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Protective device for an injection needle

The invention relates to a protective device for an injection needle or infusion needle according to the preamble of claim 1.

A protective device of this kind is known for example from US 4 929 241, in which a relatively small protective element is arranged on the needle and can be moved by a spring from the retracted position to the protection position on the needle tip, with elastic arms of the protective element engaging over the needle tip, while an engagement device on the protective element holds the latter on the needle shaft. Because of the smallness of the protective element, it is difficult to move it by hand on the needle. In addition, the securing spring can only be released when the needle tip lies free, so that a risk of injury cannot be ruled out.

The object of the invention is to design a protective device of the type mentioned at the outset in such a way that actuation by hand is made easier and a risk of injury can be ruled out.

According to the invention, this object is achieved by the features in the characterizing part of claim 1. By virtue of the fact that a grip part for moving the protective element is provided between protective element and needle holder, it is possible, when drawing the needle back by means of the needle holder after an injection, to hold the grip part comfortably with the other hand so that, as a result of the relative movement between needle and grip part, the protective element is moved into the protection position on the needle tip without the small protective element having to be touched with the fingers. A risk of injury can also be ruled out by virtue of the fact that the protective element is brought into the protection

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position when the needle is being drawn back.

Illustrative embodiments of the invention are explained in more detail below with reference to the drawings, in which:

Fig. 1 shows a protective device in longitudinal section,

Fig. 2 shows a side view of the embodiment according to Fig. 1,

Fig. 3 shows a view of the device according to Figs 1 and 2 with the protective element moved to the protection position,

Fig. 4 shows a modified device according to Figs 1 and 2 with a needle cap,

Fig. 5 shows another embodiment of a grip part in conjunction with a syringe,

Fig. 6 shows a modified embodiment of the device according to Fig. 5,

Fig. 7 shows an embodiment in conjunction with a needle holder provided with wings,

Fig. 8 shows a cross section through the embodiment according to Fig. 7,

Fig. 9 shows an end view of Fig. 7,

Fig. 10 shows a plan view of an embodiment according to Fig. 7 with needle cap,

Fig. 11 shows a view of the needle cap according to Fig. 10,

Fig. 12 shows a plan view of an embodiment according to Fig. 7 with a modified needle cap,

Fig. 13 shows a side view of the needle cap according to Fig. 12,

Fig. 14 shows a longitudinal section through a needle cap,

Fig. 15 shows a cross section through another embodiment with a curved needle,

Fig. 16 shows another needle cap in the embodiment according to Fig. 15,

Fig. 17 shows an embodiment with a deformable grip part in the starting position,

Fig. 18 shows the grip part from Fig. 17 in the extended position,

Fig. 19 shows a further embodiment of a deformable grip part in the starting position, and

Fig. 20 shows the grip part from Fig. 19 in the deployed position.

Fig. 1 shows a needle holder 1 in which a needle 2 is secured. Arranged on the shaft of the needle 2 there is a protective element 3 in the form of a spring clip with intersecting arms. Reference number 4 indicates a sleeve which can be moved with the protective element 3 along the needle shaft. In the illustrative embodiment shown, the tip 5 of the needle is designed with a curve in the manner of an epidural needle or a Huber needle, so that the sleeve 4, which has a smaller diameter than the curve on the needle tip, and, together with it, the protective element 3 and cannot be moved past the needle tip.

Arranged between needle holder 1 and protective element 3 there is a grip part 6 which, at the proximal end, has a hollow cylindrical portion 7 on which a radially protruding shield 8 is formed. On the front face of the shield 8 there is a cylindrical portion 9 whose distal end is hollow. In the standby position according to Fig. 1, the protective element 3 is arranged in the cavity 10 and, by displacement of the grip part 6, can be moved forward to the needle tip 5, while the needle holder 1 is held with the other hand. The angled ends of the intersecting arms of the protective element 3 engage over the needle tip 5, so that injury to operating personnel by the needle tip is prevented.

At the distal end, the needle holder 1 has radially protruding ribs 11 on which the hollow cylindrical portion 7 of the grip part 6 is guided. Between the cylindrical portion 9 of smaller external diameter and the hollow cylindrical portion 7 of greater external diameter, slits 12 are formed in the grip part 6, through which slits 12 the front ends of the ribs 11 of the needle holder 1 protrude radially, as Fig. 2 shows.

