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Description

The invention relates to a catheter puncture device according to the preamble of Claim 1.

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If a patient receiving medical care has to be fitted with a catheter, this is done by the medical personnel generally performing what is called the Seldinger technique. In a first step, the vessel (often an artery or vein) into which the catheter is to be inserted is punctured with a hollow puncture needle. Thereafter, a guide wire is pushed through the hollow puncture needle into the vessel. The hollow needle is then pulled back again over the guide wire lying inside it, such that the guide wire can be advanced farther into the punctured vessel in order to slightly widen this vessel initially using a dilator that is pushed over the guide wire. After removal of the dilator, the actual catheter is pushed over the guide wire into the vessel and is moved to the desired end position. The last step involves the guide wire being carefully pulled back out through the catheter.

Although this technique for puncturing blood vessels after Seldinger is a standard technique for the purpose of catheterization, fitting the catheter in place requires a large number of different maneuvers and instruments, which presuppose considerable experience in this area. Moreover, on account of various devices being pushed in and pulled out several times, there is a danger of articles or persons being contaminated by escaping blood. Finally, there is also the danger of an air embolism, i.e. if there is a slight underpressure in the punctured vessel. Therefore, as aids for catheterization, catheter puncture devices are known which are intended to permit simplified handling.

35 A device for introducing a venous catheter having a guide tube which is introducible into a vein opening and which has an internal duct dimensioned for receiving the catheter tube and is capable of being cut open in the longitudinal direction so

as to be able to be removed from the introduced catheter is known from publication DE 2340534 A1, wherein the guide tube for the catheter tube by means of a hose-type connection location is unified with a second guide tube for a puncture needle so as to form a common guide portion.

DE 101 00 102, also published as WO 02/053045 A1, likewise discloses a catheter puncture device that simplifies the fitting of a catheter, since the implements needed for performing a puncture and for fitting a catheter are made available in a system composed of several parts, without the need for a guide wire or additional dilation devices.

The catheter puncture device disclosed therein comprises a tubular housing with an elongate housing portion which merges into an extension portion, and from which a branch portion branches off at an angle. The housing portion and the branch portion have a continuous lateral opening, which is closed by a flexible sheath which extends along the branch portion and the housing portion and into which a catheter can be pushed. During the puncturing of the vessel, the puncture needle extending along the elongate housing portion and the extension portion emerges from the tip of the housing and, after the puncture procedure, is pulled back into the housing to a location behind the branching site of the branch portion. A blood collection container is located at the rear end of the puncture needle.

The catheter is then inserted through the branch portion and the housing portion out of the housing through the flexible sheath into the punctured vessel, as far as the desired depth. Only then is the catheter puncture device withdrawn from the punctured vessel of the patient. Lastly, the flexible sheath is withdrawn from the housing or peeled off from the catheter via a lateral longitudinal slit. Therefore, after the puncture procedure has been performed with the catheter puncture device disclosed in DE 101 00 102, there are, in addition to the fitted catheter itself, a total of two other parts, on the one hand the housing with the puncture needle and with the blood collection

container and, on the other hand, the detached sheath.

In addition to the above-described prior art, further catheterization methods are known that use a modified Seldinger
5 technique, wherein some of the catheter puncture devices, always in multiple parts, work using what is called the peel-away technique, in which, after the catheter has been placed in the punctured vessel, the introducer sleeves divide into two parts at a peel-away point and can be withdrawn from the vessel without
10 a movement of the catheter.

Against this background, the object of the present invention is to create a catheter puncture device which ensures that the puncture needle upon returning into the housing of the catheter
15 puncture device is secured therein in a non-reversible manner that is simple in terms of construction. Any potential infection on said puncture needle that is wetted with a patient's blood is to be reliably precluded in this way.

20 This object is achieved by a catheter puncture device having the characterizing features of Claim 1.

The dependent claims set forth advantageous embodiments of the invention.

25 The catheter puncture device according to the invention is a closed, one-piece system in which all the components required for the puncture procedure are combined and provided in a housing, and which at the same time allows the catheter to be
30 released from the catheter puncture device and uncovered in one maneuver after the catheter has been introduced into the punctured vessel.

To develop it further now, the housing of the catheter puncture
35 device according to the invention is formed in one piece, wherein the elongate, tubular and closed housing portion guides a puncture needle, protruding with its tip from the elongate housing portion and extending along the elongate housing portion

and the extension portion, and at the same time it also forms the guide channel for the catheter. After the vessel has been punctured by the puncture needle and the puncture needle has been returned to a point behind the branching site of the branch
5 portion, the catheter can be inserted through the branch portion into the elongate housing portion, wherein at least one predetermined breaking point extends along the branch portion as far as the tip of the one-piece, elongate housing portion, which predetermined breaking point allows the housing to be
10 opened, such that the catheter is exposed and the catheter puncture device can be removed.

