 may include holes 1.10 and the facing surfaces 6 of the body 1.1 may include pins 1.11 (or vice-versa) adapted to engage (e.g., frictionally, snap-fit, etc.) the holes 1.10 to secure the door 1.12 in the closed position.

[0038] The syringe 2, with RNS 4 attached to the needle 3, may be loaded into the syringe carrier 1 by opening the door 1.12 and sliding the syringe 2 into the syringe carrier 1. When the circumferential gap between the barrel 2.1 and the RNS 4 engages the shoulder section 1.4 on the body 1.1, the door 1.12 may be closed to engage the gap and prevent the syringe 2 from moving axially relative to the syringe carrier 1.

[0039] In an exemplary embodiment, the shoulder sections 1.4 may include proximally-facing contoured surfaces to accommodate a proximal portion of the neck 2.2 of the syringe 2 and distally-facing planar surfaces to abut the RNS 4.

[0040] In an exemplary embodiment, viewing windows (not shown) may be arranged in the body 1.1 for allowing visual access to the barrel 2.1 of the syringe 2 when the syringe 2 is in the syringe carrier 2. In an exemplary embodiment, the windows are formed as cut-outs.

[0041] Figures 19-23 show a fifth exemplary embodiment of a syringe carrier 1 according to the present invention. Figure 19 is a top view of a fifth embodiment of a syringe carrier 1 for supporting a syringe 2. Figure 20 is a lateral view of the syringe carrier 1 of figure 19. Figure 21 is a longitudinal section of the syringe carrier 1 of figure 19 in the section plane A-A. Figure 22 is a perspective view of the syringe carrier of figure 19 without the syringe 2. Figure 23 is another perspective view of the syringe carrier of figure 19.

[0042] As shown in Figures 19-23, the syringe carrier 1 comprises an elongate body 1.1 arranged to receive the barrel 2.1. In this exemplary embodiment, the body 1.1 is comprised of two sections 1.1.1 which, when together, have a cylindrical shape with an internal diameter corresponding to the diameter of the barrel 2.1. The sections 1.1.1 may be coupled together by clips. In an exemplary embodiment, a clip may comprise an eye 1.14 on a first section adapted to engage a hook 1.13 on a second section. The eye 1.14 may have a cross-section substantially equal to the cross-section of the hook 1.13 such that the eye 1.14 and hook 1.13 engage in a snap-fit. Distal ends of the sections 1.1.1 include shoulder sections 1.4 shaped as portions of a circle arranged in a transverse plane with respect to a longitudinal axis of the carrier 1. The shoulder sections include facing surfaces 6. When the sections 1.1.1 are in a closed position, the facing surfaces 6 may abut each other so that the shoulder sections 1.4 form circular shoulders adapted to engage the circumferential gap between the barrel 2.1 and the RNS 4. Those of skill in the art will understand that the sections 1.1.1 may be hingedly connected.

[0043] The syringe 2, with RNS 4 attached to the needle 3, may be loaded into the syringe carrier 1 by opening the sections 1.1.1 and placing the syringe 2 in the syringe carrier 2. When the sections 1.1.1 are closed, the eyes 1.14 engage the hooks 1.13 and the shoulder sections 1.4 engage the circumferential gap between the barrel 2.1 and the RNS 4. Thus, the syringe 2 is prevented from moving axially relative to the syringe carrier 1.

[0044] In an exemplary embodiment, the proximal end may include a retainer element which is adapted to provide an abutment surface to prevent the syringe 2 from disengaging the syringe carrier 1 in the proximal direction D.

[0045] In an exemplary embodiment, the shoulder sections 1.4 may include proximally-facing contoured surfaces to

accommodate a proximal portion of the neck 2.2 of the syringe 2 and distally-facing planar surfaces to abut the RNS 4.

[0046] In an exemplary embodiment, viewing windows may be arranged in the body 1.1 for allowing visual access to the barrel 2.1 of the syringe 2 when the syringe 2 is in the syringe carrier 2.