The cylindrical portion 9 of the grip part 6 provided with the cavity 10 has a solid cylindrical portion 14 between the slits 12 and the cavity 10, in the central bore of which portion 14 the needle 2 is guided. Between the slits 12 of the grip part 6, the cylindrical portion 9 is connected integrally to the shield 8 and the hollow cylindrical portion 7 via bridges 15.

These ribs 11 protruding over the outer circumference of the cylindrical portion 9 of the grip part 6 serve for attachment of a needle cap 13, which is shown in Fig. 4. This needle cap 13 is used for storing and handling the device. It can be removed from the needle holder 1 immediately before use of the injection

needle, in order to expose the needle, without the grip part 6 and the protective element 3 being moved, because the needle cap 13 is held by the ribs 11 at a radial distance from the portion 9 of the grip part 6.

Because of the smaller diameter at the portion 14 compared to the greater diameter at the ribs 11, the needle cap 13, which consists of a tube section of constant diameter, cannot be positioned incorrectly on the portion 14, but only attached to the ribs 11. This ensures that the needle cap 13 is not inadvertently engaged with a portion of the grip part 6. The needle cap 13 can be produced inexpensively by extrusion of a tube, a section of such a tube forming the needle cap 13.

After removal of the needle cap 13, an injection can be carried out in the standby position according to Figs 1 and 2. As the needle is pulled back with one hand on the needle holder 1, the grip part 6 on the portion 7 is held with the other hand, so that the protective element 3 is moved into the protection position on the needle tip as a result of the relative movement between grip part 6 and needle 2. This deployed position of the grip part 6 is illustrated in Fig. 3.

The protective element 3 is arranged loosely in the cavity 10 of the grip part 6, so that the grip part 6 can be easily drawn back from the position in Fig. 3, while the protective element remains in the protection position on the needle tip. The cavity 10 in the cylindrical portion 9 protects the protective element 3 after removal of the needle cap 13.

Fig. 4 shows a preferred embodiment of the grip part 6, the hollow cylindrical portion at the distal end of the grip part 6 being omitted, so that the solid cylindrical portion 14 forms the distal end of the grip part 6. After removal of the needle cap 13 from the

ribs 11, the protective element 3 lies free in Fig. 4.

In the embodiment according to Figs 1 and 2, the hollow cylindrical portion 7 on the grip part 6 is used to protect the fingers of the hand holding the grip part from touching the needle shaft when the needle is drawn back.

In another configuration of the needle holder 1, this hollow cylindrical portion 7 can be made larger behind the shield 8.

The grip part 6, like the needle holder 1 too, is expediently made of plastic.

Fig. 5 shows a modified embodiment of a grip part 6 in combination with a syringe 16 on which an injection needle 2 is secured via a needle holder 17 designed as cannula attachment. In this embodiment, a bead 18 is formed on the outer circumference of the needle, before the needle tip, on which bead 18 the rear wall of the protective element 3 comes to bear in the protection position. Instead of a bead 18, diametrically opposite knob-like projections can be formed by pinching the needle.

The grip part 6 has a cylindrical portion 19 which, in the starting position according to Fig. 5, is guided on the needle holder 17. In the illustrative embodiment shown, two brackets 20 extend from this cylindrical portion 19 in the proximal direction, on diametrically opposite sides, at a distance from the syringe circumference. The ends of these brackets 20 are integrally formed on an annular body 21 from which elastic fingers 22 extend radially inward. The free ends of these elastic fingers 22 lie on the outer circumference of the syringe 16.

Because of the elastic fingers 22 between the grip part

6 and the outer circumference of the syringe 16, the grip part 6 can be used for different sizes of syringe diameter, e.g. syringes with a volume of 1 ml to 10 ml can be fitted into the same grip part. By this means, there is a wide choice of syringes which can be used with the same needle.

In the embodiment according to Fig. 5 too, radially protruding ribs 11 are formed at the front end of the needle holder formed as cannula attachment and these serve as a seat for a needle cap. The protective element 3, whose rear wall protrudes beyond the cross section of the ribs 11, is moved forward into the protection position through the inner circumference of the cylindrical portion 19.

Fig. 6 shows an embodiment of the grip part 6 in which, formed on the cylindrical portion 19, there is a further cylindrical portion 9 in whose cavity 10 the protective element 3 is received. As in the embodiment according to Figs 1 and 2, axially extending slits are formed between cylindrical portion 19 and portion 9, through which slits the ribs 11 formed on the needle holder or cannula attachment 17 protrude in order to receive the needle cap 13.

