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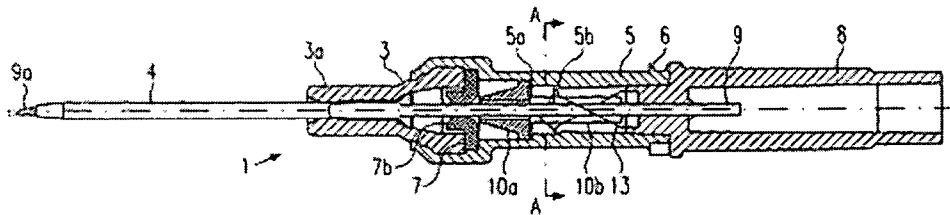
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If no classification is finished, Form P.9 should accompany this form.  
The figure of the drawing to which the abstract refers is attached.

# ABSTRACT

The invention relates to a catheter insertion device comprising: an approximately hollow cylindrical catheter sleeve (2), at whose distal end a catheter (4) is attached; a needle sleeve (8) with a hollow needle (9), which is attached thereto and which, when ready for use, extends through the catheter sleeve (2) and the catheter (4), and; a needle protective element (13) that is arranged inside the catheter sleeve (2) while being able to move on the needle (9). Said needle protective element has an engaging section (13c) that engages with an engaging device (9b), which is formed in the vicinity of the needle tip, when the hollow needle is withdrawn from the catheter sleeve (2). A check valve (7, 17) is placed inside the catheter sleeve (2) between the catheter (4) and the needle protective element (13). The hollow needle (9), when ready for use, extends through said check valve, and the check valve automatically closes once the needle is withdrawn.



### **Catheter insertion device**

The invention relates to a catheter insertion device according to the preamble of claim 1.

A device of this kind is known from EP 352 928, wherein in a hollow catheter hub a needle guard element is arranged. On withdrawal of the hollow needle from the catheter over an engaging means near the tip of the hollow needle, the needle guard element engages with the engaging means and covers the tip when the hollow needle is separated from the catheter. In this design, after withdrawal of the hollow needle from the catheter, through this catheter blood can issue with which the operating personnel can come into contact.

The invention is based on the object of designing a catheter insertion device of the type described above such that an outflow of blood from the catheter is prevented after removal of the hollow needle with the needle guard element.

This object is addressed according to the invention by the features in the characterizing part of claim 1.

Exemplary embodiments of the invention are explained in more detail below with reference to the drawing, in which

Fig. 1 shows a longitudinal section through a catheter insertion device in the ready position,  
Fig. 2 shows the catheter insertion device with the hollow needle removed,  
Fig. 3 shows the device with an attached syringe,  
Fig. 4 shows a sectional view along the line A-A in Fig. 1,  
Fig. 5 shows a longitudinal section through another embodiment,  
Fig. 6 shows a view of the valve disc, and  
Fig. 7 shows different views of a valve actuating element.

Fig. 1 shows a catheter insertion device 1 having a catheter hub 2 which has a two-part form in the embodiment. A distal hub element 3 of the catheter hub has a holding section 3a in which a catheter 4 is press-fitted. The proximal end of the hub element 3 has an enlarged diameter with regard to the distal end and forms a connecting section with a hub element 5 whose distal end overlaps the proximal end of the hub element 3 and which is provided at its proximal end with a Luer thread 6. Between the two hub elements 3 and 5, a check valve in the form of a valve disc 7 is inserted and is fixed in place by the two hub elements 3 and 5.

In the ready position according to Fig. 1, there is inserted in the catheter hub 2 a needle hub 8 to which a hollow needle 9 is fixed which extends through the valve disc 7 and the catheter 4 so that the needle tip 9a is exposed. Between needle hub 8 and valve disc 7 there is displaceably arranged in the proximal hub element 5 a valve actuating element 10 which has a truncated cone-shaped locating section 10a which serves to open the valve disc 7, as Fig. 3 shows. On the proximal side, a plunger section 10b adjoins the locating section 10a and has a hollow space for receiving a needle guard element 13. In the embodiment shown, the plunger section 10b is formed by two spaced plungers between which the needle guard element in the form of a spring clip 13 is inserted, as shown in the cross-sectional view in Fig. 4.

