Intravenous catheter device

The invention relates to an intravenous catheter device and in particular to a catheter device comprising a needle protecting means which slides to the needle point when the needle is removed from the catheter and permanently blocks the needle point such that the needle point cannot be inserted into objects or persons.

An intravenous catheter device, on which the characterizing part of claim 1 is based, is known from WO 99/08 742. Said catheter device comprises a tubular catheter having a catheter hub at the proximal end, a hollow needle adapted to be inserted into the catheter and provided with a needle hub at the proximal end, and a needle protecting means. The needle protecting means is located in a hollow space of the catheter hub, the hollow space being closed by the needle hub, wherein the needle passes through the needle protecting means and the needle protecting means comprises a spring portion made of steel through which the needle is adapted to slide. The needle protecting means comprises an engagement element which, when the needle is retracted relatively to the catheter, engages with an irregularly configured portion of the needle in order to remove the needle protecting means from the proximal end of the catheter hub. The needle protecting means comprises a bent sheet-metal portion made from spring steel which presses against the wall of the hollow space of the catheter hub, the sheet-metal portion thus being supported. Said support is no longer given when the needle protecting means is moved over the needle point when the needle is retracted, the needle protecting means thus being protected. Then the needle protecting means, together with the needle, can be removed from the hollow space of the catheter hub. In the case of the known catheter device the projection, with which the needle protecting means lockingly engages, is configured as a retaining protrusion molded to the inner wall of the catheter hub, or a retaining groove.

A catheter device comprising a needle protecting means poses the problem that the needle protecting means must be fastened in the catheter hub, with a bend or an elbow of the needle protecting means having to be moved over the projection on the inner side of the catheter hub, such that a reliable support of the needle protecting means in the hollow space of the catheter hub is ensured.

It is an object of the present invention to provide an intravenous catheter device comprising a needle protecting means where fastening of the needle protecting means in the catheter hub is facilitated.

This object is solved according to the invention with the features stated in claim 1. Thus the projection is of a generally annular configuration and extends at at least two diametrical locations of the catheter hub. This means that the projection, with which the needle protecting means lockingly engages, is not only a local singular projection but a discontinuous or open ring generally extending about the overall circumference of the hollow space. As is described below, the generally annular projection may comprise one, two or more interruptions, in particular four interruptions. The projection is of continuous configuration over a respective circumferential area of at least 60°. It is thus not necessary to precisely fasten the needle protecting means at a predetermined angle of rotation relative to the catheter hub. Subsequent rotations of the needle protecting means are possible without its function being affected.

The projection may be configured as a continuous ring without any interruptions. In this case the needle protecting means must be strongly deformed in the area of the bend for a short period of time during the fastening process to allow the bend to move over the projection. In other variants comprising a projection with at least one interruption such a strong deformation of the needle protecting means during the fastening process is not necessary.

An assembly tool may be configured at one location along its length such that it engages with the needle protecting means to rotatably couple the needle protecting means with the assembly tool. In this case it is possible to rotate the assembly tool such that the needle protecting means inside the hollow space of the catheter hub rotates, too. In this way the needle protecting means can be set into a rotational position in which it can pass the projection, and into another rotational position in which it lockingly engages with the projection. This allows particularly simple fastening of the needle protecting means in the hollow space of the catheter hub without any strong forces acting upon the needle protecting means.

Hereunder embodiments of the present invention are explained in detail with reference to the drawings in which:

Fig. 1 shows a longitudinal section across a first embodiment of an intravenous catheter device according to the invention,

Fig. 2 shows the distal end of the needle with the needle protecting means protecting the needle point when the needle has been removed from the catheter,

Fig. 3 shows a section along line III-III of Fig. 1,

Fig. 4 shows a similar representation as Fig. 3 of a second embodiment having an essentially annular projection with a small interruption,

Fig. 5 shows a section across a third embodiment with a bipartite annular projection whose segments are separated from each other by two interruptions,

Fig. 6 shows a schematic side view of the distal area of the needle shown in Fig. 1,

Fig. 7 shows a view of the needle shown in Fig. 6 as seen from the direction indicated by arrow VII,

Fig. 8 shows a perspective representation of a tool for fastening the needle protecting means for one embodiment of the invention,

Fig. 9 shows a schematic cross-section of another embodiment of the invention with the needle protecting means being oriented such that it can be inserted into the hollow space of the catheter hub, and

Fig. 10 shows by way of the same representation as Fig. 9 the condition of the needle protecting means after a rotation by approximately 45° with the needle protecting means gripping behind the segments of the projection and being in engagement with the projection.

