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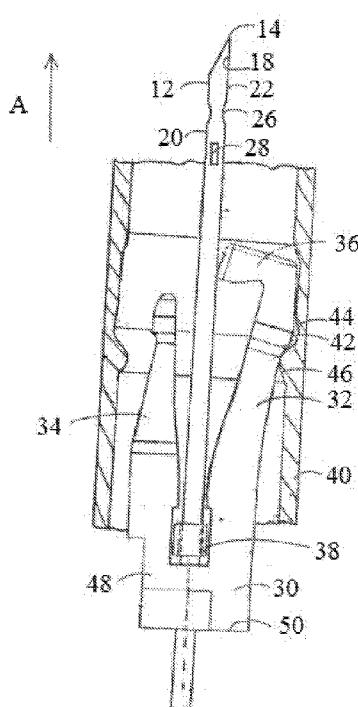
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(54) Title: INTRAVENOUS (IV) CATHETER APPARATUS

**FIG. 7**

(57) **Abstract:** An intravenous (IV)catheter apparatus comprising: a tubular catheter (10) having a proximal end (50) and a distal end (16) mounted to a catheter hub (40); a needle (12) defining an axial direction (A) having a needle shaft (22) with a needle tip (14) at a distal end (16) and a needle hub mounted to the proximal end (50) of the needle shaft (22); a needle guard (30) arranged movably on the needle shaft (22), wherein said needle shaft (22) extends through said tubular catheter (10) such that said needle tip (14) of said needle (12) protrudes from said distal end (16) of said tubular catheter (10); and wherein said needle shaft (22) is provided with: an engagement means (26) adapted to engage with the said needle guard (30) in order to prevent said needle guard (30) from sliding off said needle tip (14); and one or more lateral openings (28) covered by said tubular catheter (10).



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“INTRAVENOUS (IV) CATHETER APPARATUS”**CROSS-REFERENCE TO THE RELATED APPLICATION**

5 This application claims priority from Indian Patent Application No. 3088/DEL/2013 dated October 17, 2013, the entire disclosure of which is incorporated herein by reference.

FIELD OF THE INVENTION

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The invention relates to an intravenous (IV) catheter apparatus comprising a tubular catheter having a proximal end and a distal end, a needle defining an axial direction and having a needle shaft and a needle tip at a distal end of the needle shaft, wherein the needle shaft extends through the catheter such that the needle tip protrudes from the distal end of the tubular catheter, and wherein the needle shaft comprises an engagement means adapted to engage with a needle guard slidably arranged on the needle shaft in order to prevent the needle guard from sliding off the needle tip.

15
20**BACKGROUND OF THE INVENTION**

An intravenous (IV) catheter apparatus of this kind is generally known and, for example, used to administer medicine to a patient or to take blood from a patient.

25 In use, the tubular catheter is inserted into a blood vessel of the patient, typically a vein, by means of the needle which will be withdrawn from the catheter after insertion of the tubular catheter into the blood vessel. When the needle tip enters the blood vessel, blood flows through a lumen of the needle into a needle hub provided at a proximal end of the needle, where it can be observed by the person handling the catheter apparatus. The event of blood entering the needle hub is 30 called blood flashback and is used by the person handling the catheter apparatus to confirm venipuncture, from which point on the person inserts the catheter as far

as desired under a decreased inclination of the needle in order to not puncture the back wall of the blood vessel.

In the case of delayed blood flashback there is a risk that the person handling the catheter apparatus continues to push the needle into the blood vessel under the increased original inclination of the needle until it exits at the rear side of the blood vessel. This second venipuncture represents a risk to the health of the patient as it may result in inner bleeding. Apart from that the catheter apparatus will have to be removed and replaced by a new one, i.e. the process of introducing the catheter will have to be repeated which is unpleasant and painful to the patient.

SUMMARY OF THE INVENTION

It is an object of the invention to provide an intravenous (IV) catheter apparatus which allows for safer and more reliable placement of the catheter in the patient's blood vessel.

This object is satisfied by an intravenous (IV) catheter apparatus comprising: a tubular catheter having a proximal end and a distal end mounted to a catheter hub; a needle defining an axial direction having a needle shaft with a needle tip at a distal end and a needle hub mounted to the proximal end of the needle shaft; and a needle guard arranged movably on the needle shaft, wherein said needle shaft extends through said tubular catheter such that said needle tip of said needle protrudes from said distal end of said tubular catheter, and wherein said needle shaft is provided with an engagement means adapted to engage with the said needle guard in order to prevent said needle guard from sliding off said needle tip, and at least one lateral opening covered by said tubular catheter.

The at least one lateral opening provides communication between a lumen of the needle and an interior of the tubular catheter. In the event of first venipuncture blood entering the lumen of the needle can exit the needle through the lateral opening and thus become visible for the person handling. The at least one lateral

opening is preferably large enough in order to provide an early blood flashback function within the tubular catheter such that the practitioner can recognize that he has placed the needle correctly within a patient's vein. In case of a correct positioning of the needle, blood pours out of the opening within the needle shaft 5 into the space between the needle shaft and the inner wall of the transparent tubular catheter and is visible to the practitioner. Preferably, the at least one lateral opening is positioned close to the needle tip so that the blood does not have to travel the length of the needle to enter the needle hub in order to become visible. Instead, blood entering the lumen of the needle upon venipuncture partly 10 exits the needle again near the needle tip, thereby becoming particularly quickly and, thus, allowing for particularly fast venipuncture confirmation.

The needle guard may comprise a base portion having a needle passage extending in an axial direction from a proximal side of the base portion through the 15 base portion to a distal side of the base portion; first and second arms extending substantially in the axial direction from the distal side of the base portion; and a distal wall which is transversely arranged at a distal region of the first arm.

Furthermore, the needle guard may include a stopping element which is arranged 20 in the needle guard, in particular, which is received in a recess provided in the needle guard for stopping movement of the needle shaft relative to the said needle guard. The stopping element may be made of a material different from the material of the base portion and has a through-bore with a profile which is adapted to the principal outer profile of the needle shaft. In the case of e.g. circular cross-sections, a diameter of the through-bore can be slightly larger than a principal outer diameter of the needle. The stopping element may be formed by a washer 25 integrally formed within the base portion.

In order to allow a trouble free movement of the needle relative to the needle 30 guard when the needle is withdrawn from the tubular catheter, the lateral opening is preferably arranged on the needle shaft such that it does not come into the path of the first and second arms of the needle guard in the axial direction. In particular,

the lateral opening is arranged on the needle shaft such that it does not come into the path in the axial direction of the distal wall of the first arm when the needle is withdrawn from the tubular catheter. This arrangement ensures that the first and second arm of the needle guard do not get stuck or engage with the lateral opening when the needle is withdrawn from the tubular catheter. In particular, this arrangement ensures that distal wall of the first arm does not get stuck or engages with the lateral opening when the needle is withdrawn from the tubular catheter.

According to a preferred embodiment of the invention, the engagement means is arranged between the at least one lateral opening and the needle tip.

An arrangement of the engagement means between the at least one lateral opening and the needle tip is particularly advantageous if the profile forming the inner diameter of the tubular catheter decreases in the axial direction, thus forming a tapered distal end of the tubular catheter which tightly surrounds the needle shaft. If the lateral opening were covered by the tapered distal end of the tubular catheter in this case, there would be a risk that the tapered distal end of the tubular catheter may hinder and/or obstruct the flow of blood from entering the gap between the needle shaft and the tubular catheter. Accordingly, the arrangement of the at least one lateral opening proximally from the engagement means ensures that the blood entering the gap between the needle shaft and the tubular catheter easily spreads in the gap due to capillary action and can be seen through the transparent material of the tubular catheter, thereby allowing prompt confirmation of successful venipuncture without being hindered and/or obstructed by the tapered distal end of the tubular catheter. In other words, in order to allow the flow of blood from the lateral opening pursuant to the venipuncture, the lateral opening may preferably be arranged away from the tapered distal end of the tubular catheter in a direction opposite to the axial direction.