Fig. 6a shows, in a perspective view, a needle cap 50 which is formed by injection-molding and whose distal end can be closed, while the proximal end has, on the inner circumference, flutes or grooves 51 which correspond to the number of ribs 11 and which engage with the ribs 11 when the needle cap is placed on the needle holder 17, so that, by turning the attached needle cap 50, the needle holder 17 can also be turned. A threaded engagement is usually provided between needle holder 17 and syringe 16, so that, by turning the needle cap 50, the needle holder 17 can be screwed onto the syringe 16.

It is customary to draw liquid into the syringe by means of a needle of relatively large diameter and then to replace this needle with a needle having a relatively small diameter, in order to perform an infusion on the patient. In the embodiment according to Figs 5 and 6, the needle can be changed without difficulty.

The described design permits actuation with one hand when the syringe content has been injected, the syringe 16 being held with two fingers and the needle being pulled from the patient's skin, while at the same time a finger of the hand bears on the annular body 21 lying at the proximal end.

Fig. 7 shows a plan view of a needle holder 1 which is provided with laterally protruding wings 23 and to which a connection tube 24 is attached. Arranged between the protective element 3 arranged on the needle shaft and the needle holder 1 there is a grip part 6 with a hub-shaped portion 26 which, because of the flat injection angle (Fig. 8), expediently has a surface part 25 for bearing on the patient's skin which, on the bearing side, can be provided for example with an adhesive layer for better retention on the skin. A foam material 25' is preferably provided on the bearing side. The hub portion 26 of the grip part 6 protruding from the front end of the surface part 25 at least partially covers the protective element 3. The surface part 25 or the soft bearing part 25' also serves as spacer for keeping the protective element 3 from the patient's skin. In the illustrative embodiment according to Fig. 8, the soft bearing part 25' extends across the surface part 25 under the hub portion 26, so that the protective element 3 does not lie on the patient's skin.

The needle holder 1 provided with wings 23 is used for venous infusions, for which a thin needle is normally

used. The wings 23 are relatively large and flexible. They are pressed together if the needle is introduced into the skin at a very flat angle. A protective paper (not shown) applied on the adhesive layer on the bearing surface should not be peeled off until the needle is introduced into the vein. After the needle has been introduced into the vein, the wings 23 are placed flat against the patient's skin and secured with an adhesive tape. The grip part 6 too can be secured by means of an adhesive tape, the hub-shaped portion 26 preventing contact between protective element 3 and adhesive tape. When the needle is drawn back after removal of the adhesive tape from the needle holder, the grip part 6 initially remains in its position with the protective element 3. After the drawn-back needle tip is safely covered by the protective element 3, with the projections 18 on the needle fixing the protective element 3 on the needle tip, the grip part 6 can also be removed from the patient's skin.

Figs 7 and 8 show the device in the standby position for insertion of the needle. If the bearing surface 25 provided with an adhesive layer is used on the grip part, this is a passive system.

Fig. 9 shows a view of the grip part 6 from the right in Fig. 7. The wings 23 serve as bearing surface for the needle holder 1 since the infusion needle must remain for a certain time in the inserted position.

Figures 10 and 11 show, in a construction according to Figs 7 through 9, a needle cap 13 provided with two spaced-apart retaining brackets 27 which are hooked via a curved free end 27' on the wings 23, as Fig. 10 shows. In this embodiment, the proximal end of the needle cap 13 expediently bears on the front end of the protective element 3, as Fig. 10 shows, so that the protective element 3 is held in its standby position.

It is also possible, however, to provide a hub-shaped attachment at the proximal end of the needle cap 13, which attachment bears on the front face of the hub-shaped portion 26.

In the embodiments described, a protective element in the form of a spring clip with intersecting arms is depicted in each case. However, another design of a protective element can also be used in conjunction with the grip part 6.

Fig. 12 shows a further embodiment of the device according to Figs 7 through 9. Instead of having the suspension brackets 27, the needle cap 13 is in this case provided on both sides with an extension strut 36 which, at the free end, has a fork-shaped portion 37 for attachment to the wings 23 of the needle holder (Fig. 13). These two spaced-apart struts 36 extend through correspondingly dimensioned openings 38 in the hub portion 26 of the grip part 6, so that the fork-shaped insertion portions 37 can be pulled without difficulty through these openings 38. When the needle cap 13 is taken off, the needle holder 1 is held, and the grip part 6 is not moved.

Fig. 14 shows a longitudinal section through a needle cap 13 whose proximal end bears on the protective element 3. The needle cap is of tubular design, and the diameter enlargement 18 on the needle 2, produced by pinching, serves as a spacer for the needle cap 13. Such a needle cap can be produced by extrusion or injection-molding. It is also possible to form, on the inner circumference of the needle cap, a bead or knobs, which bear on the needle shaft and guide the needle substantially concentrically in the needle cap. The needle cap 13 is in this case held on the needle 2 by friction on the bulges 18.

According to a further embodiment, the needle cap, when

it has been fitted onto the needle, can be fixed on the needle by mean of heat and pressure or by shrinking.

Fig. 15 shows an embodiment in combination with a Huber needle 2 which is held in a needle holder 1' by means of a curved portion and is provided for perpendicular insertion upon injection. Reference number 30 designates a bearing part which is preferably made of foam material and which is provided with an adhesive face for better fixing on the patient's skin. Arranged between the bearing part 30 and the needle holder 1' there is a shield-like grip part 6 which rests on the bearing part via a flange-like area 31 and extends via a pot-shaped middle portion 32 into a corresponding depression in the needle holder 1'. The protective element 3 is arranged in this pot-shaped middle part 32.

When the needle is drawn out, the grip part 6 is held on the bearing part 30, while the needle holder 1' is removed. The protective element 3 is moved toward the needle tip until it comes to rest on the needle bulge 18, while at the same time the two intersecting arms of the protective element 3 engage over the needle tip and cover it. The grip part 6 can be removed from the bearing part 30 or together with the latter. Grip part 6 and bearing part 30 can also be connected to one another via an adhesive layer.

The side walls of the pot-shaped middle part 32 are preferably conical so that the grip part 6 cannot itself be removed but instead only pressed.

Fig. 15 shows a needle cap 13' with a tubular portion from whose proximal end there protrude diametrically opposite wall portions 33 which are inserted via partially circular slits 34 in the flange 31 of the grip part 6 into correspondingly partially circular grooves 35 in the needle holder 1'. The curved wall

portions 33 are guided loosely through the curved slits 34 in the flange 31 of the grip part 6 and inserted with a press fit into the grooves 35 of the needle holder 1'.

As in the other embodiments of a needle cap 13, the needle cap 13' in Fig. 15 can also be closed at the distal end.

Fig. 16 shows an embodiment with a Huber needle 2 according to Fig. 15, where a needle cap 13 of smaller internal diameter is pushed onto the needle 2. The needle cap corresponds substantially to that of Fig. 14, the needle cap 13 being held on the needle by means of friction at the angled front end. This needle cap 13 in Fig. 16 can be provided with radially protruding and diametrically opposite surface portions 52 through which handling is improved and the tubular needle cap 13 is made more rigid. Fig. 16a shows a perspective view of such a needle cap 13 with diametrically opposite surface portions 52.

Figs 17 and 18 show an embodiment in which the grip part 6 has a deformable portion by means of which the distal end of the grip part, on which the protective element 3 lies, can be moved in the direction of the protection position on the needle tip by means of the deformable portion being deformed. In the illustrative embodiment according to Figs 17 and 18, two pairs of deformable brackets 40 and 40' are formed on the grip part 6 and these can be pressed together by the fingers so that they can be moved from the curved state in Fig. 17 to an extended state in Fig. 18. The two deformable pairs of brackets 40 and 40' are connected to one another by a sleeve portion 41. It is also possible to insert, between the two bracket pairs 40 and 40', an element which, when pressed by the fingers, changes the two deformable brackets 40 and 40' to the extended position according to Fig. 17.

Figs 19 and 20 show a further embodiment of a deformable grip part 6, Fig. 19 illustrating the grip part in the collapsed state in the standby position. The needle cap 13 is provided at the proximal end with a receiving portion 42 which receives collapsed portions 45 of the grip part 6, which is arranged between needle holder 1 and the protective element 3 (not shown in Fig. 19) arranged in the receiving portion 42.

Fig. 20 shows in schematic representation the grip part 6 in a partially deployed state after the needle cap 13 has been removed and an injection has been carried out. The stiff portions 45 of the grip part 6 which are connected to one another via articulations and hinge portions 44 and which are partially guided on the needle 2 are moved and aligned along the needle, the protective element 3 being pushed forward to the needle tip until it engages with the needle bulge 18 and covers the needle tip.