[0047] Figures 24-28 show a sixth exemplary embodiment of a syringe carrier 1 according to the present invention. Figure 24 is a top view of a sixth embodiment of a syringe carrier 1 for supporting a syringe 2. Figure 25 is a lateral view of the syringe carrier 1 of figure 24. Figure 26 is a longitudinal section of the syringe carrier 1 of figure 24 in the section plane A-A. Figure 27 is a perspective view of the syringe carrier of figure 24 without the syringe 2. Figure 28 is another perspective view of the syringe carrier of figure 24.

[0048] As shown in Figures 24-28, the syringe carrier 1 comprises an elongate body 1.1 arranged to receive the barrel 2.1. In this exemplary embodiment, the body 1.1 has a partially cylindrical shape with an internal diameter corresponding to the diameter of the barrel 2.1. The body 1.1 may include a longitudinal slot (e.g., a cut-out) which is adapted to snap over the barrel 2.1 of the syringe 2. Proximal and distal ends of the body 1.1 include clamps 1.15, 1.16 which are adapted to retain the syringe 2 when in the syringe carrier 1. The distal end of the body 1 further includes shoulder sections 1.4 shaped as a portion of a circle arranged in a transverse plane with respect to a longitudinal axis of the carrier 1. The shoulder sections 14 form circular shoulders adapted to engage the circumferential gap between the barrel 2.1 and the RNS 4.

[0049] The syringe 2, with RNS 4 attached to the needle 3, may be loaded into the syringe carrier 1 by pressing the barrel 2.1 against the clamps 1.15, 1.16, causing the clamps 1.15, 1.16 to deflect and widen the longitudinal slot in the body 1.1. When the barrel 2.1 bypasses the clamps 1.15, 1.16, the clamps 1.15, 1.16 return to their non-deflected position and retain the syringe 2 in the syringe carrier 1. The shoulder sections 1.4 engage the circumferential gap between the barrel 2.1 and the RNS 4. Thus, the syringe 2 is prevented from moving axially relative to the syringe carrier 1.

[0050] In an exemplary embodiment, the proximal end may include a retainer element which is adapted to provide an abutment surface to prevent the syringe 2 from disengaging the syringe carrier 1 in the proximal direction D.

[0051] In an exemplary embodiment, the shoulder sections 1.4 may include proximally-facing contoured surfaces to accommodate a proximal portion of the neck 2.2 of the syringe 2 and distally-facing planar surfaces to abut the RNS 4.

[0052] In an exemplary embodiment, a viewing window may be arranged in the body 1.1 for allowing visual access to the barrel 2.1 of the syringe 2 when the syringe 2 is in the syringe carrier 2.

[0053] Figures 29-33 show a seventh exemplary embodiment of a syringe carrier 1 according to the present invention. Figure 29 is a top view of a seventh embodiment of a syringe carrier 1 for supporting a syringe 2. Figure 30 is a lateral view of the syringe carrier 1 of figure 29. Figure 31 is a longitudinal section of the syringe carrier 1 of figure 29 in the section plane A-A. Figure 32 is a perspective view of the syringe carrier of figure 29 without the syringe 2. Figure 33 is another perspective view of the syringe carrier of figure 29.

[0054] As shown in Figures 29-33, the syringe carrier 1 comprises an elongate body 1.1 arranged to receive the barrel 2.1. In this exemplary embodiment, the body 1.1 has a partially cylindrical shape with an internal diameter corresponding to the diameter of the barrel 2.1. The body 1.1 includes a collar 1.2 at its proximal end and may include a longitudinal slot (e.g., a cut-out) formed in the body 1.1 distally of the collar 1.2 which is adapted to snap over the barrel 2.1 of the syringe 2. A pair of groove hinges 1.17 may be formed in the body 1.1 adjacent a proximal end of the slot. The distal end of the body 1 includes shoulder sections 1.4 shaped as a portion of a circle arranged in a transverse plane with respect to a longitudinal axis of the carrier 1. The shoulder sections 14 form circular shoulders adapted to engage the circumferential gap between the barrel 2.1 and the RNS 4.