It is to be noted that even if the engagement means is arranged between the lateral opening and the needle tip, the blood does not have to travel the length of the needle to enter the needle hub in order to become visible. Instead, in this

arrangement blood entering the lumen of the needle upon venipuncture passes the engagement means and partly exits the needle through the lateral opening, thereby becoming visible particularly quickly and, thus, allowing for particularly fast venipuncture confirmation.

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As a result, the intravenous catheter apparatus allows faster and more reliable confirmation of successful venipuncture which makes the handling of the catheter apparatus easier both for the person placing it and the patient on whom it is used.

10 Additionally or alternatively to an arrangement of the engagement means between the at least one lateral opening and the needle tip, at least one lateral opening may be arranged between the engagement means and the needle tip. A lateral opening may, thus, be arranged proximal and/or distal to the engagement means, i.e. the arrangement of the engagement means and lateral opening may be
15 interchanged.

If a lateral opening is arranged between the engagement means and the needle tip, the blood does not have to pass the engagement means to become visible in the needle hub. Hence, the time at which blood entering the needle upon
20 venipuncture becomes visible to the person handing the catheter apparatus, is independent of the design of the engagement means. Hence, even if the engagement means is designed such that it would normally slow down the flow of blood through the needle and, thus, delay blood flashback, it does not have any adverse effect on the timing of venipuncture confirmation in the apparatus of the
25 invention.

According to a further embodiment, more than one lateral opening may be provided on the needle shaft. With relation to the engagement means, such openings may be arranged proximal and/or distal to the engagement means.

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According to a further embodiment, the needle shaft may comprise a lateral opening that is not covered by the tubular catheter.

In order to improve the visibility of the blood exiting the needle through the lateral opening, the tubular catheter advantageously comprises a transparent material.

5 According to a preferred embodiment, the at least one lateral opening comprises a slit which is cut into the needle shaft and which may have a length in the range of 0.3 to 1 mm. This slit can extend either in the axial direction or in a direction transverse thereto. Such a slit is easy to manufacture and thus helps to minimize manufacturing costs of the catheter apparatus. Those skilled in the art will 10 appreciate that various other shapes of the lateral opening are likewise suitable. For example, the shape of the lateral opening may be of any geometrical shape such as curve, square, rectangular, circular, semi-circular, and combinations thereof and/or the like shapes. In further embodiments, the lateral opening may comprise an opening such as a hole, groove, puncture, cavity, perforation or the 15 like.

According to a further embodiment, at least two discrete lateral openings may be arranged along the circumference of the needle shaft seen in a direction transverse to the axial direction. Additionally or alternatively, at least two discrete 20 lateral openings may be arranged along the length of the needle shaft seen in the axial direction.

In order to enhance spreading of the blood exiting the needle through the lateral opening inside the tubular catheter, an outer diameter of the needle shaft may be 25 slightly smaller than an inner diameter of the tubular catheter. The profile forming the inner diameter of the tubular catheter may decrease in the axial direction forming a tapered distal end. The enhanced spreading of the blood improves visibility of the blood through the tubular catheter and, thus, makes detection of successful venipuncture faster and more reliable.

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In order to make the insertion of the tubular catheter into a patient's blood vessel even more agreeable, the tubular catheter may slightly tapered in its distal end

region such that the distal end of the tubular catheter tightly surrounds the needle shaft.

According to one embodiment the engagement means comprises an enlargement 5 of the needle shaft in at least one direction transverse to the axial direction. The enlargement may be provided between the distal end and the proximal end of the needle shaft.

In a preferred embodiment, the enlargement may be made by a crimping of the 10 needle shaft. However, other ways of forming the enlargement are possible, such as applying additional material to the needle shaft, e.g. by soldering, welding or gluing, or the like etc.

The inner profile of the needle can either be reduced in the region of the 15 enlargement, for example, if the enlargement is formed by crimping, or it can be substantially constant throughout the length of the needle, for example, if the enlargement is formed by applying additional material to the needle shaft.

Thus, an engagement means that is particularly easy to manufacture comprises a 20 crimped portion of the needle shaft. The manufacturing costs of the needle thus can be further reduced.

Prior to the use of the catheter apparatus, the needle guard is arranged in the catheter hub near a proximal end of the needle shaft. In this situation, the needle 25 extends completely through the needle guard, thereby deflecting the first arm of the needle guard outwards, i.e. at an angle to the axial direction, such that the distal wall of the first arm is supported on the needle shaft. Following the insertion of the catheter into a patient, the needle is withdrawn from the tubular catheter and the needle shaft moves through the needle guard while the needle guard is 30 retained in the catheter hub. Once the needle tip passes the transverse distal wall of the needle guard, i.e. such that the needle shaft no longer supports the distal wall, a restoring force ensures that the first arm of the needle guard is moved back

into alignment with the axial direction of the needle guard, so that the needle tip is blocked by the distal wall of the needle guard, i.e. the needle tip is prevented from axially projecting out of the needle guard.

5 Once the needle tip is blocked by the distal wall and the needle is being further retracted, the engagement means of the needle shaft may engage with the stopping element to prevent the needle guard from being removed from the needle shaft. If the stopping element is made from a material which is harder and less easily distorted than the material of the base portion, the needle guard is

10 secured more effectively on the needle shaft and can be retained even if excessive external force is applied when pulling on the needle, as the engagement means is prevented from being pulled through the base portion of the needle guard due to the stopping element. Hence, it is prevented that the needle guard is removed from the needle tip accidentally and, as a result, the needle

15 guard provides a better protection against accidental pricking and thus increased safety for the person handling the catheter apparatus.

In a further embodiment of the needle guard, a tension element surrounds the first and second arms of the needle guard. In the deflected state of the first arm, the

20 tension element is expanded against a restoring force of the tension element. Once the needle shaft no longer supports the distal wall of the first arm, the tension element aids the repositioning of the first arm back into axial alignment with the axial direction. This repositioning is necessary so that the distal wall can block the needle tip from axially sliding out of the needle guard. In addition, the

25 tension element helps to enclose a space between the first and second arms and thus helps to prevent the needle shaft and the needle tip from projecting sideways out of the needle guard. In other words, the tension element adds to the protective effect of the needle guard.

30 According to a further embodiment the invention, the two arms of the needle guard, in particular the first arm having the distal wall blocking the needle tip, may have a recess in order to provide a high strength and a spring-like action of the

first arm such that it is biased into the blocking position with its distal wall in front of the needle tip.

In a further embodiment of the needle guard, a groove may be provided in a side 5 of the distal wall, with the groove extending substantially in the axial direction. The groove may act as a guide groove for the needle shaft and may aid the axial movement of the needle shaft relative to the needle guard. Due to the groove, the needle shaft is prevented from sliding sideways off the distal wall. Such a sideways movement would significantly increase the force required to move the 10 needle shaft relative to the needle guard, which would prevent a correct functioning of the needle guard.

According to a further embodiment of the invention, the catheter hub within which the needle guard is received in a ready position, includes holding means for 15 holding the needle guard even under retracting forces acting on the needle guard when the needle is retracted out of the patient's vein. These holding means may include a recess formed on the inner circumferential surface of the catheter hub into which a projection formed on the first arm of the needle guard securely engages in the ready position, i.e. when the first arm is deflected and spread apart 20 from the second arm by the needle shaft. Alternatively, these holding means may include a bump formed on the inner circumferential surface of the catheter hub. The holding means on the inner circumferential surface of the catheter hub maybe 25 also formed by a combination of a recess and a bump wherein the needle guard has a corresponding complimentary profile of a projection engaging the recess on the inner circumferential surface of the catheter hub and a recess engaging with the bump on the inner circumferential surface of the catheter hub.

As an alternative, the holding means may include at least one outer arm formed 30 on the base portion and adapted to engage the catheter hub on its outer circumferential surface. In particular the holding means may include two outer arms formed on substantially diametrical locations of the base portion and adapted to engage the catheter hub on its outer circumferential surface. By

providing such holding means, the holding function is alternatively or additionally provided at the outside of the catheter hub. Thereby, the manufacturing effort can be reduced and the safety in operation may be further increased.