The embodiment of the present invention shown in Fig. 1 comprises an elongate hollow tubular catheter 24 concentrically connected at its proximal end (remote from the patient) with the distal end of a catheter hub 26. The catheter hub 26 has a hollow space 27 communicating with the volume of the catheter 24 and being open at the proximal end.

The needle 16 passes through the catheter 24. The needle 16 is an elongate hollow needle made of steel and comprising a needle point 18 at the distal end. At a certain distance from the distal end 18 an irregularly configured portion 138 is provided. In the present embodiment said irregularly configured portion 138 is a flattened section of the needle which increases the width of the needle in one direction and decreases it in the direction perpendicular thereto. Said irregularly configured portion 138 can alternatively be a local projection.

At the proximal end of the needle 16 a needle hub 12 is attached which has a hollow space 13 communicating with the volume of the needle. The distal step in said needle hub 12 abuts the proximal end of said catheter hub 26. In this position of the needle hub 12 relative to the catheter hub 26 the distal end of the needle 16 and the needle point 18 project from the distal end of the catheter 24.

On the needle point 18 a needle protecting means 120 is provided which is configured generally in the same way as the needle protecting means shown and described in Figs. 10A, 10B and 11 of WO 99/08 742. However, the needle protecting means may also be of different configuration and numerous configurations are suggested by the prior art. In particular the needle protecting means needs not comprise any clamping means for clamping the needle.

The needle protecting means 120 which is shown in the ready condition in Fig. 1 and in the protecting condition in Fig. 2 is an integral part made of spring steel. It comprises a rear wall 126 extending transversely to the needle 16 and containing an opening. Said opening forms the engagement element 127 engaging with the irregularly configured portion 138 of the needle 16. Said opening or engagement element 127 is dimensioned such that it can be freely shifted on the needle 16 but cannot pass the irregularly configured portion 138. Consequently, the rear wall is shiftable in the area between the irregularly configured portion 138 and the needle hub 12.

From the ends of the rear wall 126 of the needle protecting means 120 arms 122 and 124 project which are generally oriented in distal direction and cross each other, with each arm 122,124 being located on a different side of the needle 16. At the end of each arm 122,124 an end wall 129,130 is arranged orthogonally to the arm. At the transition between the arm and the end wall a bend 128 or elbow oriented towards the outside is located. At the free end of the front wall 129 and 130, respectively, a lip 132 bent by more than 90° is provided. The arm 122 is shorter than the other arm 124 such that the front walls 129,130 do not collide with each other in the protected condition of the

needle protecting means. The front walls 129 and 130 are wider than the arms 122,124 such that, in said protecting condition, they can cover the needle point 18 and protect it against contact with other parts or bodies.

The needle protecting means 120 is retained in the catheter hub 26. For this purpose an annular projection 136a extending about the inner wall of the catheter hub 26 is provided. While the lips 132 press against the outer wall of the needle 16 from opposite sides (Fig. 1), the bends 128 grip behind the projection 136a. When the needle 16 is removed from the catheter 24 the needle protecting means 120 is retained in the catheter hub 26 such that the needle 16 slides through the catheter hub. When the needle point passes the lips 132 the arms 122,124 resiliently move into the position shown in Fig. 2 in which the front walls 129,130 cover the needle point. In this condition the engagement element 127 abuts the irregularly configured portion 138 such that the needle protecting means 120 is prevented from sliding beyond the distal end of the needle 16.