Thus, within a single housing, the catheter puncture device according to the invention firstly comprises the puncture
15 needle, which at one end is pushed out of the elongate housing portion and punctures the vessel. The end of the housing itself is also pushed slightly into the punctured vessel. Once the vessel is punctured, blood enters the puncture needle and is received in a preferably transparent blood collection container
20 arranged at the other end of the puncture needle.

After the puncture has been performed, the puncture needle, with the blood collection container located thereon, is pulled back out of the vessel, with the housing itself remaining in the
25 vessel.

The puncture needle is pulled back until the tip comes to lie behind the branching site of the branch portion of the housing and an abutment arranged on the puncture needle strikes a
30 corresponding counterbearing in the housing, such that the puncture needle cannot be withdrawn completely from the catheter puncture device. Likewise, to safely prevent the puncture needle from being pushed in again, a blocking element secures the puncture needle, such that the tip thereof contaminated with
35 blood comes to lie safely in the housing and does not pose a risk of injury to the medical personnel or other persons.

In the inventive construction mode, this is achieved by an

expansion body whose catching arms expand inside the tubular housing, after a step has been passed, and they thus finally prevent the puncture needle from being pushed forward. This locking effect cannot be cancelled.

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This expansion body according to the invention with catching arms is secured at the front on the puncture needle, the orientation of the catching arms having the effect that a return movement of the puncture needle is easily possible since, although the catching arms bear on the inner jacket of the tubular housing, no blocking of the movement can take place in the pulling direction. Only after they have engaged in the corresponding housing step can the catching arms spread farther open and thus effect the locking.

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The catheter is then inserted through the branch portion and through the housing into the punctured vessel and is pushed to the desired depth into the vessel.

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In the last step of the procedure, the two predetermined breaking points extending laterally on the branch portion and on the housing are now opened by means of a tear-open tab on the branch portion, and both halves of the housing portion are completely separated from each other.

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The inserted catheter then lies uncovered, and the catheter puncture device according to the invention, along with the puncture needle and blood collection container, can be easily disposed of without risk of injury.

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In an advantageous embodiment of the invention, the catheter, prior to being pushed into the punctured vessel, is releasably fixed on a holder additionally arranged on the housing. Here, a clamping holder is expediently provided which can be released with one hand. This ensures, on the one hand, that the flexible catheter does not get in the way during the actual puncturing procedure or does not come loose from the puncture device. On the other hand, however, after the puncturing procedure has been

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performed, said catheter can be easily released from the fixing holder and thus pushed into the punctured vessel.

5 In another advantageous embodiment of the invention, two approximately parallel predetermined breaking points are provided which extend along the branch portion as far as the tip of the housing. It is advantageous here that the distance between them defines the width of an opening strip removable from the housing, wherein this width corresponds approximately to that
10 of the catheter that is to be exposed.

This ensures that the peeling-off of the opening strip exposes a slit-shaped opening over the entire guide length of the catheter in the housing, such that the catheter can be released
15 from the housing without applying force. This is a considerable improvement in the sense that it is thus possible to reliably prevent a situation in which, during the release of the housing from the catheter that has been pushed into the vessel of the patient, the catheter is accidentally pulled back out of the
20 vessel.

Moreover, for the removal of this opening strip, a tearing-open device of expedient design is arranged thereon in the area of the branch portion. This is advantageous in the sense that the
25 opening of the housing along the predetermined breaking points takes place in the direction toward the punctured patient and not away from the latter. This again ensures that the inserted catheter is not accidentally pulled out of the vessel, since the pulling movement applied to the housing in order to remove the
30 opening strip takes place toward the patient.

In an advantageous embodiment of the catheter puncture device, a tearing-open device is provided on the predetermined breaking point and is designed as a grip surface, at least on one side,
35 for better introduction of tensile force into the predetermined breaking point. By taking hold of this protruding gripping surface, which is designed with a shape and size allowing it to be safely held between index finger and thumb for example, it

is possible to safely introduce the force needed to overcome the break strength of the for example notched predetermined breaking point.