On withdrawal of the hollow needle 9 from the catheter hub 2, an engaging means 9b (Fig. 2), provided near the needle tip 9a and having the form of a radial projection on the hollow needle which can be formed by light crimping, engages with the outer circumference of a bore in the rear wall 13c of the spring clip 13, so that the spring clip 13 is removed from the catheter hub with the needle 9, while simultaneously the spring arms 13a and 13b of the spring clip cover the needle tip, completely protecting and blocking it. In this separated position shown in Fig. 2, the valve disc 7, due to its elasticity, closes the through-hole for the hollow needle 9 so that no blood can flow out through the catheter 4. As Fig. 6 shows, the valve disc is provided for example with three slits 7a starting from the middle and extending radially over a short section X, forming elastic flaps 7b therebetween which can be expanded by the hollow needle.

Fig. 3 shows the insertion of a syringe 14 in the catheter hub 2, wherein the neck portion 14a of the syringe comes to abut on the plunger section 10b of the valve actuating element 10 and presses it against the valve disc 7, so that the truncated cone-shaped locating section 10a

outwardly displaces the flaps 7b of the valve disc and thereby opens the valve, so that a liquid can be inserted from the syringe 14 into the catheter 4.

The incline of the truncated cone on the locating section 10a and the displacement path of the actuating element 10 relative to the valve disc 7 are designed such that due to the elasticity of the material of the valve disc 7, the flaps 7b displace the locating section 10a to the right in Fig. 3 when the syringe 14 is removed from the catheter hub 2. Hereby, the valve disc 7 is automatically closed, as the position in Fig. 2 shows.

In the hub element 5, there is formed by a shoulder 5a a stop for the actuating element 10, to define the position of the actuating element in the separated position in Fig. 2. Hereby, the truncated cone-shaped locating section 10a lies near the stop 5a, while its distal end abuts on the valve disc 7 as shown in Fig. 2. The radial slits 7a of the valve disc 7 are designed such that in the ready position in Fig. 1, the flaps 7b are bent radially upwards less than in the open position by the locating section 10a in Fig. 3.

As the cross-sectional view in Fig. 4 shows, the two plungers 10b of the valve actuating element 10 are guided in longitudinal grooves 5e of the hub element 5 and they project radially inwards into the bore 5c of the hub element 5, so that they form an abutting surface for the neck portion 14a of the syringe 14. The bore 5c in the hub element 5 is formed slightly conically corresponding to the conical neck portion 14a of a syringe.

On the inner circumference of the bore 5c of the hub element 5, a further shoulder 5b having a smaller diameter is formed, on which the radially outer areas of the spring arms 13a and 13b abut in the ready position in Fig. 1. Hereby, the spring clip 13 is fixed in its position in the hub element 5. When the needle hub 8 with the hollow needle 9 is removed from the catheter hub 2, first the spring clip 13 is held on the shoulder 5b by abutting until the radial projection 9b comes to abut on the rear wall 13c of the spring clip. In this position, the two spring arms 13a, 13b can be released from the shoulder 5b and spring back inwards to cover the needle tip, as Fig. 2 shows, whereupon the spring clip 13 with the hollow needle 9 can be removed from the catheter hub.

In the embodiment according to Figs. 1 to 3, the distal end section of the hub element 5 is

shrunk, welded or bonded onto the proximal end section of the hub element 3 after the valve actuating element 10 and the valve disc 7 are inserted in the hub element 5. It is also possible to join the two hub elements 3 and 5 to one another, for example by a thread which is secured against loosening after assembly. The spring clip 13 is inserted together with the hollow needle 9 in the bore 5c of the hub element 5 during assembly, wherein the radially outer areas of the spring arms 13a, 13b snap in at the shoulder 5b under elastic deformation.

Preferably, in front of the shoulder 5b a projection 5b' can be formed in the bore 5c of the hub element, as shown in Fig. 2. Hereby the snap-in and holding effect of the spring clip 13 is increased.

Fig. 5 shows a modified embodiment of the connection of the two hub elements 3 and 5, in which two cylindrical sections 3b and 5d engage in one another. A thread can be provided between these two cylindrical sections. However, it is also possible to bond or weld these two sections.

In this embodiment, the valve actuating element 10 is also modified in relation to the embodiment of Figs. 1 to 3. Fig. 7a shows a side view of the approximately U-shaped actuating element 10 with the spring clip 13 inserted therein. As the side view rotated by 90° in Fig. 7b shows, the locating section 10a is partly flattened on opposite sides so that the width of the plunger sections 10b extends into the locating section 10a. Fig. 7c is a front view from the left in Fig. 7b and shows the flattened structure of the locating section 10a. Fig. 7d is a sectional view along the central line in Fig. 7b. Fig. 7e shows a section through the valve actuating element 10 along the line B-B in Fig. 7d.

Fig. 5 shows the lower half of the valve actuating element 10 corresponding to the view in Fig. 7a, and the upper half in a sectional view rotated by 90° corresponding to Fig. 7b. The shoulder 5a for positioning the valve actuating element 10 in the hub element 5 is hereby formed on the ends of the diametrically opposite grooves 5e (Fig. 4), so that the proximal ends of the plunger sections 10b abut on the shoulders 5a. Corresponding to the shoulder 5b in Figs. 1 to 3 in the embodiment in Fig. 5, there is formed on the hub element 5a projection 5f which projects inwards at diametrically opposite positions on the bore 5c of the hub element 5 and fixes the spring clip 13 in the hub element 5 until the spring arms 13a,

13b spring inwards over the needle tip and the spring clip with the hollow needle 9 is removed from the catheter hub.

In the embodiment of a catheter insertion device according to Figs. 1 to 7e, in the position of the valve actuating element 10 in Fig. 2 the valve disc 7 can be opened by low pressure produced by the syringe 4 for drawing off liquid from the catheter, wherein the elastic flaps 7b are bent upward by the low pressure.

It is convenient to fabricate the check valve in the form of a valve disc 7 or of the flap valve 17 from elastic silicon, while a correspondingly rigid plastic material is used for the hub elements 3 and 5 and for the valve actuating element 10.

### Claims

1. Catheter insertion device comprising  
an approximately hollow-cylindrical catheter hub to whose distal end a catheter is attached,  
a needle hub having a hollow needle attached thereon and extending in the ready position through the catheter hub and the catheter,  
a needle guard element which is arranged displaceably on the needle in the catheter hub and has an engaging section which engages with an engaging means formed on the inner circumference of the catheter hub in the ready position and which is engageable with the needle near the needle tip when the hollow needle is removed from the catheter hub,  
characterized by  
a check valve which is fixed in the catheter hub between the catheter and the needle guard element and through which the hollow needle extends in the ready position and which automatically closes after removal of the needle,  
and by  
a valve actuating element which is displaceably guided in the catheter hub and has a hollow space for receiving the needle guard element in the ready position.
2. Device according to claim 1, wherein the catheter hub has a two-part form and the check valve is held between a distal hub element and a proximal hub element which are joined to one another.
3. Device according to claim 1, wherein the valve actuating element has at least one plunger extending in axial direction.
4. Device according to one of the preceding claims, wherein the valve actuating element is formed with a truncated cone-shaped distal end section.
5. Device according to claim 1, wherein the engaging means on the inner circumference

of the catheter hub is in the form of a radial projection.

6. Device according to claim 1, wherein the check valve is in the form of a valve disc with at least one radial slit extending radially outward from the center of the valve disc.
7. Device according to one of the preceding claims, wherein the needle has engaging means for the needle guard element in the form of a crimp.
8. Device according to claim 6, wherein the needle guard element is formed as a spring clip which has diametrically opposite spring arms starting from a rear wall provided with an opening, wherein the spring arms cross each other and are forced apart by the needle in the ready position and whose distal end sections overlap and block the needle tip when the crimp of the needle comes to abut on the rear wall of the needle guard element during removal of the needle from the catheter.