In the embodiment shown in Fig. 1 the projection 136a is of completely round and continuous configuration. The annular projection 136a retains the needle protecting means 120 in the catheter hub 26 when the needle 16 is removed from the catheter hub 26 until the arms 122,124 of the needle protecting means 120 are no longer supported by the needle 16 and resiliently move towards the inside. Here, the projection 136 is integrally molded to the catheter hub 26, e. g. by injection molding.

In the embodiment shown in Fig. 4 the projection 136b oriented towards the inside is of generally C-shaped configuration. Said C-shaped projection 136b can be made from a metal snap ring partially seated in an annular groove on the inside of the catheter hub. In this way it is possible to produce the projection 136b by inserting the snap ring into the catheter hub 26 until it lockingly engages the corresponding groove.

Fig. 5 shows another alternative where the projection 136c is divided into two segments with intermediate interruptions 137. Each segment has a larger circumferential extension than the intermediate interruptions 137. Further, the circumferential extension is considerably larger than the width of the distal front walls 129,130 of the needle protecting means. Preferably, the generally annular projection projecting towards the inside does not have any interruptions 137 whose width is larger than the width of the distal front walls 129 and 130, respectively, of the needle protecting means. The interruptions 137 being dimensioned such that they are smaller than the width of the front walls prevents the needle protecting means 120 from unintentionally passing the interruptions 137 thus sliding out of the catheter hub without covering the needle point. According to the present invention any number of separate segments forming a generally annular projection may be provided as long as the needle protecting means 120 is securely retained in the catheter hub when the needle 16 is removed from the catheter 24.

As shown in Figs. 6 and 7 the irregularly configured portion 138 of the needle 16 is preferably produced by deformation, with two bulges 138a oriented in opposite directions and at right angles thereto two dents 138b also located opposite each other being produced. The bulges 138a have a width W which is small enough to allow the needle 16 to move in the catheter 24 as shown in Fig. 1, but which is too large to pass the opening forming the engagement element 127 in the basis wall 126 of the needle protecting means 120.

The catheter device according to Fig. 1 is assembled by pushing the needle protecting means 120 over the point 18 of the needle 16 before the irregularly configured portion 138 is produced on the needle. The needle 16 then passes the engagement element 134 which is an opening in the basis wall 126 of the needle protecting means 120. The distal arms 132 are pressed apart and the needle 16 passes between them. Then the irregularly configured portion 138 is produced on the needle 16 such that the needle protecting means 120 is captured between the irregularly configured portion 138 and the needle hub 12.

Then the needle 16 and the needle protecting means 120 located thereupon are inserted into the catheter hub 26 such that the acute needle point 18 enters the catheter 24. The needle 16 is inserted into the catheter 24 to such an extent that the bends 128 of the needle protecting means abut the projection 136a.

When the bends 128 abut the annular projection 136a the advance movement of the needle protecting means is stopped. This advance movement may also be stopped earlier since the inner wall of the catheter hub 26 tapers such that the needle protecting means 120 is compressed during its advance movement. If the needle protecting means 120 cannot be advanced, a tool is used for advancing the needle protecting means 120 further into the catheter hub 26 until the bends 128 of the needle protecting means 120 lockingly engage with the projection 136a. For this purpose an adequate force must be exerted by the tool on the needle protecting means 120 such that the bends 128 resiliently move towards each other to move over the projection 136a. Then they move towards the outside again and press against the inner wall of the catheter hub 26. The needle protecting means 120 is now in the ready position as shown in Fig. 1.

The tool for inserting the needle protecting means may have any suitable form. Preferably, the tool shown in Fig. 8 is used which comprises a simple pin 200 having a longitudinal slot 202 extending over the overall length. The tool 200 can accommodate the needle 16 in said slot 202 while advancing the needle protecting means 120.

The annular projection 136a retains the needle protecting means 120 when the needle is retracted until the lips 132 of the needle protecting means 120 lockingly engage with the needle point such that the bends 128 work free from the annular projection 136a and the needle protecting means, together with the needle 16, can be removed from the catheter hub 26.