[0055] The syringe 2, with RNS 4 attached to the needle 3, may be loaded into the syringe carrier 1 by sliding the syringe 2 through the collar 1.2 in the distal direction D. When the RNS 4 abuts the shoulder sections 1.4, the body 1.1 may radially deflect (e.g., rotate) about the groove hinges 1.17. When the RNS 4 bypasses the shoulder sections 1.4, the body 1.1 may return to its non-deflected position and retain the syringe 2 in the syringe carrier 1. The shoulder sections 1.4 engage the circumferential gap between the barrel 2.1 and the RNS 4. Thus, the syringe 2 is prevented from moving axially relative to the syringe carrier 1.

[0056] In an exemplary embodiment, the proximal end may include a retainer element which is adapted to provide an abutment surface to prevent the syringe 2 from disengaging the syringe carrier 1 in the proximal direction D.

[0057] In an exemplary embodiment, the shoulder sections 1.4 may include proximally-facing contoured surfaces to

accommodate a proximal portion of the neck 2.2 of the syringe 2 and distally-facing planar surfaces to abut the RNS 4.

[0058] In an exemplary embodiment, a viewing window may be arranged in the body 1.1 for allowing visual access to the barrel 2.1 of the syringe 2 when the syringe 2 is in the syringe carrier 2.

[0059] Figures 34-38 show an eighth exemplary embodiment of a syringe carrier 1 according to the present invention. Figure 34 is a top view of an eighth embodiment of a syringe carrier 1 for supporting a syringe 2. Figure 35 is a lateral view of the syringe carrier 1 of figure 34. Figure 36 is a longitudinal section of the syringe carrier 1 of figure 34 in the section plane A-A. Figure 37 is a perspective view of the syringe carrier of figure 34 without the syringe 2. Figure 38 is another perspective view of the syringe carrier of figure 34.

[0060] As shown in Figures 34-38, the syringe carrier 1 comprises an elongate body 1.1 arranged to receive the barrel 2.1. In this exemplary embodiment, the body 1.1 has a cylindrical shape with an annular groove 1.19 adjacent its distal end which is adapted to engage a circlip 8. The circlip 8 may engage the circumferential gap between the barrel 1.2 and the RNS 4.

[0061] The syringe 2, with RNS 4 attached to the needle 3 and the circlip 8 attached to the syringe 2, may be loaded into the syringe carrier 1 by sliding the syringe 2 into the syringe carrier 1 in the distal direction D. In a non-deflected position, an outer diameter of the circlip 8 may be substantially equal to a diameter of the body 1.1. Thus, when the syringe 2 with the circlip 8 is inserted into the syringe carrier 1, the circlip 8 may deflect radially until the circlip 8 reaches the annular groove 1.19. The circlip 8 may then expand to the non-deflected position and retain the syringe 2 in an axial position relative to the syringe carrier 1. That is, the circlip 8 may engage the annular groove 1.19 and the circumferential gap between the barrel 2.1 and the RNS 4. Thus, the syringe 2 is prevented from moving axially relative to the syringe carrier 1.

[0062] In an exemplary embodiment, the proximal end may include a retainer element which is adapted to provide an abutment surface to prevent the syringe 2 from disengaging the syringe carrier 1 in the proximal direction D.

[0063] In an exemplary embodiment, the shoulder sections 1.4 may include proximally-facing contoured surfaces to accommodate a proximal portion of the neck 2.2 of the syringe 2 and distally-facing planar surfaces to abut the RNS 4.

[0064] In an exemplary embodiment, a viewing window may be arranged in the body 1.1 for allowing visual access to the barrel 2.1 of the syringe 2 when the syringe 2 is in the syringe carrier 2.