5 In a further embodiment, the catheter hub may have an opening or window in order to provide additional space for the deflected first arm in the ready position. The opening or window can be formed as a through-hole through the circumferential wall of the catheter hub. The opening in the circumferential wall of the catheter hub may also provide a holding edge acting as the holding means for
10 holding the needle guard within the catheter hub in the ready position even under retracting forces applied on the needle by the practitioner.

Further advantageous embodiments of the invention and preferred apparatuses for carrying out the invention are described in connection with the accompanying
15 drawings.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

The embodiments of the invention are described in the following description and in
20 the accompanying drawings, wherein:

Fig. 1 shows a longitudinal sectional view of a distal end region of an intravenous (IV) catheter apparatus in accordance with one embodiment of the invention.

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Fig. 2 shows a longitudinal sectional view of a distal end region of an intravenous (IV) catheter apparatus in accordance with another embodiment of the invention.

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Fig. 3 shows a longitudinal sectional view of a distal end region of an intravenous (IV) catheter apparatus in accordance with another embodiment of the invention.

Fig. 4 shows a longitudinal sectional view of a distal end region of an intravenous (IV) catheter apparatus in accordance with another embodiment of the invention.

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Fig. 5 shows a longitudinal sectional view of a distal end region of an intravenous (IV) catheter apparatus in accordance with another embodiment of the invention.

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Fig. 6 shows a longitudinal sectional view of a distal end region of an intravenous (IV) catheter apparatus in accordance with another embodiment of the invention.

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Fig. 7 shows a longitudinal sectional view of a part of an intravenous (IV) catheter apparatus with a needle guard movably arranged on the needle in accordance with one of the embodiments of the invention.

DETAILED DESCRIPTION OF THE INVENTION

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Generally speaking, the term proximal refers to a region of the device or a location on the device which is closest to, for example, a clinician using the device. In contrast to this, the term distal refers to a region of the device which is farthest from the clinician, for example, the distal region of a needle will be the region of a needle containing the needle tip which is to be inserted e.g. into a patient's vein.

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Fig. 1 shows a distal end portion of a tubular catheter 10 of an intravenous (IV) catheter apparatus of the invention. The tubular catheter 10 is made of a transparent material, for example, a transparent plastic material.

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A needle 12 defining an axial direction (A) extends through the tubular catheter 10 such that a distal tip of the needle 12 protrudes from a distal end 16 of the tubular catheter 10. The needle 12 has a lumen 18 which extends along the length of the

needle 12 in the axial direction (A) and is defined by a wall 20 of the needle 12. The needle wall 20 forms a needle shaft 22.

The outer diameter of the needle shaft 22 is slightly smaller than the inner

5 diameter of the tubular catheter 10 in order to provide a small gap 24 between the needle shaft 22. In its distal end region of the tubular catheter 10 is slightly tapered such that the distal end 16 of the tubular catheter 10 tightly surrounds the needle shaft 22.

10 Proximal from the needle tip 14 the needle shaft 22 is provided with an engagement means 26 for preventing a needle guard 30 as shown in Fig. 7 slidably arranged on the needle shaft 22 from moving beyond the needle tip 14. The engagement means 26 may comprise any form of irregularity of the needle shaft 22, for example, an enlargement of the outer profile of the needle shaft 22 at
15 least in one direction transverse to the axial direction (A).

In the illustrated embodiment, the engagement means 26 comprises a crimped portion of the needle shaft 22.

20 The needle guard 30 may comprise a generally cylindrical base portion 48 made of a plastic material and having an axial bore through which the needle 12 extends. The inner diameter of the bore is adapted to the principal outer diameter of the needle shaft 22 such that the needle shaft 22 is free to slide through the bore, but the engagement means 26 of the needle 12 cannot pass the base portion 48 of the needle guard 30 due to the stopping element 38 provided
25 therein.

30 The needle guard 30 further comprise first 32 and second 34 arms extending generally in the axial direction (A) from the distal side of the base portion 48 and a distal wall 36 which is transversely arranged at a distal region of the first arm 32. At least one of the arms 32, 34 has elastic properties such that it can be deflected slightly off the axial direction (A) by the needle shaft 22. Both of the first 32 and

second 34 arms may be integrally formed with the base portion 48. Alternatively, one of the arms 32, 34 may be integral with the base portion 48 whereas the other one of the arms 32, 34 may be made of a strip of sheet metal.

5 The length of the first arm 32 is longer than the distance between the needle tip 14 and the engagement means 26, such that the distal wall 36 of the first arm 32 can move in front of the needle tip 14 and capture the needle tip 14 in the needle guard 30 before the engagement means 26 of the needle 12 engages with the base portion 48 of the needle guard, in particular with the stopping element 38

10 provided therein.

Preferably, the first 32 and second 34 arms are surrounded by an elastic element which biases the first 32 and second 34 arms towards the needle 12. The elastic element may cover a substantial portion of the first 32 and second 34 arms seen 15 in the axial direction (A) and, thus, prevent the needle tip 14 captured between the arms 32, 34 from protruding sideway out of the needle guard 30.

The engagement means 26 is provided in the needle wall 20 in a region between the needle tip 14 and at least one lateral opening 28. The lateral opening 28 is 20 positioned such that it is covered by the tubular catheter 10 when the needle tip 14 protrudes from the distal end 16 of the tubular catheter 10, i.e. it is arranged proximal to the engagement means 26. The lateral opening 28 thus provides communication between the lumen 18 of the needle 12 and the interior of the tubular catheter 10.

25 When the needle 12 together with the tubular catheter 10 is inserted into a blood vessel of a patient, blood flows into the lumen 18 of the needle 12 in the event of venipuncture. The blood flowing into the lumen 18 of the needle 12 partly exits the needle 12 through the lateral opening 28 and enters the gap 24 between the 30 needle shaft 22 and the tubular catheter 10. The blood entering the gap 24 between the needle shaft 22 and the tubular catheter 10 spreads in the gap 24 due to capillary action and can be seen through the transparent material of the

tubular catheter 10, thereby allowing prompt confirmation of successful venipuncture.

Fig. 2 shows a distal end portion of a tubular catheter of an intravenous (IV) catheter apparatus according to another embodiment of the invention, wherein at least one lateral opening 28 is provided in the needle wall 20 in a region between the needle tip 14 and the engagement means 26. The lateral opening 28 is positioned such that it is covered by the tubular catheter 10 when the needle tip 14 protrudes from the distal end 16 of the tubular catheter 10, i.e. it is arranged between the engagement means 26 and the distal end 16 of the tubular catheter 10. The lateral opening 28 thus provides communication between the lumen 18 of the needle 12 and the interior of the tubular catheter 10.

Fig. 3 shows a distal end portion of the tubular catheter of an intravenous (IV) catheter apparatus according to another embodiment of the invention, the engagement means 26 is provided in the needle wall 20 in a region between the needle tip 14 and lateral opening 28. As shown, more than one lateral openings 28 are provided on the needle wall 20. The lateral openings 28 are positioned such that they are covered by the tubular catheter 10 when the needle tip 14 protrudes from the distal end 16 of the tubular catheter 10, i.e. the lateral openings 28 are arranged proximal to the engagement means 26. The lateral openings 28 thus provide communication between the lumen 18 of the needle 12 and the interior of the tubular catheter 10.

Fig. 4 shows a distal end portion of a tubular catheter of an intravenous (IV) catheter apparatus according to another embodiment of the invention, wherein more than one lateral openings 28 are provided in the needle wall 20 in a region between the needle tip 14 and the engagement means 26. The lateral openings 28 are positioned such that they are covered by the tubular catheter 10 when the needle tip 14 protrudes from the distal end 16 of the tubular catheter 10, i.e. the lateral openings are arranged between the engagement means 26 and the distal end 16 of the tubular catheter 10. The lateral openings 28 thus provide

communication between the lumen 18 of the needle 12 and the interior of the tubular catheter 10.

5 Figs. 5 and 6 shows a distal end portion of a tubular catheter of an intravenous (IV) catheter apparatus according to further embodiments of the invention, wherein more than one lateral openings 28 are provided in the needle wall 20. As shown lateral openings 28 are provided proximal and distal to the engagement means 26. The lateral openings 28 are positioned such that they are covered by the tubular catheter 10 when the needle tip 14 protrudes from the distal end 16 of 10 the tubular catheter 10. The lateral openings 28 thus provide communication between the lumen 18 of the needle 12 and the interior of the tubular catheter 10.

15 Fig. 7 shows a longitudinal sectional view of a part of an intravenous (IV) catheter apparatus with a needle guard movably arranged on the needle in accordance with one of the embodiments of the invention. As mentioned above, prior to the use of the catheter apparatus the needle 12 extends through the tubular catheter 10 and the needle guard 30 is arranged in the catheter hub 40. In this situation, the distal wall 36 of the needle guard 30 contacts the needle 12, with the needle shaft 22 being guided in the groove (not shown) in the side of the distal wall 36. 20 The needle shaft 22 thereby supports the distal wall 36, due to which the first arm 32 of the needle guard 30 is deflected outwards, i.e. away from the needle 12, against a restoring force of the tension element (not shown).

25 In order to retain the needle guard 30 in the catheter hub 40 while the needle 12 is being withdrawn from the tubular catheter 10, the shoulders 42 provided on both the first arm 32 and the second arm 34 of the needle guard 30 engage with recesses 44 or protrusions 46 or combinations thereof provided on the inner circumferential surface of the catheter hub 40. The protrusions 46 may form an annular ring extending along the entire inner periphery of the catheter hub 40, or 30 they may form one or more ring segments extending along only a respective part of the inner periphery of the catheter hub 40. Similarly, the recesses 44 may form an annular groove extending along the entire inner periphery of the catheter hub

40, or they may form one or more groove segments extending along only a respective part of the inner periphery of the catheter hub 40.

The engagement means 26 is provided in the needle wall 20 in a region between 5 the needle tip 14 and at least one lateral opening 28. The lateral opening 28 is positioned such that it is covered by the tubular catheter 10 when the needle tip 14 protrudes from the distal end 16 of the tubular catheter 10, i.e. it is arranged proximal to the engagement means 26. For the sake clarity, this embodiment 10 illustrates the catheter apparatus without the tubular catheter 10. The lateral opening 28 thus provides communication between the lumen 18 of the needle 12 and the interior of the tubular catheter 10.

As shown and in order to allow a trouble free movement of the needle 12 relative 15 to the needle guard 30, the lateral opening 28 is arranged on the needle shaft 22 such that it does not come into the path of the first 32 and second 34 arms of the needle guard 30 in the axial direction (A). In particular, the lateral opening 28 is arranged on the needle shaft 22 such that it does not come into the path in the axial direction (A) of the distal wall 36 of the first arm 32 when the needle 12 is withdrawn from the tubular catheter 10. This arrangement ensures that the first 32 20 and second 34 arm of the needle guard 30 do not get stuck or engage with the lateral opening 28 when the needle 12 is withdrawn from the tubular catheter 10. In particular, this arrangement ensures that distal wall 36 of the first arm 32 does not get stuck or engages with the lateral opening 28 when the needle 12 is withdrawn from the tubular catheter 10.

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Although this invention has been disclosed in the context of certain preferred 30 embodiments and examples, it will be understood by those skilled in the art that the present invention extends beyond the specifically disclosed embodiments to other alternative embodiments and/or uses of the invention and obvious modifications and equivalents thereof. Thus, from the foregoing description, it will be apparent to one of ordinary skill in the art that many changes and modifications

can be made thereto without departing from the spirit or scope of the invention as set forth herein.

Accordingly, it is not intended that the scope of the foregoing description be

5 limited to the exact description set forth above, but rather that such description be construed as encompassing all of the features that reside in the present invention, including all the features and embodiments that would be treated as equivalents thereof by those skilled in the relevant art.

LIST OF REFERENCE NUMERALS

	10	tubular catheter
	12	needle
5	14	needle tip
	16	distal end
	18	lumen
	20	needle wall
	22	needle shaft
10	24	gap
	26	engagement means
	28	lateral opening
	30	needle guard
	32	first arm
15	34	second arm
	36	distal wall
	38	stopping element
	40	catheter hub
	42	shoulders
20	44	recess
	46	protrusion
	48	base portion
	50	proximal end
	52	proximal side
25	54	distal side
	A	axial direction

WE CLAIM:

1. An intravenous (IV) catheter apparatus comprising:

a tubular catheter (10) having a proximal end (50) and a distal end

5 (16) mounted to a catheter hub (40);

a needle (12) defining an axial direction (A) having a needle shaft (22) with a needle tip (14) at a distal end (16) and a needle hub mounted to the proximal end (50) of the needle shaft (22); and

10 a needle guard (30) arranged movably on the needle shaft (22);

wherein said needle shaft (22) extends through said tubular catheter (10) such that said needle tip (14) of said needle (12) protrudes from said distal end (16) of said tubular catheter (10); and

15 wherein said needle shaft (22) is provided with:

an engagement means (26) adapted to engage with said needle guard (30) in order to prevent said needle guard (30) from sliding off said needle tip (14); and

20 at least one lateral opening (28) covered by said tubular catheter (10).

25 2. The intravenous (IV) catheter apparatus in accordance with claim 1, wherein said engagement means (26) is arranged between said at least one lateral opening (28) and said needle tip (14).

30 3. The intravenous (IV) catheter apparatus in accordance with claim 1, wherein at least one lateral opening (28) is arranged between said engagement means (26) and said needle tip (14).

4. The intravenous (IV) catheter apparatus in accordance with claim 1, wherein said at least one lateral opening (28) provides communication between a lumen (18) of said needle (12) and an interior of said tubular catheter (10).

5. The intravenous (IV) catheter apparatus in accordance with claim 1, wherein an outer diameter of the needle shaft (22) is slightly smaller than an inner diameter of said tubular catheter (10).

5 6. The intravenous (IV) catheter apparatus in accordance with claim 1, wherein said tubular catheter (10) is slightly tapered in its distal end region such that the distal end (16) of the tubular catheter (10) tightly surrounds the needle shaft (22).

10 7. The intravenous (IV) catheter apparatus in accordance with claim 1, wherein said at least one lateral opening (28) is arranged proximally from the tapered end region of the tubular catheter (10).

8. The intravenous (IV) catheter apparatus in accordance with claim 1, 15 wherein said engagement means (26) comprises an enlargement of said needle shaft (22) in at least one direction transverse to the axial direction (A).

9. The intravenous (IV) catheter apparatus in accordance with claim 1, 20 wherein said engagement means (26) comprises a crimped portion of said needle shaft (22).

10. The intravenous (IV) catheter apparatus in accordance with claim 1, wherein said tubular catheter (10) comprises a transparent material.

25 11. The intravenous (IV) catheter apparatus in accordance with claim 1, wherein said at least one lateral opening (28) is of any geometrical shape such as curve, square, rectangular, circular, semi-circular, and combinations thereof and/or the like shapes.

30 12. The intravenous (IV) catheter apparatus in accordance with claim 1, wherein said at least one lateral opening (28) comprises an opening such as a hole, groove, puncture, cavity, perforation or the like.

13. The intravenous (IV) catheter apparatus in accordance with claim 1, wherein said at least one lateral opening (28) comprises a slit cut into said needle shaft (22) in a direction transverse to said axial direction (A).

5 14. The intravenous (IV) catheter apparatus in accordance with claim 1, wherein said at least one lateral opening (28) comprises a slit cut into said needle shaft (22) in said axial direction (A).

10 15. The intravenous (IV) catheter apparatus in accordance with claim 1, wherein at least two lateral openings (28) are arranged along the circumference of the needle shaft (22) seen in a direction transverse to said axial direction (A).

15 16. The intravenous (IV) catheter apparatus in accordance with claim 1, wherein at least two lateral openings (28) are arranged along the length of the needle shaft (22) seen in said axial direction (A).

20 17. The intravenous (IV) catheter apparatus in accordance with claim 1, wherein said at least one lateral opening (28) is arranged on the needle shaft (22) out of the path of the first and second arms (32, 34) of the needle guard (30) in the axial direction (A) when the needle is retracted.

18. The intravenous (IV) catheter apparatus in accordance with claim 1, wherein said needle guard (30) comprises:

25 a base portion (48) having a needle (12) passage extending in an axial direction (A) from a proximal side (52) of the base portion (48) through the base portion (48) to a distal side (54) of the base portion (48);

first (32) and second (34) arms extending substantially in the axial direction (A) from the distal side (54) of the base portion (48); and

30 a distal wall (36) which is transversely arranged at a distal region of the first arm (32).

19. The intravenous (IV) catheter apparatus in accordance with claim 1, wherein a stopping element (38) is received in a recess (44) provided in said needle guard (32) for stopping movement of said needle shaft (22) relative to said needle guard (32).

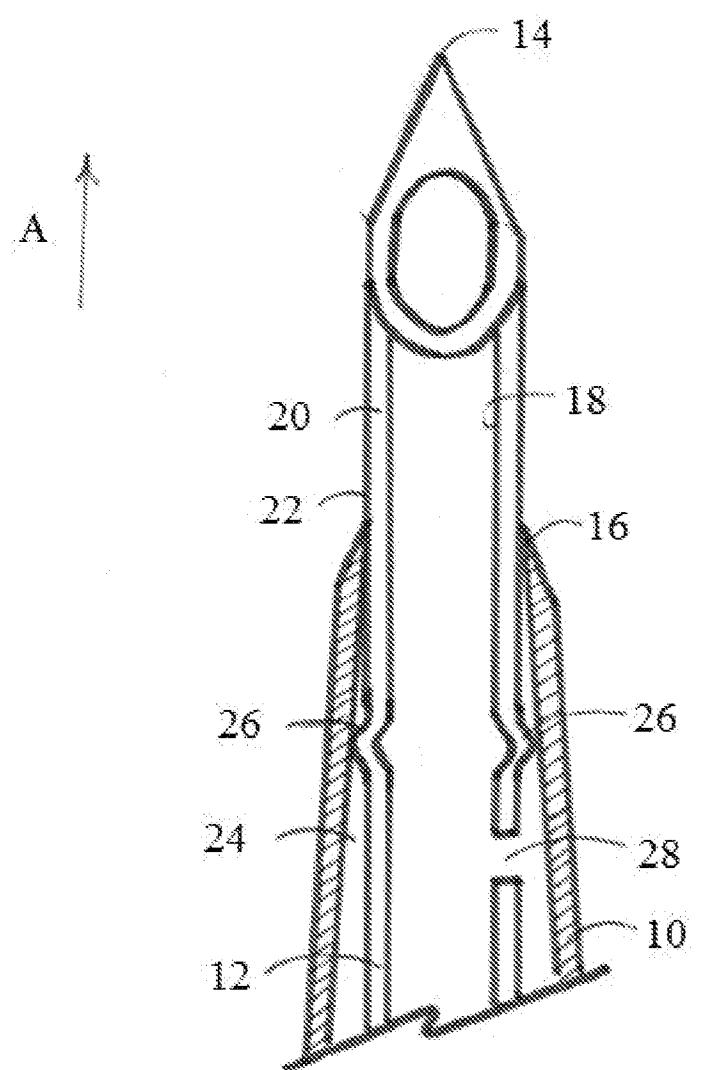
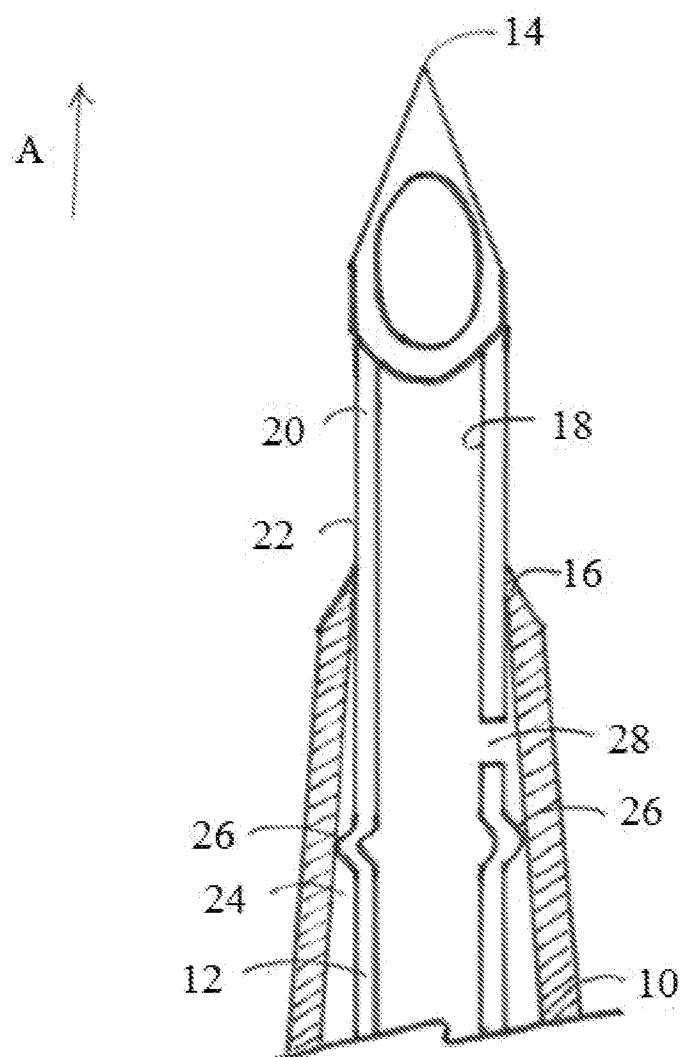
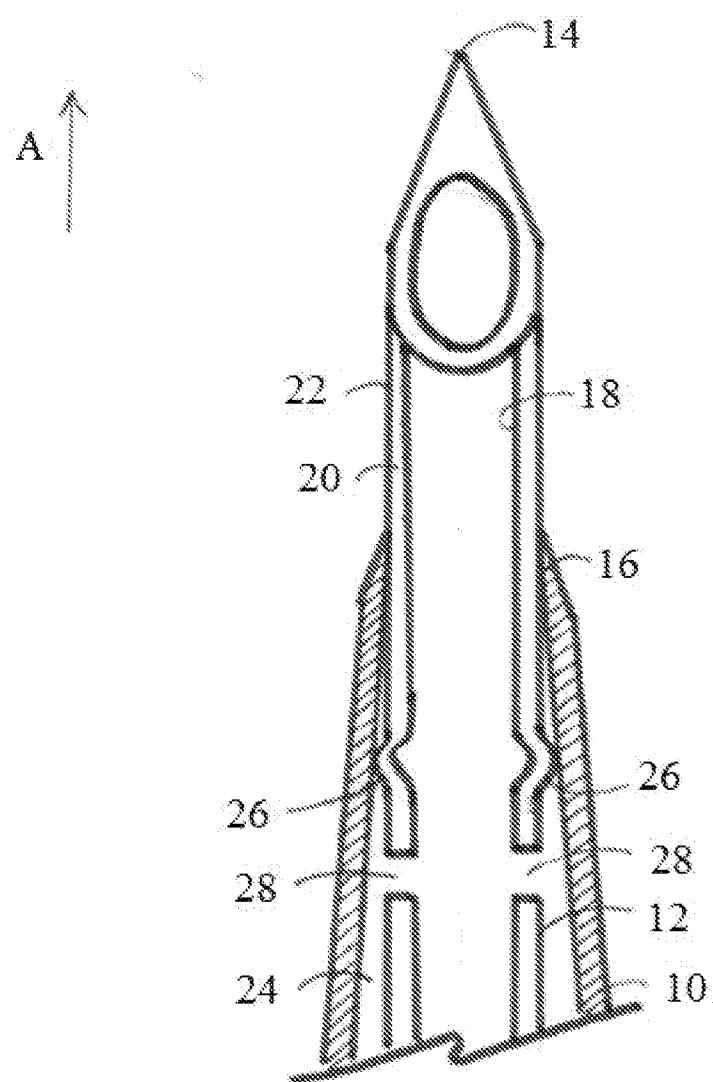
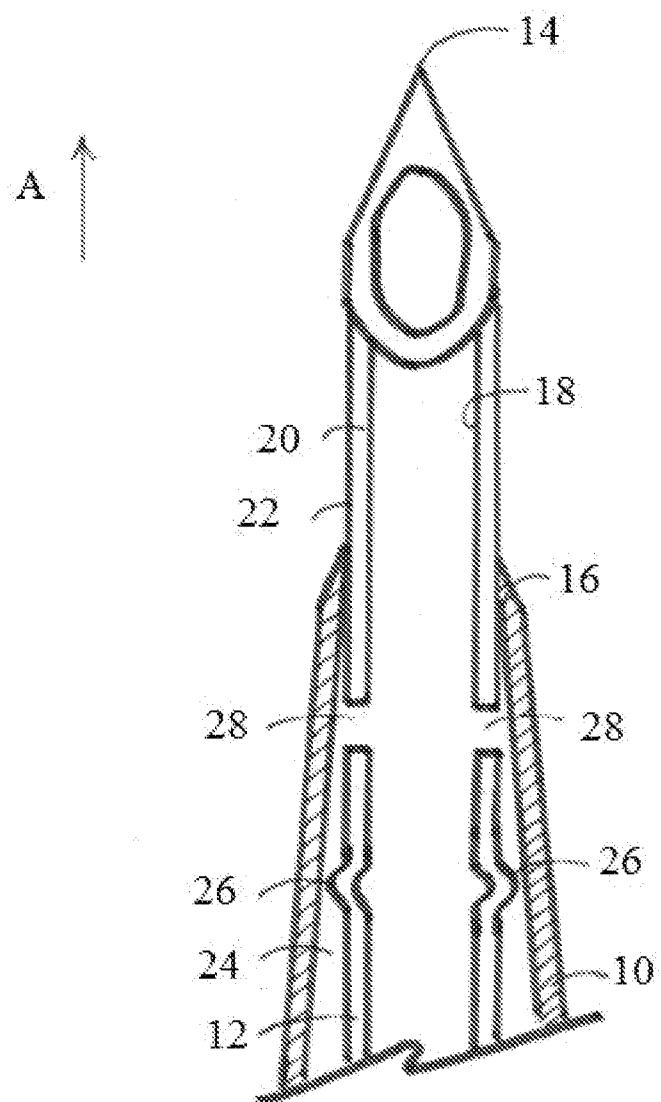
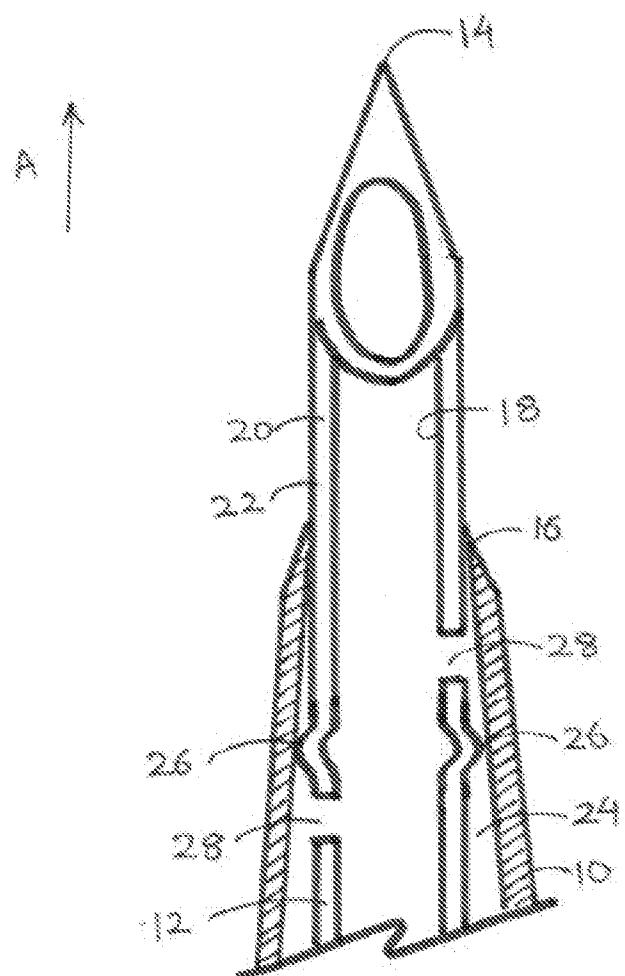


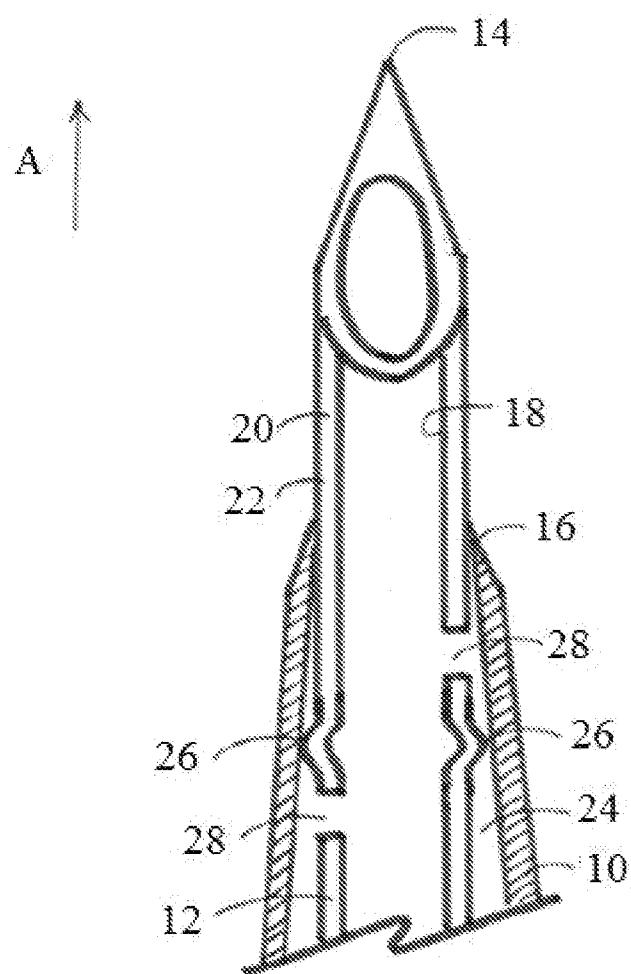
FIG. 1

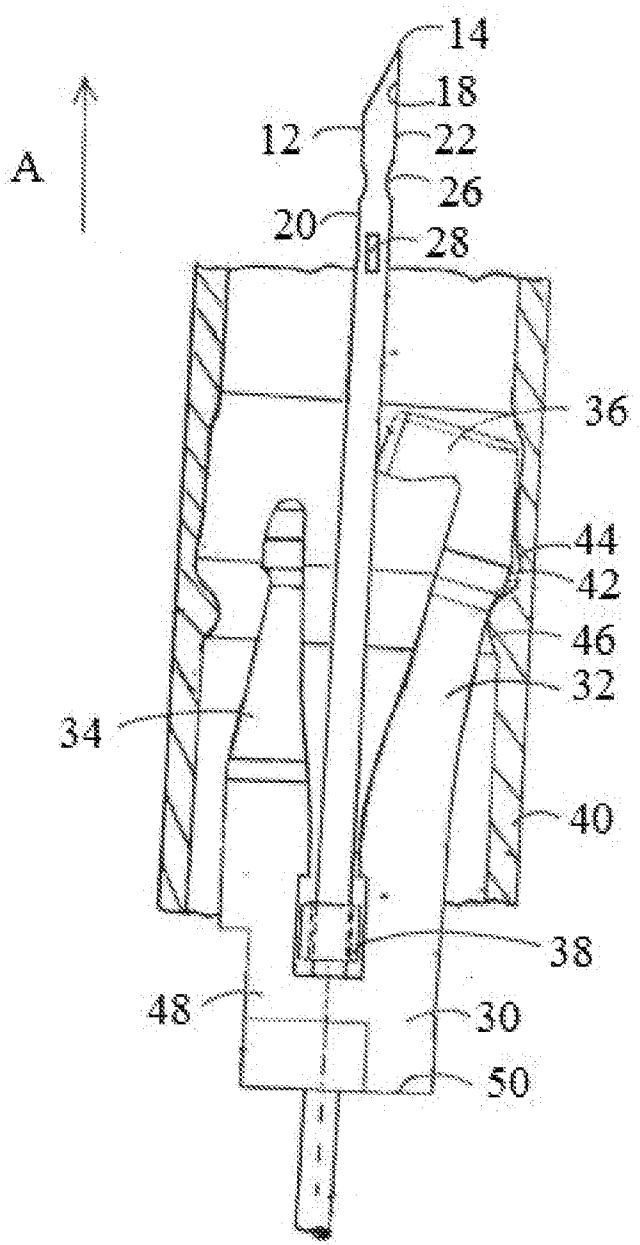
**FIG. 2**

**FIG. 3**

**FIG. 4**

**FIG. 5**

**FIG. 6**

**FIG. 7**

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2014/065260

A. CLASSIFICATION OF SUBJECT MATTER

A61M 25/06 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC and A61M 25/0606, A61M25/0618, A61M25/0625, A61M25/0631 and keywords: needle and engage and guard and prevent and similar terms.

WPI and EPODOC: Applicant and inventor name searches.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Documents are listed in the continuation of Box C	

Further documents are listed in the continuation of Box C See patent family annex

* Special categories of cited documents:	
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"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
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Date of the actual completion of the international search 16 February 2015	Date of mailing of the international search report 16 February 2015
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA Email address: pct@ipaaustralia.gov.au	Authorised officer David Melhuish AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No. 0262832426

INTERNATIONAL SEARCH REPORT		International application No. PCT/IB2014/065260
C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2013/124765 A1 (POLY MEDICURE LIMITED) 29 August 2013 figures 1, 2, 6, 7A to 7C, paragraphs 41 to 43, 56, 58, 61	1 - 5, 8 - 13, 15 - 19
Y	figures 1, 2, 6, 7A to 7C, paragraphs 41 to 43, 56, 58, 61	14
X	WO 2012/076990 A1 (POLY MEDICURE LIMITED) 14 June 2012 paragraphs 20 to 30	1, 3 - 13, 15 - 18
Y	paragraphs 20 to 30	14
Y	US 2012/0078200 A1 (WOEHR et al.) 29 March 2012 figures 10A and 10B, paragraph 76	1 - 19
Y	US 7604616 B2 (THORESEN et al.) 20 October 2009 figures 3A to 3G, 4 to 6 and 66	1 - 19
Y	US 5306253 A (BRIMHALL) 26 April 1994 figure 3 and column 5 lines 6 to 8	1 - 19
Y	US 2012/0041371 A1 (TAL et al.) 16 February 2012 figure 2	1 - 19
Y	US 2013/0066276 A1 (ITO et al.) 14 March 2013 figure 5	14

INTERNATIONAL SEARCH REPORT Information on patent family members		International application No. PCT/IB2014/065260	
This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.			
Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	Publication Date	Publication Number	Publication Date
WO 2013/124765 A1	29 August 2013	AU 2013223740 A1	25 Sep 2014
		CN 104203327 A	10 Dec 2014
		EP 2817060 A1	31 Dec 2014
WO 2012/076990 A1	14 June 2012	AU 2011340205 A1	01 Aug 2013
		CN 103338810 A	02 Oct 2013
		CO 6741196 A2	30 Aug 2013
		EA 201370134 A1	30 Oct 2013
		EP 2646100 A1	09 Oct 2013
		JP 2014504187 A	20 Feb 2014
		KR 20130123420 A	12 Nov 2013
		MX 2013006404 A	13 Sep 2013
		SG 191021 A1	31 Jul 2013
		US 2013261554 A1	03 Oct 2013
US 2012/0078200 A1	29 March 2012	US 8382721 B2	26 Feb 2013
		AR 013430 A1	27 Dec 2000
		AR 028572 A1	14 May 2003
		AU 730988 B2	22 Mar 2001
		AU 783650 B2	17 Nov 2005
		AU 4207001 A	21 Feb 2002
		AU 9532398 A	08 Mar 1999
		AU 2002251021 B2	21 Jun 2007
		AU 2005203491 A1	01 Sep 2005
		AU 2006200679 A1	16 Mar 2006
		AU 2006200679 B2	20 Nov 2008
		AU 2007216913 A1	11 Oct 2007
		AU 2007216913 B2	23 Dec 2010
		AU 2009233612 A1	26 Nov 2009
		AU 2009233612 B2	24 Jan 2013
		AU 2012258325 A1	13 Dec 2012
		AU 2012258325 B2	31 Jan 2013
		AU 2012258327 A1	13 Dec 2012
		AU 2012258327 B2	17 Jan 2013
		AU 2012260577 A1	20 Dec 2012
		AU 2012260577 B2	17 Jan 2013
		AU 2013202166 A1	02 May 2013
Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001. Form PCT/ISA/210 (Family Annex)(July 2009)			

INTERNATIONAL SEARCH REPORT Information on patent family members		International application No. PCT/IB2014/065260	
This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.			
Patent Document/s Cited in Search Report	Patent Family Member/s		
Publication Number	Publication Date	Publication Number	Publication Date
		AU 2013202166 B2	28 Nov 2013
		AU 2013248192 A1	14 Nov 2013
		AU 2013248192 B2	20 Feb 2014
		AU 2014202597 A1	05 Jun 2014
		AU 2014202746 A1	12 Jun 2014
		BR 0101974 A	09 Apr 2002
		BR 0207579 A	27 Apr 2004
		BR 0216079 B1	27 Nov 2012
		BR 9812128 A	18 Jul 2000
		CN 1267226 A	20 Sep 2000
		CN 1494445 A	05 May 2004
		CN 1589917 A	09 Mar 2005
		CN 1951513 A	25 Apr 2007
		CN 1951513 B	23 Feb 2011
		CN 1981885 A	20 Jun 2007
		EP 1003588 A1	31 May 2000
		EP 1003588 B1	17 Nov 2004
		EP 1180381 A1	20 Feb 2002
		EP 1180381 B1	28 Dec 2005
		EP 1363690 A1	26 Nov 2003
		EP 1363690 B1	28 Jun 2006
		EP 1421969 A1	26 May 2004
		EP 1421969 B1	14 Nov 2012
		EP 1702643 A2	20 Sep 2006
		EP 1702643 B1	19 Nov 2008
		EP 1707230 A2	04 Oct 2006
		EP 1716882 A1	02 Nov 2006
		EP 1716882 B1	13 Aug 2008
		EP 1815880 A1	08 Aug 2007
		EP 1815880 B1	09 Sep 2009
		EP 1911486 A1	16 Apr 2008
		EP 1911486 B1	07 Oct 2009
		EP 1911487 A1	16 Apr 2008
		EP 1911487 B1	10 Apr 2013
		EP 2316512 A1	04 May 2011
		EP 2316512 B1	17 Jul 2013