An alternative method of assembling the intravenous catheter comprising a spring clip according to the present invention is realized by employing the embodiment shown in Fig. 4 where the projection 136b is an open snap ring. In this case the open snap ring can be slipped onto the needle protecting means such that it is positioned between the proximal end and the distal end of the needle protecting means. Prior to this the needle protecting means 120 has been slipped onto the needle 16 which is then deformed to produce the irregularly configured portion 138. Thereafter the needle protecting means 120 and the open ring 136b are simultaneously inserted into the catheter hub 26 by means of the same tool.

Said tool preferably comprises two fingers each of which extends along one side of the needle protecting means 120. Using these fingers the open ring 136b is pushed further into the catheter hub than the proximal end of the needle protecting means 120. Thus it is not necessary to push the needle protecting means 120 over the annular projection 136b. On the contrary, the needle protecting means 120 and the annular projection 136b are inserted together. Thus the annular projection 136b is inserted into the catheter hub 26 such that the needle protecting means 120 lockingly engages with said lockingly annular projection 136b and remains in that condition until the needle 16 is retracted.

Figs. 9 and 10 show another embodiment of the device, which allows a different fastening method. Here, the annular projection 136d is configured such that it comprises at least 4 interruptions 137 between the segments, with the corners 250 of the needle protecting means 120a being adapted to be pushed through the interruptions 137 at a low force or no force at all. When the needle protecting means 120a has been inserted into the catheter hub 26 until it is positioned behind the projection 136d, the needle protecting means 120a is rotated such that the four corners 250 are positioned behind the segments of the projection 136d as shown in Fig. 10. Thus the needle protecting means 120a is retained in the catheter hub 26 until the needle 16 is retracted.

It may be appropriate to configure the needle protecting means 120 such that it has a generally square profile, as shown in Figs. 9 and 10, but other rectangular or polygonal contours of the needle protecting means 120a are also suitable. It is merely necessary to arrange the interruptions 137 of the projection 136d such that the needle protecting means 120 can be easily pushed through said interruptions 137 and then lockingly engages with the projection 136d when the needle protecting means 120a has been rotated such that the corners 250 abut the segments of the projection 136d.

Claims

1. Intravenous catheter device comprising a tubular catheter (24) having a proximal end provided with a catheter hub (26), a needle (16) adapted to be inserted into said catheter (24), the needle (16) having a proximal end provided with a needle hub (12), wherein the needle hub (12) abuts with the catheter hub (26) such that a point (18) at the distal end of the needle (16) projects from the catheter (24), an integral needle protecting means (120) adapted to be shifted on the needle (16), the needle protecting means (120) being arranged in a hollow space (27) of the catheter hub (26) and comprising an engagement element (127) engaging with an irregularly configured portion (138) of the needle (16) when the needle (16) is retracted relatively to the catheter (24) to remove the needle protecting means (120) from the proximal end of the catheter hub (26), and a projection (136a,136b,136c,136d) projecting into the hollow space (27) of the catheter hub (26), the projection (136a,136b,136c,136d) forming a retaining element for the needle protecting means (120),

   characterized in that

   the projection (136a-136d) is of generally annular configuration and extends at at least two diametrical locations of the catheter hub (26).

2. Intravenous catheter device according to claim 1, characterized in that the projection (136a) is a continuous ring.

3. Intravenous catheter device according to claim 1, characterized in that the projection (136b) is a snap ring comprising an opening (137) and seated in a groove on the inner wall of the catheter hub (26).

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4. Intravenous catheter device according to claim 1, characterized in that the projection (136c,136d) is made up of segments separated from each other by interruptions (137) at at least two diametrical locations.

5. Intravenous catheter device according to claim 4, characterized in that the projection (136d) is made up of four segments separated from each other by four interruptions (137), wherein the needle protecting means (120) comprises four corners (250) as seen in axial direction relative to the needle, the four corners (250) being adapted to pass through said interruptions (137).