[0065] Figures 39-43 show a ninth exemplary embodiment of a syringe carrier 1 according to the present invention. Figure 39 is a top view of a ninth embodiment of a syringe carrier 1 for supporting a syringe 2. Figure 40 is a lateral view of the syringe carrier 1 of figure 39. Figure 41 is a longitudinal section of the syringe carrier 1 of figure 39 in the section plane A-A. Figure 42 is a perspective view of the syringe carrier of figure 39 without the syringe 2. Figure 43 is another perspective view of the syringe carrier of figure 39.

[0066] As shown in Figures 39-43, the syringe carrier 1 comprises an elongate body 1.1 arranged to receive the barrel 2.1. In this exemplary embodiment, the body 1.1 has a cylindrical shape with an annular groove 1.19 having at least one aperture 1.20 adjacent its distal end which is adapted to engage a circlip 8.

[0067] The syringe 2, with RNS 4 attached to the needle 3, may be loaded into the syringe carrier 1 by sliding the syringe 2 into the syringe carrier 1 in the distal direction D. When the circumferential gap between the barrel 2.1 and the RNS 4 is aligned with the annular groove 1.19, the circlip 8 may be coupled to the body 1.1 and engage the apertures 1.20. By extending inwardly through the apertures, the circlip 8 may be coupled to the outside of the body 1.1 but engage the circumferential gap between the barrel 2.1 and the RNS 4. The engagement between the circlip 8 and the apertures 1.20 prevents the circlip 8 from translating relative to the body 1.1, and the engagement between the circlip 8 and the circumferential gap prevents the syringe 2 from moving axially relative to the syringe carrier 1.

[0068] In an exemplary embodiment, the proximal end may include a retainer element which is adapted to provide an abutment surface to prevent the syringe 2 from disengaging the syringe carrier 1 in the proximal direction D.

[0069] In an exemplary embodiment, the shoulder sections 1.4 may include proximally-facing contoured surfaces to accommodate a proximal portion of the neck 2.2 of the syringe 2 and distally-facing planar surfaces to abut the RNS 4.

[0070] In an exemplary embodiment, a viewing window may be arranged in the body 1.1 for allowing visual access to the barrel

2.1 of the syringe 2 when the syringe 2 is in the syringe carrier 2.

[0071] Figures 44-48 show a tenth exemplary embodiment of a syringe carrier 1 and a tool 9 for inserting a syringe 2 into the syringe carrier 1 according to the present invention.

[0072] As shown in Figures 39-43, the syringe carrier 1 comprises an elongate body 1.1 arranged to receive the barrel 2.1. In this exemplary embodiment, the body 1.1 has an enlarged portion 1.21 on its distal end. The body 1.1 has cylindrical shape with a first diameter and the enlarged portion 1.21 has a second diameter, larger than the first diameter. The enlarged portion 1.21 has one or more resilient barbs 1.22 extending toward a longitudinal axis of the body 1.1 and angled toward a proximal end of the body 1.1.

[0073] The syringe 2, with RNS 4 attached to the needle 3, may be loaded into the syringe carrier 1 by inserting the tool 9 into the enlarged portion 1.21 of the syringe carrier 1. The tool 9 may be a cylinder having an open end adapted to receive the RNS 4. The tool 9 may have a third diameter substantially equal to the second diameter. As the tool 9 is inserted into the enlarged portion 1.21, the tool 9 engages and deflects the resilient barbs 1.22. When the barbs 1.22 are deflected, the RNS 4 can pass the barbs 1.22 in the distal direction D and extend from a distal opening of the body 1.1. When a finger flange 2.3 of the syringe 2 abuts a proximal end of the body 1.1, the tool 9 may be removed and the barbs 1.22 may engage the circumferential gap between the barrel 2.1 and the RNS 4 to prevent the syringe 2 from moving axially relative to the syringe carrier 1.