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

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INTERNATIONAL SEARCH REPORT Information on patent family members		International application No. PCT/IB2014/065260
This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.		
Patent Document/s Cited in Search Report		Patent Family Member/s
Publication Number	Publication Date	Publication Number
		EP 2338554 A1 29 Jun 2011
		EP 2394684 A2 14 Dec 2011
		HK 1096879 A1 07 Nov 2008
		HK 1106168 A1 09 Sep 2011
		HK 1108658 A1 30 Sep 2010
		JP 2001514943 A 18 Sep 2001
		JP 3486169 B2 13 Jan 2004
		JP 2003265615 A 24 Sep 2003
		JP 3486188 B2 13 Jan 2004
		JP 2002102345 A 09 Apr 2002
		JP 3609760 B2 12 Jan 2005
		JP 2008149158 A 03 Jul 2008
		JP 4594399 B2 08 Dec 2010
		JP 2004522540 A 29 Jul 2004
		JP 4606697 B2 05 Jan 2011
		JP 2010188154 A 02 Sep 2010
		JP 4778096 B2 21 Sep 2011
		MX PA01004981 A 24 Jun 2003
		MX PA03007464 A 15 Oct 2004
		MY 128527 A 28 Feb 2007
		SG 100705 A1 26 Dec 2003
		US 6117108 A 12 Sep 2000
		US 6287278 B1 11 Sep 2001
		US 6616630 B1 09 Sep 2003
		US 2005004532 A1 06 Jan 2005
		US 7125397 B2 24 Oct 2006
		US 2004116856 A1 17 Jun 2004
		US 7214211 B2 08 May 2007
		US 2003195471 A1 16 Oct 2003
		US 7264613 B2 04 Sep 2007
		US 2007083159 A1 12 Apr 2007
		US 7608057 B2 27 Oct 2009
		US 2007049868 A1 01 Mar 2007
		US 7611487 B2 03 Nov 2009
		US 2007129689 A1 07 Jun 2007
		US 7611499 B2 03 Nov 2009

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

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INTERNATIONAL SEARCH REPORT Information on patent family members		International application No. PCT/IB2014/065260
This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.		
Patent Document/s Cited in Search Report		Patent Family Member/s
Publication Number	Publication Date	Publication Number
		US 2006116638 A1 01 Jun 2006
		US 7625360 B2 01 Dec 2009
		US 2007100297 A1 03 May 2007
		US 7972313 B2 05 Jul 2011
		US 2010087787 A1 08 Apr 2010
		US 8100858 B2 24 Jan 2012
		US 2005027263 A1 03 Feb 2005
		US 8211070 B2 03 Jul 2012
		US 2011208133 A1 25 Aug 2011
		US 8376994 B2 19 Feb 2013
		US 2013102976 A1 25 Apr 2013
		US 8568372 B2 29 Oct 2013
		US 2013053781 A1 28 Feb 2013
		US 8647313 B2 11 Feb 2014
		US 2014221939 A1 07 Aug 2014
		US 8827965 B2 09 Sep 2014
		US 2013253443 A1 26 Sep 2013
		US 2014135701 A1 15 May 2014
		WO 9908742 A1 25 Feb 1999
		WO 02068022 A1 06 Sep 2002
		ZA 9807377 A 17 Feb 1999
		ZA 200103937 A 13 Nov 2002
		ZA 200306165 A 10 Aug 2004
Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001. Form PCT/ISA/210 (Family Annex)(July 2009)		

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This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.			
Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	Publication Date	Publication Number	Publication Date
US 7604616 B2	20 October 2009	US 7604616 B2	20 Oct 2009
		AU 745601 B2	21 Mar 2002
		AU 769076 B2	15 Jan 2004
		AU 2970601 A	14 Aug 2001
		AU 3463899 A	01 Nov 1999
		AU 4150902 A	18 Jun 2002
		AU 5815299 A	05 Dec 2000
		AU 6830501 A	17 Dec 2001
		AU 2001229706 B2	12 May 2005
		AU 2002241509 B2	14 Dec 2006
		AU 2003243717 A1	06 Jan 2004
		AU 2003245632 A1	02 Feb 2004
		BR 0107774 A	06 Jul 2004
		BR 0107774 B1	27 Nov 2012
		BR 0311907 A	05 Apr 2005
		BR 0311907 B1	21 Aug 2012
		BR 0311937 A	05 Apr 2005
		BR 0311937 B1	21 Aug 2012
		CN 1427731 A	02 Jul 2003
		CN 1662274 A	31 Aug 2005
		CN 1662275 A	31 Aug 2005
		CN 1817379 A	16 Aug 2006
		CN 1817379 B	23 Jun 2010
		CN 101543657 A	30 Sep 2009
		CN 101543657 B	08 May 2013
		CN 101623533 A	13 Jan 2010
		CN 101623533 B	01 May 2013
		CN 101628144 A	20 Jan 2010
		CN 101628144 B	06 Mar 2013
		EP 1069924 A1	24 Jan 2001
		EP 1069924 B1	04 Feb 2004
		EP 1181072 A1	27 Feb 2002
		EP 1181072 B1	01 Jun 2005
		EP 1255581 A1	13 Nov 2002
		EP 1292355 A2	19 Mar 2003

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INTERNATIONAL SEARCH REPORT Information on patent family members		International application No. PCT/IB2014/065260
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Patent Document/s Cited in Search Report		Patent Family Member/s
Publication Number	Publication Date	Publication Number
		EP 1292355 B1
		EP 1513578 A1
		EP 1513578 B1
		EP 1513579 A1
		EP 1513579 B1
		EP 1886710 A2
		EP 2014328 A1
		EP 2204209 A2
		EP 2204209 B1
		EP 2204210 A2
		EP 2204210 B1
		EP 2204211 A2
		EP 2204211 B1
		EP 2204212 A2
		EP 2204212 B1
		EP 2298404 A1
		EP 2298405 A1
		JP 2002511319 A
		JP 3379645 B2
		JP 2002543939 A
		JP 3730126 B2
		JP 2005529717 A
		JP 4457004 B2
		JP 2005529719 A
		JP 4476120 B2
		JP 2010046522 A
		JP 5112412 B2
		JP 2010046521 A
		JP 5121808 B2
		US 6004294 A
		US 6379333 B1
		US 2003105431 A1
		US 6652490 B2
		US 6749588 B1
		US 2005080378 A1
		US 7507222 B2
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Patent Document/s Cited in Search Report		Patent Family Member/s
Publication Number	Publication Date	Publication Number
		US 2004236288 A1
		US 7935080 B2
		US 2010191188 A1
		US 8864714 B2
		US 2004186434 A1
		US 2010191189 A1
		WO 0069501 A1
		WO 0156642 A1
		WO 0193940 A2
		WO 0245786 A2
		WO 9952584 A1
		WO 2004000408 A1
		WO 2004007013 A1
		25 Nov 2004
		03 May 2011
		29 Jul 2010
		21 Oct 2014
		23 Sep 2004
		29 Jul 2010
		23 Nov 2000
		09 Aug 2001
		13 Dec 2001
		13 Jun 2002
		21 Oct 1999
		31 Dec 2003
		22 Jan 2004
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Patent Document/s Cited in Search Report			Patent Family Member/s
Publication Number	Publication Date	Publication Number	Publication Date
US 5306253 A	26 April 1994	CA 2115911 A1 EP 0615765 A1 EP 0615765 B1 JP H06296698 A JP 2573796 B2	18 Sep 1994 21 Sep 1994 12 Jun 1996 25 Oct 1994 22 Jan 1997
US 2012/0041371 A1	16 February 2012	US 8657790 B2 AU 2006302805 A1 AU 2006302805 A2 CA 2606586 A1 EP 1876972 A2 EP 2366422 A1 JP 2008534154 A JP 5166239 B2 KR 20080011179 A US 2009221961 A1 WO 2007046850 A2 ZA 200709123 A ZA 200900411 A	25 Feb 2014 26 Apr 2007 26 Apr 2007 26 Apr 2007 16 Jan 2008 21 Sep 2011 28 Aug 2008 21 Mar 2013 31 Jan 2008 03 Sep 2009 26 Apr 2007 29 Jul 2009 28 Oct 2009
US 2013/0066276 A1	14 March 2013	US 8920378 B2 CN 102933242 A EP 2578250 A1 JP 2011251081 A JP 5594520 B2 KR 20130109021 A MX 2012014150 A WO 2011152160 A1	30 Dec 2014 13 Feb 2013 10 Apr 2013 15 Dec 2011 24 Sep 2014 07 Oct 2013 29 Apr 2013 08 Dec 2011
End of Annex			
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