Compared to the embodiments according to Figs 17 through 20, the embodiments according to Figs 1 through 16 have the advantage that a greater cannula length is available in the standby position because the protective element 3 lies directly on the needle holder, whereas, in the embodiments according to Figs 17 through 20, a more complicated design of the grip part 6 is provided between protective element 3 and needle holder 1, as a result of which the available cannula length is restricted. The embodiment according to Figs 19 and 20 is also more advantageous in terms of the length of the available cannula than the embodiment according to Figs 17 and 18 because a more compact arrangement is made possible by the folding of the portions 45, as Fig. 19 shows when compared to Fig. 17. Instead of the fold portions in Fig. 20, a scissor mechanism between protective element and needle holder

can also be provided in order to accommodate, in a smaller space, elements with which the protective element can be deployed.

In all the embodiments, the protective element 3 is preferably a needle clip which is made of metal and whose intersecting arms issue from opposite sides of a proximal wall portion having a hole for the passage of the needle, the hole diameter being smaller than the maximum transverse dimension of the needle at the pinch 18, so that the needle clip is held in the protection position on the needle tip by means of the portion 18 of increased diameter. The intersecting arms extending on both sides of the needle 2, as Fig. 14a shows, have, at the distal end, an end portion which is widened to approximately the width of the rear wall and which, in the starting position, lies with elastic pretensioning on the outer circumference of the needle and, on reaching the needle tip, is moved by spring action into the protection position in which the two widened end portions engage over the needle tip. For this purpose, the distal ends of the arms, as the side views show, are slightly offset with respect to one another in the longitudinal direction or the arms are of different lengths, so that it is thus ensured that the two angled end portions of the arms engage over the needle tip. At least on the longer arm, the end portion is curved inward at the free edge in order to ensure that the needle tip is covered even if an attempt is made to push the needle clip back from the protection position on the needle, the inwardly curved end portion hooking onto the needle tip. The needle clip as a whole can be made very compact and only about 7 mm long.

Claims

1. A protective device for an injection needle or infusion needle (2), comprising a needle holder (1) at the proximal end of the needle, on whose shaft a protective element (3) for the needle tip can be moved, said protective element (3) being prevented, by an engagement device (4, 18) between needle (2) and protective element (3), from being moved past the needle tip, characterized in that a grip part (6) is provided between protective element (3) and needle holder (1) for the purpose of moving or securing the protective element (3).

2. The device as claimed in claim 1, in which the grip part (6) has a hollow cylindrical portion (7) which is guided on the needle holder (1) and which prevents the fingers from coming into contact with the needle shaft when the needle is drawn back.

3. The device as claimed in claim 2, in which a shield (8) is formed at the distal end of the hollow cylindrical portion.

4. The device as claimed in the preceding claims, in which radially protruding ribs (11) are formed at the distal end of the needle holder (1), and this portion of the needle holder (1) provided with ribs (11) has a greater diameter than the protective element (3) and is used for attachment of a needle cap (13).

5. The device as claimed in claim 4, in which the grip part (6) has, on a cylindrical portion (9), axially extending slits (12) through which the ribs (11) of the needle holder (1) protrude radially.

6. The device as claimed in the preceding claims, in which the grip part (6) is provided, at the distal end, with a cavity (10) for receiving the protective element (3).

7. The device as claimed in the preceding claims, in which the grip part (6) at the proximal end has an annular body (21) which has radially inwardly projecting elastic fingers (22) and is connected via brackets (20) to a cylindrical portion (19) on which the protective element (3) bears.

8. The device as claimed in claim 1, in which the needle holder (1) is provided on opposite sides with wings (23) and the grip part (6) has a hub-shaped portion (26) for partially engaging over the protective element (3).

9. The device as claimed in claim 8, in which a needle cap (13) is provided with brackets (27) which can be hooked on the wings (23) of the needle holder, while the proximal end of the needle cap (13) bears on the distal end of the protective element (3).

10. The device as claimed in claim 8, in which the hub-shaped portion (26) juts out from a flat bearing part (25) on which the needle holder (1) rests.

11. The device as claimed in claim 1, in which the grip part (6) has a flange-like portion (31) with a pot-shaped middle part (32) and rests on a bearing part (30).

12. The device as claimed in claims 10 and 11, in which the bearing part (25, 30) has an adhesive layer for fixing the device on a patient's skin.

13. The device as claimed in claim 1, in which the grip part (6) has at least one deformable portion (40, 45) by means of which the protective element (3) can be moved into the protection position on the needle tip by deformation of said portion.

14. The device as claimed in claim 13, in which brackets (40) that can be deformed by pressure with the fingers are formed on the grip part (6).

15. The device as claimed in claim 13, in which portions (45) connected by articulation or hinge portions (44) are formed on the grip part (6) and are partially guided on the needle (2) and can be converted from the collapsed state to a deployed state.