[0074] In an exemplary embodiment, the proximal end may include a retainer element which is adapted to provide an abutment surface to prevent the syringe 2 from disengaging the syringe carrier 1 in the proximal direction D.

[0075] In an exemplary embodiment, the barbs 1.22 may include proximally-facing contoured surfaces to accommodate a proximal portion of the neck 2.2 of the syringe 2 and distally-facing planar surfaces to abut the RNS 4.

[0076] In an exemplary embodiment, a viewing window may be arranged in the body 1.1 for allowing visual access to the barrel 2.1 of the syringe 2 when the syringe 2 is in the syringe carrier 2.

[0077] It is apparent to those skilled in the art that the number of deflectable arms 1.3, shoulder sections 1.4, clips 8 may be varied without departing from the spirit and scope of the invention. Likewise, all the illustrated embodiments may be implemented with or without viewing windows 5, projections 1.6, restraining features retainer elements 1.7 and clips. Different kinds of clips may likewise be applied.

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- [US5078698A \[0003\]](#)

Patentkrav

1. Sprøjtebæreenhed (1), der omfatter:

et legeme (1.1), der er indrettet til at modtage en cylinder
5 (2.1) af en sprøjte (2), hvilket legeme (1.1) indbefatter to
sektioner (1.1.1), der har distale ender med skuldersektioner
(1.4), hvor skuldersektionerne (1.4) er indrettet til at gå i
indgreb med et omkredsende mellemrum mellem cylinderen (2.1)
af sprøjten (2) og en kanyleafskærmning (4), der dækker en
10 kanyle (3) på sprøjten (2), til forhindring af, at sprøjten
(2) bevæger sig i en distal retning (D) i forhold til
sprøjtebæreenheden (1), der er kendetegnet ved, at sektionerne
(1.1.1) er elastisk koblet til en krave (1.2) på en proksimal
ende af legemet (1.1), hvor skuldersektionerne (1.4) bøjer af,
15 når de går i indgreb med kanyleafskærmningen (4), og
returnerer til en ikke-afbøjet position, når de afkobles fra
kanyleafskærmningen (4) til kobling med det omkredsende
mellemrum mellem cylinderen (2.1) af sprøjten (2) og
kanyleafskærmningen (4).

20

2. Sprøjtebæreenhed (1) ifølge et hvilket som helst af
ovennævnte krav, hvor skuldersektionerne (1.4) indbefatter
proksimalt vendende konturerede overflader til at rumme en
proksimal del af en hals (2.2) af sprøjten (2) og distalt
25 vendende plane overflader til at grænse op til
kanyleafskærmningen (4).

3. Sprøjtebæreenhed (1) ifølge et hvilket som helst af
ovennævnte krav, hvor legemet (1.1) indbefatter et eller flere
30 visningsvinduer (5).

4. Sprøjtebæreenhed (1) ifølge et hvilket som helst af
ovennævnte krav, hvor legemet (1.1) indbefatter et
låseelement, der er indrettet til at tilvejebringe en
35 tilstødsflade til forhindring af, at sprøjten (2) kobles fra
sprøjtebæreenheden (1) i en proksimal retning (P).

5. Sprøjtebæreenhed (1) ifølge krav 3, hvor det ene eller de flere vinduer (5) dannes, når udskæringer i de elastiske sektioner (1.1.1) i det væsentlige er fortløbende, når de
5 elastiske sektioner (1.1.1) er i den ikke-afbøjede position.

6. Sprøjtebæreenhed (1) ifølge krav 5, hvor der er dannet et fremspring (1.6) omkring hver udskæring, og fremspringene (1.6) danner et omrids for vinduet (5), når sektionerne
10 (1.1.1) er i den ikke-afbøjede position.

7. Sprøjtebæreenhed (1) ifølge et hvilket som helst af kravene 3 eller 4, hvor vinduerne (5) er formet i sektionerne (1.1.1).

DRAWINGS

