5 For the purpose of a closer description, an embodiment of the one-piece catheter puncture device according to the invention is shown in detail in Figures 1 to 4, in which

Figure 1 shows a perspective view of a catheter puncture device
10 according to the invention, more or less in its original size,

Figure 2 shows an enlarged detail of a sectional view through the housing after the puncture has been performed, with the puncture needle pulled back,
15

Figure 3 shows a perspective view of the catheter puncture device during the opening of the predetermined breaking points, and

20 Figure 4 shows the device after the predetermined breaking points have been completely opened.

Figure 1 shows the catheter puncture device 2 according to the invention, consisting of a tubular housing 3 with an elongate
25 housing portion which merges into an extension portion for guiding the puncture needle 9 with blood collection container 7, abutment and blocking element 17, and from which a branch portion 5 branches off at an angle, through which branch portion 5 a catheter 8 can be pushed into the elongate housing portion.
30 In terms of these design properties, the novel catheter puncture device follows the prior art.

In its outward appearance, the catheter puncture device 2 according to the invention is already considerably narrower than
35 was the case of the designs cited in the prior art. This is achieved primarily by the fact that the predetermined breaking points 15, which can be discerned only on one side in the illustrated design, but which also extend in parallel on the not

discernible rear face of the device in the concrete design solution, allow both the catheter 8 and also the cannula 9 for puncturing the vessel to be guided in the same tubular housing 3.

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It should be mentioned here that the blood collection container 7, which is arranged on the rear housing portion 4 with handle 6 via a screw connection, does not necessarily have to be present in this illustrated design. Alternatively, the blood collection
10 container 7 can also be replaced by a plugged-on disposable syringe, for example a 10-ml syringe, without thereby impairing the structural functionality. To this extent, the blood collection container 7, in the design solution illustrated here, represents only one possible design option. A blood collection
15 container 7 is to be understood in principle as any body that can be fitted onto the catheter puncture device 2 and here prevents escape of blood during the puncture procedure.

Looking now at figure 2, which is a sectional view of the
20 catheter puncture device 2 in the area of entry of the catheter 8 through the branch portion 5, this dual function of the tubular housing 3 of the catheter puncture device 2 becomes very clear. Figure 2 shows the method step in which the catheter puncture device 2 has already been successfully inserted into a vessel
25 of the patient, which is not illustrated here. After this puncture procedure, the cannula 8 can be pulled back to a point behind the branch portion 5 into a rear area 4 of the catheter puncture device 2, where locking takes place. This locking has the effect that this puncture needle 9 cannot be moved forward,
30 nor can it be moved farther out from the device.

In the design according to the invention as shown in Figure 2, this locking is obtained by means of an expansion body 17 whose catching arms 10 expand inside the tubular housing 3, after a
35 step 16 has been passed, and they thus finally prevent the puncture needle 9 from being pushed forward. This locking effect cannot be cancelled.

This expansion body 17 according to the invention with catching arms 10 is secured at the front on the puncture needle 9, the orientation of the catching arms 10 having the effect that a return movement of the puncture needle 9 is easily possible since, although the catching arms 10 bear on the inner jacket of the tubular housing 3, no blocking of the movement can take place in the pulling direction. Only after they have engaged in the corresponding housing step 16 can the catching arms 10 spread farther open and thus effect the locking.

Figure 2 moreover shows the front end of the cannula 8 to be inserted, which cannula 8 is pushed into the branch portion 5 of the catheter puncture device 2. It will be clear from a comparison with Figure 1 that the catheter 8 is fixed in this starting position by a holder 1, which fixes the catheter 8 in this position until it is to be inserted into the punctured vessel. For this purpose, provision is made that the catheter 8, when it is to be pushed in farther, can be pulled upward out of the clamping holder 1 and thus brought to a movable position. Since, after the puncture has been performed, the puncture needle 9 no longer blocks the tubular housing 3 as a guide for the catheter 8, an open guide channel is present through which the catheter 8 can now be inserted into the vessel of the patient.

Figure 3 shows the procedure after the catheter 8 has been pushed into the punctured vessel of the patient. Since the catheter 8 is now in place, the tubular vessel 3 can be pulled out of the punctured vessel of the patient. However, the catheter 8 is still enclosed in the tubular housing 3 of the catheter puncture device 2 and first of all has to be released from it. For this purpose, provision is made for the detachment of an opening strip 13, which is defined by the two predetermined breaking points 15 that extend in the longitudinal direction from the branching site 5 to the tip of the tubular housing 3.

Figure 3 shows the procedure of detaching this opening strip 13, as a result of which, as is shown in Figure 4, the individual

constituent parts of the catheter puncture device 2 are separated. After the opening strip 13 has been pulled off, the catheter puncture device 2, previously in one piece, disassembles into the actual inserted catheter 8, the catheter puncture device 2 with the puncture needle 9 drawn back completely as far as the abutment and with the elongate outlet opening 11 for the catheter, and the opening strip 13 which has exposed the corresponding opening 11.

10 It is clear here that the puncture needle 9 remains safely in the catheter puncture device 2, and also that the blood that has emerged during the puncture procedure remains safely in the blood collection container 7, without any risk of contamination of the personnel working with the catheter puncture device 2.
15 To this extent, the present safety cannula with locking action meets the relevant requirements of the Medical Devices Act.

The detachment of the opening strip 13 on the parallel predetermined breaking points 15 along the tubular housing 3 is made easier by grip surfaces 12 in the area of the branch portion 20 5. These wing-like grip surfaces 12 branching off on both sides of the catheter puncture device 2 allow this area to be easily gripped, for example between thumb and index finger, as a result of which it is possible to further reduce the risk of the catheter 8, already located in the vessel, being pulled out 25 accidentally.

Patentkrav

1. Kateterpunkturinstrument (2) omfattende et lukket udformet røragtigt hus (3) i én del med et aflangt husafsnit, som går
5 over i et forlængelsesafsnit til føring af den punkturnål (9), som med sin spids stikker ud fra det lange husafsnit på forsiden, med blodopsamlingsbeholder (7), positionsstop og spærreelement, og hvorfra der i en vinkel forgrener sig et forgreningsafsnit (5), via hvilket et kateter (8) efter udført punktur og
10 tilbageføring af punkturnålen (9) til bag forgreningsstedet på forgreningsafsnittet (5) kan skubbes ind i det aflange husafsnit, idet der langs med forgreningsafsnittet (5) og frem til spidsen af det aflange husafsnit forløber i det mindste et brudsted (15), ved hjælp af hvilket det røragtige hus (3) på
15 kateterpunkturinstrumentet (2), efter at kateteret (8) er skubbet igennem, kan brækkes af for at fjerne huset (3) fra kateteret (8), idet spærreelementet fikserer punkturnålen (9), når denne er ført tilbage, over forgreningsstedet på forgreningsafsnittet (5),
20 kendetegnet ved, at spærreelementet er udformet som ekspansionslegeme (17) i det forreste afsnit på punkturnålen, hvis fangarme (10) ved tilbagetrækning af punkturnålen (9) ud over forgreningsafsnittet (5) ekspanderer til et afsætningstrin (16) i det bageste område
25 (4) på det røragtige hus (3) og således fastholder punkturnålen.
2. Kateterpunkturinstrument ifølge krav 1, kendetegnet ved, at der på huset (3) er placeret i det mindste en holder (1), som
30 fikserer kateteret (8), frem til dette er skubbet ind i huset (3), aftageligt i forgreningsafsnittet (5).
3. Kateterpunkturinstrument ifølge krav 1 eller 2, kendetegnet ved, at
35 spidsen af det aflange husafsnit, hvorfra punkturnålen (9) stikker ud til punkturen, er formet spidsaffaset.
4. Kateterpunkturinstrument ifølge et af de foregående krav,

kendetegnet ved, at
det i det mindste ene brudsted (15) er forsynet med en herpå
placeret afrivningsanordning (12).

- 5 5. Kateterpunkturinstrument ifølge krav 4, kendetegnet ved,
at
afrivningsanordningen (12) på brudstedet (15) er udformet som i
det mindste en gribeflade til bedre trækkraftindledning i det i
det mindste ene brudsted (15).

10

6. Kateterpunkturinstrument ifølge et af de foregående krav,
kendetegnet ved, at
to parallelt forløbende brudsteder (15) strækker sig langs med
forgreningsafsnittet (5) frem til spidsen af huset (3), idet
15 deres indbyrdes afstand definerer bredden af en åbningsstrimmel
(13), som kan fjernes fra huset (3), idet denne bredde svarer
til bredden på det kateter (8), som skal anlægges.

Fig. 1:

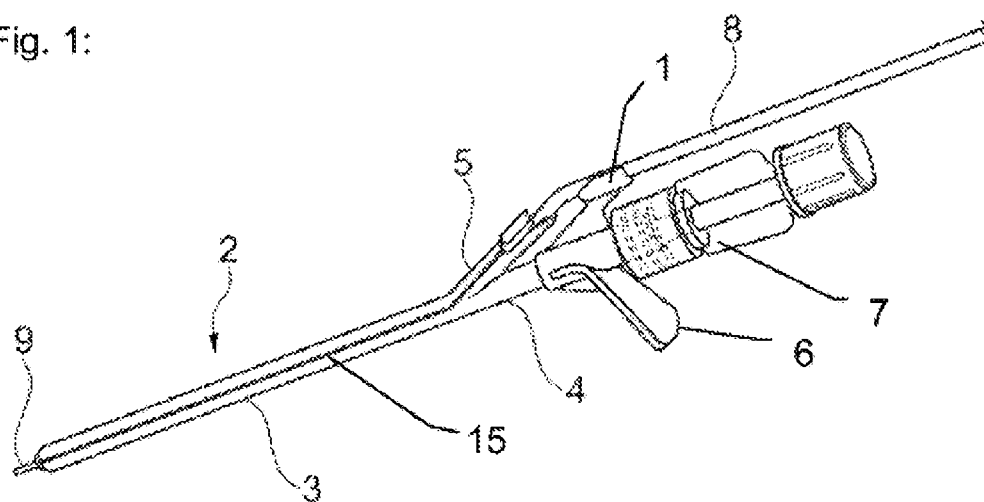


Fig. 2:

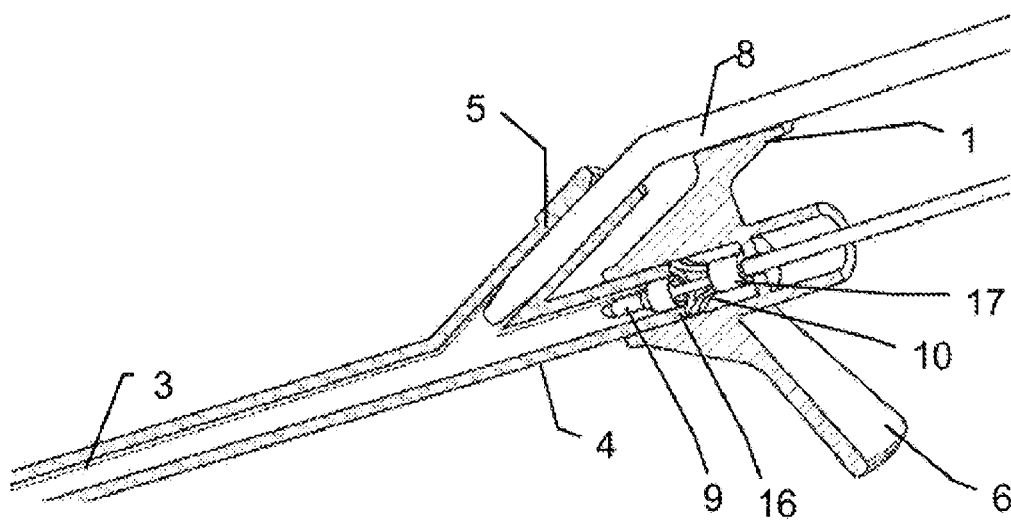


Fig. 3:

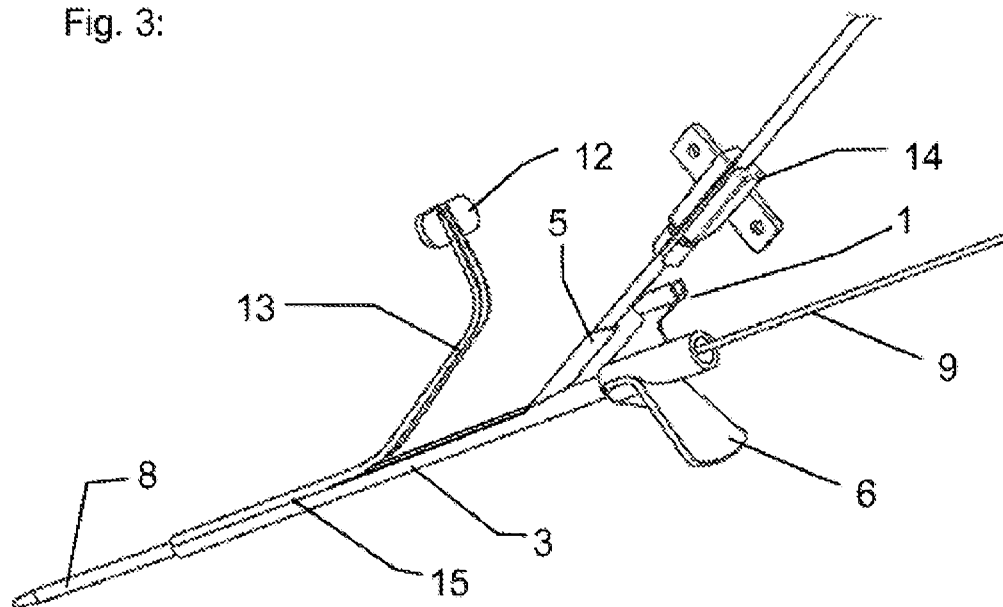


Fig. 4:

