

Title of the Invention: NEEDLE GUARD**FIELD OF THE INVENTION:**

5 The invention relates to needle guard for a medical device, in particular for a safety IV catheter device. The needle guard is configured to slidably receive a needle having a needle shaft and a needle tip. The needle guard has a longitudinal axis defining an axial direction. The needle guard comprises a base portion, a first arm and a second arm. The first arm and the second arm extend substantially in axial direction from a distal side of the base portion. The invention
10 further relates to a medical device comprising the needle guard.

BACKGROUND OF THE INVENTION:

Such needle guards are generally known and are used to cover the tip of the needle of a
15 medical device after use of the medical device. Such needle guards are typically adapted to automatically cover the needle tip after withdrawal of the needle, for example, from a patient. Advantageously, such needle guards thereby serve to prevent accidental pricking of, for example, a medical practitioner or a patient by the needle tip after removal of the needle from the medical device. In other words, the needle guard helps to handle the needle after its usage
20 without the danger of pricking and thereby without the danger of transmitting possibly infectious diseases from the patient to another person like the medical practitioner.

EP 2 861 291 B1 and WO 2013/124765 A1 disclose a needle guard comprising a base portion having a needle passage extending in an axial direction from a proximal side of said base
25 portion from said base portion to a distal side of said base portion for movably receiving a needle shaft. The needle guard further comprises a first and a second arm extending substantially in said axial direction from said distal side of said base portion. The first arm further comprises a distal wall which is transversely arranged at a distal region of the first arm. The needle guard further comprises a stopping element which is configured to be slidably arranged
30 on a needle shaft. The stopping element of EP 2 861 291 B1 is movable relative to said base portion.

WO 2011/154767 A1 discloses another needle guard. Said needle guard is slidably arranged on a needle. Said needle guard is retained in a chamber of a catheter hub when the needle
35 extends through the catheter hub and a catheter. The needle guard is removable from the catheter hub once the needle tip of the needle is received in the needle guard upon withdrawal of the needle from the catheter.

SUMMARY & OBJECTS OF THE INVENTION

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It is an object of the invention to provide an improved needle guard.

This object is solved by a needle guard according to claim 1.

5 The needle guard of the present invention is configured to slidably receive a needle having a needle shaft and a needle tip, wherein the needle guard has a longitudinal axis defining an axial direction. The needle guard comprises a base portion, a first arm and a second arm. The first arm and the second arm extend substantially in axial direction from a distal side of the base portion. The first arm and the second arm have a distal portion in axial distance from the base portion and a proximal portion axially proximate to the base portion. The base portion comprises a passage extending in axial direction therethrough from a proximal side of the base portion to the distal side of the base portion for movably receiving the needle shaft. The first arm has a transverse wall transversely provided at the distal portion of the first arm. The second arm has an axial protrusion axially provided at the distal portion of the second arm. The needle guard has a ready state, in which the needle shaft extends through the needle guard such that the needle tip protrudes in axial direction beyond the needle guard such that the needle shaft extends between the transverse wall and the axial protrusion. The needle guard has a protecting state, in which the needle shaft is retracted such that the needle tip is located between the first arm and the second arm in a protected position. In the protecting state of the needle guard the distal portion of the first arm and the distal portion of the second arm are in an engaged position such that the axial protrusion of the second arm approaches the transverse wall on the first arm. Said engaged position advantageously contributes to the needle guard's ability to safely contain the needle within the needle guard. This further minimizes the risk for medical practitioners of being injured by the needle tip.

25 According to an embodiment, the transverse wall of the first arm and the axial protrusion of the second arm form a gap between one another in transverse direction in the protecting state of the needle guard. Generally, the transverse direction is arranged substantially orthogonal to the axial direction.

30 According to an embodiment, when viewing from the base portion distally and along the axial direction, the gap is hidden by the second arm.

35 According to an embodiment, the gap has a maximum distance which is smaller than a diameter of the passage extending through the base portion, preferably smaller than 50% of the diameter of the passage extending through the base portion, more preferably smaller than 30% of the diameter of the passage extending through the base portion.

40 According to an embodiment, the axial protrusion of the second arm has an axial protrusion inner surface adapted to face the first arm and wherein the transverse wall of the first arm has

a transverse wall inner surface adapted to face the second arm, wherein in the protecting state, the transverse wall inner surface and the axial protrusion inner surface at least partly approach each other.

5 According to another embodiment, the transverse wall of the first arm and the axial protrusion of the second arm at least partly contact each other in the protecting state of the needle guard. This helps to securely retain the needle tip within the needle guard and to maintain the protecting state.

10 According to an embodiment, the axial protrusion of the second arm has an axial protrusion inner surface adapted to face the first arm and wherein the transverse wall of the first arm has a transverse wall inner surface adapted to face the second arm, wherein in the protecting state, the transverse wall inner surface and the axial protrusion inner surface at least partly contact each.

15 According to an embodiment, the transverse wall inner surface is adapted to contact the needle shaft at a point or along a line contact or two-dimensionally along a surface portion in the ready state. Beneficially, such contact reduces the friction between the needle guard and the needle. This positively influences the user experience when retracting the needle from the needle
20 guard, i.e. when bringing the needle guard from the ready state to the protecting state, since the user experiences only little resistance.

According to an embodiment, the axial protrusion of the second arm extends at the distal end of the second arm such that it forms a recess, wherein the transverse wall of the first arm is
25 adapted to protrude and/or to engage into this recess in the protecting state of the needle guard. Said engagement of the transverse wall into the recesses allows to provide a more secure protecting state. For example, when viewed in the axial direction in the protecting state, said engagement into the recess allows the first and second arm to overlap in the transverse direction, which prevents the needle from being pushed in distal direction outside the needle
30 guard.

According to an embodiment, an inner surface of the transverse wall, in particular the transverse wall inner surface, forms an angle (i) with an imaginary line extending in the axial direction, which angle is in the ready state between 0 and 15 degrees, preferably around 10
35 degrees, and/or which is in the protecting state less than 5 degree, preferably around 0 degree. In the ready state, the angle allows a small friction force between the transverse wall and the needle, which makes it easier for medical practitioner to retract the needle and to bring the needle guard from the ready state to the protecting state. Said angle (i) may face in the distal direction.

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Generally said, the expression “extending along” or “extending along an imaginary line” or “extending in” with reference to the axial direction can mean that the imaginary line is arranged parallel to the axial direction and/or parallel to the longitudinal axis.

5 According to an embodiment, the axial protrusion inner surface is arranged distantly to the needle shaft in the ready state. Thereby, the axial protrusion inner surface does not lead to any friction between the needle and the needle guard. This makes it easier to move the needle relative to the needle guard.

10 According to an embodiment, an inner surface of the axial protrusion, in particular the axial protrusion inner surface, forms an angle (j) with an imaginary line extending in the axial direction, which is in the ready state between 0 and 10 degrees, preferably around 5 degrees, and/or in the protecting state between 0 and 15 degrees, preferably around 8 degrees. Said angle (j) may face in the distal direction.

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According to an embodiment, the distal portion of the second arm further comprises a needle contact surface proximally arranged to the axial protrusion for at least partly contacting the needle shaft in the ready state. In other words, one may say that the needle contact area comprises the needle contact surface and the needle contact surface forms an inner side of the needle contact portion. Thereby, a distinct contact area can be achieved separate to the axial protrusion. By doing so, the needle contact surface can be designed to achieve a desired amount of friction on the needle in the ready state making it easier to move the needle relative to the needle guard.

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25 According to an embodiment, the needle contact surface is adapted to contact the needle shaft in the ready state at a point or along a line contact or two-dimensionally along a surface portion.

According to an embodiment, the transverse wall forms the distal most portion of the first arm and/or the axial protrusion forms the distal most portion of the second arm.

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According to an embodiment, the axial protrusion has an outer surface forming an angle (d) with an imaginary line extending in the axial direction, which is in the ready state between 0 and 15 degrees, preferably about 7 degrees, and/or in the protecting state between 0 and 15 degrees, preferably about 12 degrees. Said angle (d) may face in the distal direction.

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According to an embodiment, the transverse wall has an axial end surface forming an angle (h) with an imaginary line extending in the axial direction, which is in the ready state between 75 and 90 degrees, preferably about 80 degrees, and/or in the protecting state between 85 and 95 degrees, preferably about 90 degrees. The axial end surface of the transverse wall can

be the same as the axial end surface of the first arm. Said angle (h) may face in the outside and/or transverse direction.

5 According to an embodiment, the axial protrusion has an axial end surface forming an angle (m) with an imaginary line extending in the axial direction, which is in the ready state between 85 and 95 degrees, preferably about 90 degrees, and/or in the protecting state between 80 and 90 degrees, preferably about 83 degrees. The axial end surface of the axial protrusion can be the same as the axial end surface of the second arm. Said angle (m) may face in the outside and/or transverse direction.

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According to an embodiment, each of the first arm and the second arm has an intermediate portion proximal to the distal portion, which intermediate portion is adapted to be at least partly surrounded by an elastic element.

15 According to an embodiment, at least one of the first and second arm is adapted to urge against each other in transverse direction in the protecting state. This helps to keep the first and second arm in the protecting state. In an example, at least one of the first and second arm is preloaded such that the arm urges or the arms urge towards a relaxed position in transverse direction and/or towards the other arm of the first and second arm.

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According to an embodiment, at least one of the first and second arm is in a relaxed position in the protecting state. This means that the corresponding arm is not pretensioned in the protecting state. This has the effect that the corresponding arm maintains its position of the protecting state even during a long shelf life.

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According to an embodiment, at least one of the first and second arm is pretensioned in the ready state. Preferably, the pretension is such that the corresponding arm urges towards the protecting state. This helps that the needle guard maintains the protecting state. In addition, this helps to provide a needle guard which does not comprise or need an elastic element.

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According to an embodiment at least one of the first and second arm is pretensioned in the ready state and in the protecting state, and has a relaxed position between its positions in the ready state and the protecting state.

35 According to an embodiment, the elastic element is designed to urge the first and second arm in transverse direction against each other to the protecting state when surrounding the intermediate portion.

40 According to an embodiment, the intermediate portion of the second arm has an inner surface adapted to face the needle shaft, which forms an angle (a) with an imaginary line extending in

the axial direction, which angle (a) is in the ready state between 5 and 10 degrees, preferably about 10 degrees, and/or in the protecting state between 10 and 20 degrees, preferably about 13 degrees. Said angle (a) may face the proximal direction.

- 5 Generally said, an angle facing the proximal direction or facing the distal direction may mean that the angle opens to the corresponding direction.

According to an embodiment, the intermediate portion of the second arm has an outer surface, which forms an angle (c) with an imaginary line extending in the axial direction, which is in the ready state between 5 and 15 degrees, preferably about 10 degrees, and/or in the protecting state between 10 and 20 degrees, preferably about 16 degrees. Said angle (c) may face in the distal direction.

According to an embodiment, the intermediate portion of the first arm has an inner surface adapted to face the needle shaft, which forms an angle (f) with an imaginary line extending in the axial direction, which angle (f) is in the ready state between 0 and 10 degrees, preferably about 3 degrees, and/or in the protecting state between 0 and 15 degrees, preferably about 8 degrees. Said angle (f) may face in the distal direction.

According to an embodiment, the distal portion of the first arm has an inner wall surface arranged proximal to the transverse wall, which inner wall surface forms an angle (g) with an imaginary line extending in the axial direction, which is in the ready state between 5 and 20 degrees, preferably about 13 degrees, and/or in the protecting state between 15 to 30 degrees, preferably about 23 degrees. Said angle (g) may face in the proximal direction.

According to an embodiment, the proximal portion of the second arm has an inner surface adapted to face the needle shaft, which inner surface forms an angle (b) with an imaginary line extending in the axial direction, which is in the ready state between 15 and 25 degrees, preferably about 19 degrees, and/or in the protecting state between 15 and 25 degrees, preferably about 19 degrees. Said angle (b) may face in the distal direction.

According to an embodiment, the angle (b) is substantially the same in the ready state and in the protecting state.

According to an embodiment, the proximal portion of the first arm has an inner surface adapted to face the needle shaft, which inner surface forms an angle (e) with an imaginary line extending in the axial direction, which is in the ready state between 10 and 30 degrees, preferably about 20 degrees, and/or in the protecting state between 10 and 30 degrees, preferably about 20 degrees. Said angle (d) may face in the distal direction.

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According to an embodiment, the angle (e) is substantially the same in the ready state and in the protecting state.

5 According to an embodiment, an inner surface of the intermediate portion of the first arm and an inner surface of the proximal portion of the first arm form an angle (o) of between 150 and 170 degrees, preferably about 160 degrees, in the protecting state and/or ready state.

10 According to an embodiment, the surface of the intermediate portion of the first arm is located adjacent to the inner surface of the proximal portion of the first arm.

15 According to an embodiment, an inner surface of the intermediate portion of the second arm and an inner surface of the proximal portion of the second arm form an angle (p) of between 140 and 160 degrees, preferably 150 degrees, in the protecting state and/or ready state, wherein optionally the inner surface of the proximal portion is arranged distal and/or adjacent to the proximal inner portion.

20 According to an embodiment, the transverse wall comprises a proximal wall surface, which may be arranged between the transverse wall inner surface and the inner wall surface. Said differently, one may say that the proximal wall surface forms a proximal facing surface of the transverse wall. The proximal wall surface forms an angle (l) with an imaginary line extending in the transverse direction, i.e. orthogonal to the axial direction, which angle (l) is in the ready state about 4,5 degrees, and/or in the protecting state about 16 degrees. Nevertheless, said angle (l) may be varied to be more or less than 4,5 degrees in the ready state and more or less than 16 degrees. Said angle (l) may face in the outside and/or transverse direction.

25 According to an embodiment, the second arm comprises an inner surface which may form part of recess. Said differently, one may say that said inner surface substantially faces in the distal direction. Said inner surface may form an angle (k) with an imaginary line extending in the transverse direction, which angle (k) is in the ready state about 0 degrees or in the alternative about 5 degrees, and/or which angle (k) is in the protecting state about 3 degrees or in the alternative about 8 degrees. In general, said angle (k) is positive with regard to the transverse direction. Said angle (k) may face in the inside and/or transverse direction.

35 According to an embodiment, the second arm comprises an outer surface, which the outer surface forms a proximal end of the edge of the second arm. Furthermore, the outer surface is arranged distal to the inclined outer surface. The outer surface forms an angle (n) with an imaginary line extending in the transverse direction, which angle (n) is in the ready state about 0 degree, and/or which is in the protecting state about 6 degrees. Said angle (n) may face in the outside and/or transverse direction.

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According to an embodiment, the second arm comprises a proximal inner surface arranged at the proximal portion of the second arm and its inner side. The proximal inner surface 82 may form an angle (q) with an imaginary line extending in the axial direction, which is in the ready state according between 0 and 10 degrees, preferably about 5 degrees, and/or in the
5 protecting state between 0 and 10 degrees, preferably about 5 degrees. Said angle (q) may face in the distal direction.

According to an embodiment, the first arm comprises a proximal inner surface arranged at the proximal portion of the first arm. Distal and proximate to the proximal inner surface, another
10 inner surface may be arranged. The proximal inner surface may form an angle (r) with an imaginary line extending in the axial direction, which is in the ready state between 0 and 10 degrees, preferably about 5 degrees, and/or in the protecting state between 0 and 10 degrees, preferably about 5 degrees. Said angle (r) may face in the distal direction.

15 According to an embodiment, the first arm may comprise two outer surfaces forming an angle (s) with each other, which is about 170 degrees both in the ready state and the protecting state.

According to an embodiment, the inner surface of the intermediate portion of the second arm is located adjacent and/or distal to the inner surface of the proximal portion of the second arm.

20 According to an embodiment, the first arm towers the second arm at least in the ready state.

According to an embodiment, the axial protrusion and the transverse wall each have a design adapted to mate with each other at least in the protecting state. This helps to securely maintain
25 the needle within the needle guard and to maintain the protecting state of the needle guard.

According to an embodiment, the axial protrusion has a greater, smaller or substantially the same axial extension than the transverse wall.

30 According to an embodiment, the axial protrusion and/or the transverse wall comprises a locking feature, which allows to lock the first and second arm with each other at least in the protecting state. Thereby, the locking feature can increase the safety of the needle guard.

According to an embodiment, the locking feature comprises a groove and a protrusion, wherein
35 the groove is adapted to receive the protrusion in the protecting state in a locking manner.

According to an embodiment, the groove is formed at the transverse wall and/or the axial protrusion, wherein the protrusion is formed at the other one of the axial protrusion and the transverse wall.

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According to an embodiment, the axial protrusion extends further proximal in axial direction than the transverse wall.

5 According to an embodiment, the axial protrusion inner surface comprises a surface part extending further proximal in axial direction than the transverse wall inner surface.

10 According to an embodiment, a proximal end of the axial protrusion is located further proximal in axial direction than a proximal end of the transverse wall by a distance. Preferably, said distance is smaller than the needle outer diameter and/or at least one millimeter. Furthermore, the distance may be the same or smaller than an axial extension of the transverse wall inner surface. The proximal end may be located at the same height along the axial direction as the inner surface of the recess and/or the axial end of the needle contact portion.

15 According to an embodiment, a distal end of the axial protrusion is located further distal in axial direction than a distal end of the transverse wall.

20 According to an embodiment, an axial length of the transverse wall measured in the axial direction and/or a width of the transverse wall measured in the transverse direction is larger than a diameter of the needle shaft by a factor.

According to an embodiment, the factor is at least greater than 1,5, 2, 2,5, 3, 3,5, 4, 4,5, 5 or 10.

25 According to an embodiment, the needle guard further comprises a stopping element arranged at the passage of the base portion, wherein the stopping element has an opening configured to slidably receive the needle shaft. The stopping element may be adapted to engage with an engagement portion on the needle shaft. Such an engagement portion may have a different outer dimension, shape, and/or size than other parts of the needle shaft. As an example, the engagement portion may comprise a crimped portion.

30 According to an embodiment, at least the base portion comprises a first material and the stopping element comprises a second material different from said first material, wherein preferably the second material is of greater hardness and/or stiffness than the first material.

35 According to an embodiment, at least the base portion comprises a first material and the stopping element comprises a second material, which is the same as the first material.

40 According to an embodiment, the second material comprises metallic material, non-metallic material and/or plastic material.

According to an embodiment, the opening of the stopping element has an inner diameter which is smaller than a minimum inner dimension of the passage seen in the transverse direction.

According to an embodiment, the stopping element is integrally formed with the base portion.

5 This may facilitate the manufacturing of the needle guard.

According to an embodiment, the stopping element is arranged at the passage of the base portion such that a middle axis of the opening forms an angle with an imaginary line extending in the axial direction, wherein preferably the angle is at least 5 degrees, more preferably at least 10 degrees. Accordingly, the opening can be tiltedly arranged relative to the passage and/or the axial direction.

According to an embodiment, the stopping element is tiltedly arranged at the passage of the base portion. Such a tilted arrangement allows to reduce the friction which the stopping element can exert on the needle shaft.

According to an embodiment, the stopping element is arranged at the passage of the base portion in such a way that the opening of the stopping element is adapted to form a line contact, in particular a ring-line contact, or at least one point contact with the needle shaft. Such contact allows to reduce the friction which the stopping element can exert on the needle shaft.

According to an embodiment, the stopping element is integrally formed with the base portion. According to a further embodiment, stopping element is formed by the passage or a part of the passage of the base portion. In an embodiment, the stopping element can be formed by a part of the passage comprising a smaller diameter than another part of the passage in the axial direction. All said embodiments have the effect that the stopping element is not a unit separate to the base portion, which simplifies manufacturing of the needle guard.

According to an embodiment, in the ready state at least one of the first and second arm is adapted to contact/abut the needle shaft.

According to an embodiment, the second arm has an axial extension in the axial direction which is greater, smaller or substantially the same as the axial extension of the first arm.

35 According to an embodiment, in the protecting state the first arm and the second arm do not overlap in the transverse direction when seen from the base portion in the axial direction.

According to an embodiment, in the protecting state there is no gap between the first arm and the second arm in the transverse direction when seen from the base portion in the axial direction.

According to an embodiment, in the protecting state the first arm and the second arm overlap in the transverse direction when seen from the base portion in the axial direction.

- 5 According to an embodiment, the distal portion of the second arm comprises an inner protrusion adapted to face the first arm. One may say that the needle contact portion forms the inner protrusion.

10 According to an embodiment, the inner protrusion is adapted to contact the needle shaft at least in the ready state.

According to an embodiment, the axial protrusion comprises the inner protrusion or wherein the axial protrusion distally extends from the inner protrusion in the axial direction.

- 15 According to an embodiment, the transverse wall forms an axial gap with the inner protrusion in the axial direction.

According to an embodiment, the inner protrusion is arranged more proximal than the transverse wall inner surface.

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According to an embodiment, the axial gap is at least 0,05 mm, preferably at least 1 mm, and more preferably more than 1 mm.

- 25 According to an embodiment, the axial gap is smaller than an axial extension of the transverse wall, wherein preferably the axial gap is at least 5 % of the axial extension of the transverse wall.

According to an embodiment, at least in the protecting state the inner protrusion is adapted to urge the needle shaft towards the first arm, in particular towards the transverse wall.

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According to an embodiment, the passage comprises a minimum inner dimension seen in the transverse direction which is substantially the same as an outside diameter of the needle shaft.

- 35 According to an embodiment, the minimum inner dimension and the outer diameter of the needle shaft are configured to form a close fit ratio.

40 According to an embodiment, at least one of the first and second arm has an outer surface comprising an indent section, which reduces the transverse extension of the corresponding arm, in particular on the outside of the corresponding arm. Such an indent section reduces or removes the interference and/or friction force, which can prevail when contacting an inner wall

of a catheter hub or the like when the needle guard is housed within the catheter hub in the ready position.

5 According to an embodiment, the indent section has a substantially planar profile and/or wherein the outer surface of the arm comprising the indent section is substantially non-circular. Said non-circularity can be seen in a cross-sectional view orthogonal to the axial direction and through the indent section.

10 According to an embodiment, the base portion, the distal portion and/or the intermediate portion of the first and/or second arm forms the at least one indent section. Preferably, a first indent section is formed on the outer surface of the distal portion of the first arm and a second indent section is formed on the outer surface of the intermediate portion and/or base portion of the first arm. The same can apply to the second arm.

15 According to an embodiment, at least one of the first and second arm has the outer surface comprising a contact surface adapted to at least partly contact an inner wall of a receiving element, in particular a catheter hub.

20 According to an embodiment, the contact surface comprises at least one form-fit section, which is adapted to form-fit an inner wall of the receiving element at least in the ready state.

According to an embodiment, the form-fit section comprises a substantially circular form, wherein in particular the form-fit section is substantially ring-shaped.

25 According to an embodiment, the distal portion, the intermediate portion and/or the proximal portion of the first and/or second arm comprises the form-fit section, wherein preferably a proximal end of the distal portion of the first and/or second arm comprises the form-fit section.

30 According to an embodiment, the gap formed by the transverse wall and the axial protrusion in the transverse direction in the protecting state is smaller than a length of at least one of the form-fit sections in the axial and/or transverse direction.

35 According to an embodiment, the gap is smaller than a width of the transverse wall and/or the axial protrusion measured in the transverse direction.

According to an embodiment, the gap is smaller than a further gap formed by the first arm and the second arm at the intermediate portion in the transverse direction.

According to an embodiment, the axial protrusion has a width that is smaller than, the same as or greater than a width of the transverse wall, wherein preferably the width is measured in a direction perpendicular to the axial direction and/or perpendicular to the transverse direction.

- 5 According to an embodiment, the axial protrusion has a length measured in the axial direction that is smaller than, the same as or greater than a length of the transverse wall measured in the axial direction.

- 10 According to an embodiment, a width of the axial protrusion measured in the transverse direction and towards the first arm tapers from proximal to distal or is substantially constant or increases from proximal to distal.

- 15 According to an embodiment, a width of the axial protrusion measured in the transverse direction and not towards the first arm tapers from proximal to distal or is substantially constant or increases from proximal to distal.

- 20 According to an embodiment, the transverse wall comprises a distal tip and a proximal tip, wherein both tips face the axial protrusion, wherein the proximal tip is located more proximal than the distal end of the second arm.

According to an embodiment, the distal tip is located more proximal or more distal than the distal end of the second arm.

- 25 According to an embodiment, the passage has a first section comprising a non-circular shape. Said feature and the following feature in relation to the first section can form a separate embodiment independent from other features elucidated in the application.

- 30 According to an embodiment, the first section has a first inner dimension and a second inner dimension, wherein the first inner dimension is smaller than the second inner dimension.

According to an embodiment, the second inner dimension is oriented substantially orthogonal to the first inner dimension.

- 35 According to an embodiment, the second inner dimension is at least 10 %, preferably at least 25 %, greater than the first inner dimension.

According to an embodiment, the first section has a substantially rectangular shape and/or a substantially rectangular shape with curved edges and/or oval shape.

According to an embodiment, the passage further has a second section, wherein the second section is different to the first section in shape.

5 According to an embodiment, the second section is located more distal or proximal than the first section when viewed in the axial direction.

According to an embodiment, the second section has a substantially circular shape.

10 According to an embodiment, the second inner dimension is measured in a direction from the first arm to the second arm or substantially perpendicular to said direction.

15 According to an embodiment, the first inner dimension of the first passage is substantially the same size than an inner dimension of the second section, in particular an inner diameter of the second section.

According to an embodiment, the first section has a smaller, same or larger axial extension than the second section.

20 The object is further solved by a needle guard according to claim 90. Said needle guard is for a medical device, in particular for a safety IV catheter device, wherein the needle guard is configured to slidably receive a needle having a needle shaft and a needle tip, wherein the needle guard has a longitudinal axis defining an axial direction, the needle guard comprising: a base portion; a first arm; and a second arm; wherein the first arm and the second arm extend substantially in axial direction from a distal side of the base portion, wherein the first arm and
25 the second arm have a distal portion in axial distance from the base portion and a proximal portion axially proximate to the base portion; wherein the base portion comprises a passage extending in axial direction therethrough from a proximal side of the base portion to the distal side of the base portion for movably receiving the needle shaft; wherein the needle guard has a ready state, in which the needle shaft extends through the needle guard such that the needle
30 tip protrudes in axial direction beyond the needle guard; wherein the needle guard has a protecting state, in which the needle shaft is retracted such that the needle tip is located between the first arm and the second arm in a protected position; and wherein the passage has a first section comprising a non-circular shape.

35 The non-circular shape has the effect that the needle shaft is less tiltable within the passage in one dimension than in another dimension. Accordingly, this protecting state allows to keep the needle tip and/or needle shaft between the first arm and the second arm in the protecting state maintaining the retention within the needle guard in a more secure way.

According to an embodiment, the first section has a first inner dimension and a second inner dimension, wherein the first inner dimension is smaller than the second inner dimension.

5 According to an embodiment, the second inner dimension is oriented substantially orthogonal to the first inner dimension.

According to an embodiment, the second inner dimension is at least 10%, preferably at least 25%, greater than the first inner dimension.

10 According to an embodiment, the first section has a substantially rectangular shape and/or a substantially rectangular shape with curved edges and/or oval shape.

According to an embodiment, the passage further has a second section, wherein the second section is different to the first section in shape.

15 According to an embodiment, the second section is located more distal or proximal than the first section when viewed in the axial direction.

20 According to an embodiment, the second section has a substantially circular shape.

According to an embodiment, the second inner dimension is measured in a direction from the first arm to the second arm or substantially perpendicular to said direction.

25 According to an embodiment, the first inner dimension of the first passage is substantially the same size than an inner dimension of the second section, in particular an inner diameter of the second section.

30 According to an embodiment, the first section has a smaller, the same or a larger axial extension than the second section.

35 The invention further relates to a medical device having a needle guard according to one of the preceding embodiments and an elastic element at least partly surrounding the needle guard, wherein the elastic element is configured to urge the first and second arm in transverse direction against each other to the protecting state. In the alternative, the needle guard may be without an elastic element.

According to an embodiment, the elastic element comprises an elastic band. The elastic band may be formed of a plastic material or a rubber material.

According to an embodiment, the elastic element is integrally formed with the needle guard. This facilitates the manufacturing of the needle guard having a unitary structure.

5 According to an embodiment, the medical device further comprises a needle with a needle shaft.

According to an embodiment, the needle is formed by an IV-catheter needle.

10 According to an embodiment, the medical device further comprises at least one of the following: a catheter hub comprising a catheter port; a needle cover adapter to cover the needle, wherein preferably the needle cover is adapted to be attachable to the catheter hub; a luer end comprising a luer lock; a needle hub comprising the needle, wherein preferably the needle hub is adapted to be attachable to the catheter hub.

15 The invention further relates to a needle guard for a medical device, in particular for a safety IV catheter device, wherein the needle guard is configured to slidably receive a needle having a needle shaft and a needle tip, wherein the needle guard has a longitudinal axis defining an axial direction, the needle guard comprising: a base portion; a first arm; and a second arm; wherein the first arm and the second arm extend substantially in axial direction from a distal
20 side of the base portion, wherein each of the first arm and the second arm having an edge forming a form-fit section, wherein the first arm and the second arm have a distal portion in axial distance from the base portion and a proximal portion axially proximate to the base portion; wherein the base portion comprises a passage extending in axial direction therethrough from a proximal side of the base portion to the distal side of the base portion for
25 movably receiving the needle shaft; wherein the first arm has a transverse wall transversely provided at the distal portion of the first arm, wherein the transverse wall does not cover and/or go beyond the edge of second arm in transverse direction.

The following embodiments can apply to all previously described embodiments.
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According to an embodiment, the second arm has an axial protrusion axially provided at the distal portion of the second arm.

35 According to an embodiment, the transverse wall has a distal tip and a proximal tip.

According to an embodiment, the axial protrusion protrudes more distal than the proximal tip of the transverse wall.

40 According to an embodiment, the proximal tip is located more proximal than the distal end of the second arm.

According to an embodiment, the transverse wall forms a concave section, which can be adapted to receive the needle tip in the protecting state.

- 5 According to an embodiment, the concave section is substantially aligned with and/or intersected by the longitudinal axis in the protecting state.

According to an embodiment, the concave section is aligned with and/or intersected by a middle axis of the passage.

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According to an embodiment, the transverse wall comprises an L-shape or is formed similar to an L-shape.

- 15 According to an embodiment, the transverse wall comprises a first wall part mostly extending along the axial direction and a second wall part mostly extending in the transverse direction towards the second arm.

According to an embodiment, the second wall part is located more distal than the first wall part, wherein preferably the second wall part extends distally from the first wall part.

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According to an embodiment, the second wall part has a greater width measured in the transverse direction and towards the second arm than the first wall part, and/or wherein the first wall part has a greater length measured in the axial direction than the second wall part.

- 25 According to an embodiment, the second arm is adapted to contact the needle shaft by the transverse wall inner surface in the ready state.

According to an embodiment, the transverse wall is tapered from proximal to distal along the axial direction, in particular when seen in transverse direction from the second arm towards the first arm.

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BRIEF DESCRIPTION OF ACCOMPANYING DRAWINGS:

- 35 The invention will now be explained in more detail in the following with reference to preferred embodiments and to the accompanying drawings in which are shown:

Fig. 1 a side perspective view of a needle guard in a ready state according to an embodiment;

- Fig. 2 a side perspective view of a needle guard in a ready state according to a further embodiment;
- Fig. 3 a side perspective view of the needle guard of figure 2 in the protecting state;
- 5 Fig. 4 a side perspective view of the needle guard of figure 3 in the protecting state in combination with an elastic element;
- Fig. 5a a side perspective view of a needle guard according to a further embodiment;
- 10 Fig. 5b a side perspective view of a needle guard according to a further embodiment;
- Fig. 5c a side perspective view of a needle guard according to a further embodiment;
- 15 Fig. 6a a side perspective view of the needle guard according to figure 5a;
- Fig. 6b a side perspective view the needle guard according to figure 5b;
- Fig. 6c a side perspective view of the needle guard according to figure 5c;
- 20 Fig. 7a a side perspective view of the needle guard according to another embodiment;
- Fig. 7b a perspective view of the needle guard of figure 7a;
- 25 Fig. 7c a perspective view of the needle guard of figure 7a;
- Fig. 7d a cross-sectional view of the needle guard of figure 7a;
- Fig. 8a a side perspective view of a needle guard according to another embodiment;
- 30 Fig. 8b a side perspective view of a needle guard according to another embodiment;
- Fig. 9a a bottom view of the needle guard of the embodiment according to figure 1;
- 35 Fig. 9b a cross-sectional view of the needle guard of the embodiment according to figure 1;
- Fig. 10a another cross-sectional view of the needle guard of the embodiment according to figure 9a;
- 40

- Fig. 10b another cross-sectional view of the needle guard of the embodiment according to figure 9a;
- 5 Fig. 10c another cross-sectional view of the needle guard of the embodiment according to figure 9a;
- Fig. 10d another cross-sectional view of the needle guard of the embodiment according to figure 9a;
- 10 Fig. 11a a bottom view of a needle guard of another embodiment;
- Fig. 11b a cross-sectional view of the needle guard of the embodiment according to figure 11a;
- 15 Fig. 12a a cross-sectional view of a medical device having a needle guard; and
- Fig. 12b a detail of figure 12a.

DETAILED DESCRIPTION OF THE INVENTION:

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Figure 1 shows needle guard 10 in the ready state according to an embodiment. The needle guard 10 is for a medical device, in particular for a safety IV catheter device. The needle guard 10 has a longitudinal axis LA defining an axial direction. The needle guard 10 comprises a base portion 12, a first arm 14 and a second arm 16. The first arm 14 and the second arm 16 extend substantially in axial direction from a distal side 18 of the base portion 12. The first arm 14 has a distal portion 20 in axial distance from the base portion 12 and a proximal portion 22 axially proximate to the base portion 12. In a similar way, the second arm 16 has a distal portion 24 in axial distance from the base portion 12 and a proximal portion 26 axially proximate to the base portion 12.

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The base portion 12 comprises a passage, which is not visible in Figure 1, but through which a needle shaft 28 of a needle 30 extends. The passage extends in the axial direction through the base portion 12 from a proximal side 32 to the distal side 18 of the base portion 12. The passage in the base portion 12 is adapted for movably receiving the needle shaft 28.

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Since the needle guard 10 is shown in the ready state, the needle shaft 28 fully extends through the needle guard 10 such that a needle tip 34 of the needle 30 protrudes in axial direction beyond the needle guard 10.

The first arm 14 comprises a transverse wall 36, which is provided at the distal portion 20 of the first arm 14. The second arm 16 comprises an axial protrusion 38, which is provided at the distal portion 24 of the second arm 16 and which extends in the axial direction. The distal portion of the second arm 16 further comprises a needle contact portion 40 comprising a
5 needle contact surface 42 proximally arranged to the axial protrusion 38. The needle contact surface 42 partly contacts the needle shaft 28 in the ready state and is arranged in an angle relative to an outer surface of the needle shaft 28. In the present embodiment, the needle contact surface 42 contacts the needle shaft 28 along a line contact, but in another embodiment there may be contact of another kind, for example point contact and or a two-
10 dimensional contact area. The needle contact surface 42 forms an innermost portion of the second arm 16 in the ready state. The axial protrusion 38 is arranged more outwards in the transverse direction TD and in a direction away from the first arm 14 than the needle contact surface 42. Thereby, one may say that the axial protrusion 38 forms an axial extension of the
15 needle contact portion 40, but which is arranged more outwardly than the needle contact surface 42 and needle contact portion 40. Said differently, one may also say that the distal portion 24 of the second arm 16 comprises a recess 44, which forms the axial protrusion 38. In the ready state, the axial protrusion 38 is arranged distantly from the needle shaft 28. Generally said, the transverse direction TD is arranged substantially orthogonal to the axial direction AD.

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The second arm 16 further comprises an intermediate portion 46 proximal to the distal portion 24 and distal to the proximal portion 26. The intermediate portion 46 comprises an inclined outer surface 48, which forms an angle c with an imaginary line extending in the axial direction. Said angle c is in the ready state between 5 and 15 degrees, preferably about 10 degrees,
25 and/or in the protecting state between 10 and 20 degrees, preferably about 16 degrees. The intermediate portion 46 is adapted to receive an elastic element, which is adapted to urge the first and second arm 14, 16 against each other.

The intermediate portion 46 has a smaller width in the transverse direction TD than the needle
30 contact portion 40. While on the inner side of the second arm 16 the intermediate portion 46 smoothly merges with the needle contact surface 42, the outer surface of the needle contact portion 40 forms an edge 50 extending more outwardly than the intermediate portion 46. The edge 50 comprises a form-fit section 52 having a substantially ring-shaped form, wherein the ring-shaped form partly extends around the longitudinal axis LA and wherein the ring-shape
35 does only extend around about 180 degree of the second arm 16 about the longitudinal axis LA. The form-fit section 52 is adapted to form-fit an inner wall of a receiving element, such as an inner surface of a catheter hub. The form-fit section 52 forms an outermost portion of the second arm 16 in the transverse direction TD.

The first arm 14 of the embodiment according to figure 1 has a greater axial extension than the second arm 16. Therefore, a distal end 54 of the first arm 14 is arranged more distally than a distal end 56 of the second arm 16.

- 5 The first arm 14 substantially extends along the axial direction, but the transverse wall 36 protrudes in an inward direction and towards the second arm 16. Therefore, one may say that the transverse wall 36 forms an inside projection on the distal portion 20 of the first arm 14.

10 The first arm 14 further comprises an intermediate portion 58 proximal to the distal portion 20 and distal to the proximal portion 22. The intermediate portion 58 comprises an outer surface 60, which in the ready state is arranged substantially parallel to an imaginary line extending in the axial direction. Nevertheless, in the protecting state, the outer surface 60 forms an angle with said imaginary line. Similar to the second arm 16, the proximal end of the distal portion 20 comprises an edge 62 at substantially the same axial position than the edge 50 of the second arm 16 and extending more outwardly than the intermediate portion 58. The edge 62 comprises a form-fit section 64 having a substantially ring-shaped form, wherein the ring-shaped form partly extends around the longitudinal axis LA and wherein the ring-shape does only extend around about 180 degree of the first arm 14 about the longitudinal axis LA. The form-fit section 64 is adapted to form-fit an inner wall of a receiving element. The form-fit section 64 forms an outermost portion of the first arm 14 in the transverse direction TD.

In the ready state according to figure 1, the first arm 14 is arranged distantly to the needle shaft 28 except for the transverse wall 36, which contacts the needle shaft 28. Therefore, the transverse wall 36 comprises a transverse wall inner surface 66, which is adapted to at least partly contact the needle shaft 28 in the ready state and to contact or approach the axial protrusion 38 in the protecting state. In the embodiment according to figure 1, the transverse wall inner surface 66 is arranged to form an angle i with an imaginary line extending in the axial direction, which angle i is in the ready state between 0 and 15 degrees, preferably around 10 degrees, and/or which is in the protecting state less than 5 degrees, preferably around 0 degree. The transverse wall inner surface 66 contacts the needle shaft 28 along a line contact, but in another embodiment there may be contact of another kind, for example point contact and or a two-dimensional contact area.

35 The second arm 16 comprises at the outer side of the base portion 12 two parallel extending first recessed sections 65. Only one of the first recessed sections 65 can be viewed, since the other one is arranged on the other side of the needle cover 10 at the same position. The first recessed sections 65 have the form of a rectangular cutout, but which may have a form of a different kind in alternative embodiments. The first recessed section 65 extends from the outer side of the second arm 16 towards the first arm 14. Furthermore, the first recessed section 65 extends from the proximal side 32 into the base portion 12. The first recessed section 65 may

be used to correctly orient the needle guard 10 around the longitudinal axis LA when arranging inside a catheter hub.

Furthermore, the second arm 16 comprises at the outer side of the base portion 12 a second
5 recessed section 67, which has the form of a rectangular cutout, but which may have a form of
a different kind in alternative embodiments. The second recessed section 67 extends from the
proximal side 32 into the proximal portion 26 of the second arm 16. However, compared to the
first recessed section 65, the second recessed section's 67 axial extension is about twice as
10 much as the first recessed section's 75, and the second recessed section's 67 transverse
extension is significantly smaller than the first recessed section's 75. The second recessed
section's 67 transverse extension may be about 1 or a few millimeters. The second recessed
section 67 may be used to correctly orient the needle guard 10 around the longitudinal axis LA
when arranging inside a catheter hub.

15 Figure 2 shows a needle guard 10 in a ready state according to a further embodiment, which
is similar to the embodiment according to figure 1. Figure 3 refers to the same embodiment
than figure 2, but the needle guard 10 is in the protecting state.

Compared to the embodiment according to figure 1, the axial protrusion 38 has a longer
20 extension in the axial direction AD. This effects that the axial extension of the first arm 14 is
slightly longer than the axial extension of the second arm 16. In other words, the distal end 56
of the second arm 16 is arranged more distal in the axial direction AD than the distal end 54 of
the first arm 14.

25 As a further difference compared to the embodiment according to figure 1, the design of the
first and second arm 14, 16 on the inner side, i.e. on the side of the arms 14, 16 adapted to
face the needle shaft 28 is different, as will be outlined in the following.

With regard to the first arm 14, the proximal portion 22 comprises an inner surface 68 which is
30 arranged at an angle e relative to an imaginary line extending in the axial direction. Said angle
 e is in the ready state between 10 and 30 degrees, preferably about 20 degrees, and/or in the
protecting state between 10 and 30 degrees, preferably about 20 degrees. In other words, the
inner surface 68 forms an inner edge in the inner side of the first arm 14 such that the inner
side of the intermediate portion 58 is arranged more outwardly and more distanced to the
35 needle shaft 28 than the inner side of the proximal portion 22. In the same context, the inner
surface 68 forms an angle o with an inner surface 70 of the intermediate portion 58 of between
150 and 170 degrees, preferably about 160 degrees, in the protecting state and ready state.
The inner surface 68 forms an angle f with an imaginary line extending in the axial direction
AD, which angle f is in the ready state between 0 and 10 degrees, preferably about 3 degrees,
40 and/or in the protecting state between 0 and 15 degrees, preferably about 8 degrees.

On its inner side, the first arm 14 comprises a proximal inner surface 69 arranged at the proximal portion 22 of the first arm 14. Distal and proximate to the proximal inner surface 69, the inner surface 68 is arranged. The proximal inner surface 69 may form an angle r with an imaginary line extending in the axial direction, which is in the ready state according to figure 2 between 0 and 10 degrees, preferably about 5 degrees, and/or in the protecting state according to figure 3 between 0 and 10 degrees, preferably about 5 degrees.

Similar to the embodiment according to figure 1, the outer surface 60 of the first arm 14 is arranged substantially parallel to an imaginary line extending in the axial direction AD in the ready state according to figure 2. The outer surface 60 is arranged more outwardly than an outer surface 72 at the proximal portion 22 of the first arm 14. More precisely, the proximal portion 22 comprises an outer surface 74 linking outer surfaces 72 and 60, but the outer surface 74 is arranged at an angle relative to an imaginary line extending in the axial direction AD. In this context, the outer surface 60 forms an angle s with the outer surface 74, which is about 170 degrees in the ready state of figure 2 and the protecting state of figure 3.

Similar to the embodiment according to figure 1, the transverse wall inner surface 66 is arranged to form an angle i with an imaginary line extending in the axial direction, which angle i is in the ready state according to figure 2 between 0 and 15 degrees, preferably around 10 degrees, and/or which is in the protecting state according to figure 3 less than 5 degrees, preferably around 0 degree.

Furthermore, the distal end 54 of the first arm 14 comprises an axial end surface 76 forming an angle h with an imaginary line extending in the axial direction, which is in the ready state according to figure 2 between 75 and 90 degrees, preferably about 80 degrees, and/or in the protecting state according to figure 3 between 85 and 95 degrees, preferably about 90 degrees.

In addition, the distal portion 36 of the first arm 14 has an inner wall surface 78 arranged proximal to the transverse wall 36 and distal to the edge 62. In other words, the inner wall surface 78 links the transverse wall 36 and the edge 62 on an inner side of the first arm. The inner wall surface 78 forms an angle g with an imaginary line extending in the axial direction, which is in the ready state according to figure 2 between 5 and 20 degrees, preferably about 13 degrees, and/or in the protecting state according to figure 3 between 15 to 30 degrees, preferably about 23 degrees.

The transverse wall 36 comprises a proximal wall surface 80 arranged between the transverse wall inner surface 66 and the inner wall surface 78. One may say that the proximal wall surface 80 forms a proximal facing surface of the transverse wall 36. The proximal wall surface 80

forms an angle l with an imaginary line extending in the transverse direction TD, i.e. orthogonal to the axial direction, which angle is in the ready state according to figure 2 about 4,5 degrees, and/or in the protecting state according to figure 3 about 16 degrees. Nevertheless, said angle l may be varied to be more or less than 4,5 degrees in the ready state and more or less than 16 degrees.

Similar to the embodiment according to figure 1, the second arm 16 comprises the intermediate portion 46 proximal to the distal portion 24 and distal to the proximal portion 26. The intermediate portion 46 also comprises the inclined outer surface 48, which forms the angle c with an imaginary line extending in the axial direction. Said angle c is in the ready state according to figure 2 between 5 and 15 degrees, preferably about 10 degrees, and/or in the protecting state according to figure 3 between 10 and 20 degrees, preferably about 16 degrees.

On its inner side, the second arm 16 comprises a proximal inner surface 82 arranged at the proximal portion 26 of the second arm 16. Distal to the proximal inner surface 82, the inner side of the second arm 16 further comprises an inner surface 84, which extends away from the needle shaft 28 when viewed from the base portion 12 in the distal direction. Distal to the inner surface 84, the inner side of the second arm 16 further comprises another inner surface 86, which extends to the needle shaft 28 when viewed from the base portion 12 in the distal direction. Distal to the inner surface 86, the second arm 16 comprises the needle contact surface 42.

The proximal inner surface 82 may form an angle q with an imaginary line extending in the axial direction, which is in the ready state according to figure 2 between 0 and 10 degrees, preferably about 5 degrees, and/or in the protecting state according to figure 3 between 0 and 10 degrees, preferably about 5 degrees.

The needle contact surface 42 two-dimensionally contacts the needle shaft 28 in the ready state according to figure 2. Accordingly, the needle contact surface 42 is arranged parallel to an imaginary line extending in the axial direction AD.

The inner surface 84 forms an angle b with an imaginary line extending in the axial direction, which is in the ready state according to figure 2 between 15 and 25 degrees, preferably about 19 degrees, and/or in the protecting state according to figure 3 between 15 and 25 degrees, preferably about 19 degrees. The same angle b is formed by the inner surface 84 with the proximal inner surface 82.

The inner surface 86 of the intermediate portion 46 of the second arm 16 and an inner surface 84 of the proximal portion 26 of the second arm 16 form an angle p of between 140 and 160

degrees, preferably 150 degrees, in the protecting state according to figure 2 and/or in the ready state according to figure 3.

5 The inner surface 86 forms an angle α with an imaginary line extending in the axial direction, which angle α is in the ready state according to figure 2 between 5 and 10 degrees, preferably about 10 degrees, and/or in the protecting state according to figure 3 between 10 and 20 degrees, preferably about 13 degrees.

10 The axial protrusion 38 has an outer surface 88 proximal to the distal end 56 and distal to the edge 50. The outer surface 88 forms an angle δ with an imaginary line extending in the axial direction, which is in the ready state according to figure 3 between 0 and 15 degrees, preferably about 7 degrees, and/or in the protecting state according to figure 3 between 0 and 15 degrees, preferably about 12 degrees.

15 The distal end 56 comprises an axial end surface 90 forming an angle m with an imaginary line extending in the axial direction, which angle m is in the ready state according to figure 2 between 85 and 95 degrees, preferably about 90 degrees, and/or in the protecting state according to figure 3 between 80 and 90 degrees, preferably about 83 degrees.

20 Proximal to the edge 50, the second arm 16 comprises an outer surface 92. One may also say that the outer surface 92 forms a proximal end of the edge 50. Furthermore, the outer surface 92 is arranged distal to the inclined outer surface 48. The outer surface forms an angle n with an imaginary line extending in the transverse direction, which angle n is in the ready state according to figure 2 about 0 degree, and/or which is in the protecting state according to figure
25 3 about 6 degrees.

The axial protrusion 38 further comprises an axial protrusion inner surface 94 proximal to the distal end 56 and adapted to face the needle shaft 28. Furthermore, the axial protrusion inner surface 94 may form part of recess 44. The axial protrusion inner surface 94 forms an angle j
30 with an imaginary line extending in the axial direction, which angle j is in the ready state according to figure 2 about 5 degrees, and/or which angle j is in the protecting state according to figure 3 about 8 degrees. In the alternative the angle j may be in the ready state about 0 degrees.

35 Distal to the needle contact surface 42, the second arm 16 comprises an inner surface 96 which may form part of recess 44. Said inner surface 96 may form an angle k with an imaginary line extending in the transverse direction TD, which angle k is in the ready state according to figure 2 about 0 degrees or in the alternative about 5 degrees, and/or which angle k is in the protecting state according to figure 3 about 3 degrees or in the alternative about 8 degrees.

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Figure 4 shows the needle guard 10 according to figure 3 in the protecting state in combination with an elastic element 98. The elastic element 98 is surrounding the arms 14, 16 of the needle guard 10 at the intermediate portion 46, 58. The elastic element 98 is designed to urge the first and second arm 14, 16 in transverse direction against each other to the protecting state. In addition to the elastic element 98 or in alternative to the elastic element 98, the needle guard 10 may be formed such that at least one of the arms 14, 16 is urged to the protecting state as shown in figure 3. In this context, the needle shaft 28 may urge at least one of the arms 14, 16 outwardly and in transverse direction when the needle shaft 28 is arranged between the transverse wall 36 and the needle contact surface 42 and/or the axial protrusion 38. This may be achieved by elastic deformation of at least one of the arms 14, 16. Once the needle shaft 28 is retracted and does exert a urging force on the arms 14, 16, the arms 14, 16 again elastically deform to their form according to the protecting state.

Figures 5a to 5c show respective needle guards 10 from a side perspective according to different embodiments. The respective needle guards 10 are formed according to the embodiment according to figure 2, but the respective axial protrusions 38 have different lengths. In the embodiment according to figure 5a, the axial protrusion 38 is of a long form such that the second arm 16 is longer in the axial direction AD than the first arm 14 both in the ready state and in the protecting state. Therefore, the second arm 16 towers the first arm 14 in the axial direction AD. In the embodiment according to figure 5b, the axial protrusion 38 is of a middle length form such that the axial extension of the second arm 16 is the same as the axial extension of the first arm 14 at least in the protecting state. In the embodiment according to figure 5c, the axial protrusion 38 is of a short form such that the second arm 16 is shorter in the axial direction AD than the first arm 14 both in the ready state and in the protecting state. Therefore, the first arm 14 towers the second arm 16 in the axial direction AD.

The needle guard 10 can have a form in the protecting state as shown in figures 5a to 5c. In particular, the transverse wall 36 and the axial protrusion 38 can form a gap 39 between one another in transverse direction TD. Nevertheless, when seen in the axial direction, the first arm 14 and the second arm 16 overlap each other. Overlapping may be beneficial to maintain the needle tip 34 within the needle guard 10.

The transverse wall 36 comprises a distal tip 97 and a proximal tip 99, wherein both tips 97, 99 are adapted to face the axial protrusion 38. The distal tip 97 forms a transition between the axial end surface 76 and the transverse wall inner surface 66. The proximal tip 99 forms a transition between the transverse wall inner surface 66 and the proximal wall surface 80. In the embodiments according to figures 5a to 5c, the proximal tip 99 is located more proximal than the distal end 56 of the second arm 16. In figure 5a, the distal tip 97 is also located more proximal than the distal end 56 of the second arm 16. In figure 5b, the distal tip 97 is located

slightly more distal than the distal end 56 of the second arm 16. In figure 5c, the distal tip 97 is located substantially more distal than the distal end 56 of the second arm 16.

Furthermore, in figure 5a, the axial protrusion 38 has a length measured in the axial direction AD that is greater than a length of the transverse wall 36 measured in the axial direction AD. In figure 5b, the axial protrusion 38 has a length measured in the axial direction AD that is slightly smaller than a length of the transverse wall 36 measured in the axial direction AD. In figure 5c, the axial protrusion 38 has a length measured in the axial direction AD that is smaller or substantially smaller than a length of the transverse wall 36 measured in the axial direction AD.

According to embodiments not shown, the transverse wall 36 can have a length measured in the axial direction AD that is greater, substantially the same or shorter than the length of the axial protrusion 38 measured in the axial direction AD.

Despite a maximum width of the axial protrusion 38 measured in the transverse direction TD is the same in all figures 5a to 5c, said maximum width can be greater than or smaller than shown in any of figures 5a to 5c. For example, the maximum width of the axial protrusion 38 measured in the transverse direction TD can be greater than a maximum width of the transverse wall 36 measured in the transverse direction TD.

As shown in all figures 5a to 5c, the width of the axial protrusion 38 measured in the transverse direction TD tapers from proximal to distal. According to different embodiments, the width of the axial protrusion 38 measured in the transverse direction TD can be substantially constant or increasing from proximal to distal.

Figures 6a to 6c show the needle guards 10 of figures 5a to 5c from another side perspective, i.e. when viewing the respective needle guards 10 of figures 5a to 5c from left to right, or said differently from the second arm 16 towards the first arm 14. In addition to the axial length of the arms 14, 16, it can be seen that the second arms 16 covers the first arm 14 except for the axial protrusion 38 and the part distal to the edge 50. Therefore and except for the axial protrusion 38, one may say that the width of the second arm 16 in the transverse direction TD is at least the same as the width of the first arm 14 in the transverse direction TD. In an alternative embodiment, the widths of the arms 14, 16 in the axial direction may be vice versa. With regard to the axial protrusion 38, in all embodiments according to figures 6a to 6c, the width of the axial protrusion 38 in the transverse direction TD is less than the maximum width of the transverse wall 36 in the transverse direction TD, in particular by a factor of about 1/2. Furthermore, it can be seen that the axial protrusion 38 has a constant width in the transverse direction TD. In addition, the transverse wall 36 has a tapered form tapering along the axial direction AD from proximal to distal.

Furthermore, it can be seen that the needle contact portion 40 has a greater width in the transverse direction TD and not measured towards the first arm 14 than the axial protrusion 38.

- 5 In Figures 6a to 6c, the first recessed sections 65 can be seen, which extends on both lateral sides of the second arm 16, such that a middle shaft 89 separates the first recessed sections 65. Furthermore, the second recessed section 67 can be seen.

- Figures 7a to 7d show a needle guard 10 according to another embodiment. The needle guard 10 is formed substantially in line with the embodiment of figure 1 or may be formed in line with any other embodiment of this application, but the needle guard additionally comprises a locking feature 100, which allows to lock the first and second arms 14, 16 with each other in the protecting state. Therefore, the second arm 16 comprises a protrusion 102 on the inner side of the axial protrusion 38, i.e. on the axial protrusion inner surface 94. In addition, the first arm 14 comprises a groove 104 formed on the inner side of the transverse wall 36, i.e. on the transverse wall inner surface 66. The groove 104 is adapted to receive the protrusion 102 in the protecting state in a locking manner. In this context, the groove 104 and the protrusion 102 may form a form-fit. Said form-fit may be adapted to provide a frictional force such that the form-fit can only be overcome by exerting a force exceeding a predetermined amount of force. Said amount of force may then be of a size a user or a medical practitioner can apply.

- Figure 7d further shows that the needle guard 10 comprises a stopping element 106, which may have the form of a washer. The stopping element 106 is arranged at the passage 108 formed in the base portion 12. The stopping element 106 has an opening 110 configured to slidably receive the needle shaft 28. Therefore, opening 110 of the stopping element 106 has an inner diameter which is smaller than a minimum inner diameter of the passage 108.

- Furthermore, the opening 110 has an inner diameter which is smaller than a maximum outer diameter of the needle shaft 28 at an engagement portion 112 comprising a crimped portion. When the needle shaft 28 is retracted from the needle guard 10, i.e. in figure 7d in the downwards direction, the stopping element 106 then engaged with the engagement portion 112 and prevents the needle shaft 28 from leaving the needle guard 10. Therefore, the needle tip 34 can be safely maintained in the protecting state and inside the needle guard 10. Some or all features in the context of the stopping element 106 can be comprised by any of the embodiments of this application.

Figure 7d further shows that the passage has a first section 114 of a first size and a second section 116 of a second size greater than the first size. Said feature will be explained in more detail in the following.

In an alternative embodiment, the stopping element 106 may be arranged at the passage 108 of the base portion 12 such that a middle axis of the opening 110 forms an angle with an imaginary line extending in the axial direction AD. In this context, the base portion 12 may have a respective cutout for receiving the stopping element 106 at an angle.

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Figure 7c further shows that the first arm 14 can have a first indent section 101 and a second indent section 103 on its outer surface. The same can apply to the second arm 16. The indent sections 101,103 reduce the transverse extension of the first arm 14. This may be beneficial for receiving the needle guard 10 within a receiving element, such as a catheter hub, since the interference or friction force can be reduced dependent on the size of the indent section. The indent section 101 has a substantially planar profile within the outer surface of the first arm 14. Said differently, the indent section 101 interrupts the circular outer shape of the first arm 14 about the axial direction AD. In the embodiment according to figure 7c, the second indent section 103 extends from base portion 12 to a proximal part of the intermediate portion 58. The first indent section 101 is formed on the outside of the transverse wall 36.

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Figure 8a shows a side perspective of a needle guard 10 according to another embodiment. Figure 8b shows a side perspective of a needle guard 10 according to another embodiment. The embodiments according to figures 8a and 8b schematically show that the axial protrusion 38 can have different designs on its inner side. In particular, the inner surface 96 can have different extensions in the axial direction. According to both embodiments in figures 8a and 8b, the axial extension of the inner surface 96 is greater in both axial directions, i.e. extends more distal and more proximal than the transverse wall inner surface 66.

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Furthermore, the distal portion 24 of the second arm 16 comprises an inner protrusion 118 adapted to face the first arm 14. One may say that the inner protrusion 118 forms the needle contact surface 42. One may also say that the needle contact portion 40 forms the inner protrusion 118. With regard to figure 8a, the axial protrusion 38 comprises the inner protrusion 118. With regard to figure 8b, the axial protrusion 38 distally extends from the inner protrusion 118 in the axial direction AD.

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In both figures 8a and 8b, the transverse wall 36 forms an axial gap 119 with the inner protrusion 118 in the axial direction AD, wherein the axial gap 119 of the embodiment of figure 8b is larger than the axial gap 119 of the embodiment according to figure 8a. In view of figures 8a and 8b, it can be seen that the position of the inner protrusion can be varied along the axial direction AD, which allows to change the position of the second arm 16 contacting the needle shaft 28 in the ready state. In addition, a bigger axial gap 119 may lead to the second arm 16 exerting a smaller frictional force on the needle shaft 28 when retracting the needle shaft 28. A small frictional force can lead to an increased user experience.

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Figure 9a is a bottom view of the needle guard 10 of the embodiment according to figure 1. Bottom view means to view the needle guard along the axial direction AD in from proximal to distal, i.e. in the context of figure 1 when viewed from right to left. It can be seen that both arms 14, 16 have a substantially circular outer cross-sectional form.

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Figure 9b is a cross-sectional view of the needle guard 10 of the embodiment according to figure 1. It can be seen that the passage 108 comprises the first section 114 of the first size and the second section 116 of the second size, wherein the first section 114 is arranged more proximal than the second section 116. The axial extension of the first section 114 is greater than the axial extension of the second section 116. In the embodiment according to figure 9b, the axial extension of the first section 114 is greater than the axial extension of the second section 116 by a factor of about 1/2. The second section 114 has a substantially circular cross section, which inner diameter is at least slightly greater than the inner diameter of the opening 110 of the stopping element 106.

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According to the beneficial embodiment according to figure 9a and 9b, the first section 114 has a substantially non-circular shape. In further detail, the first section 114 has a first inner dimension W and a second inner dimension L, wherein the first inner dimension W is smaller than the second inner dimension L. Preferably, the second inner dimension L is measured in the transverse direction TD and in the direction from the first arm 14 to the second arm 16. More preferably, the first inner dimension W is measured in the transverse direction TD and perpendicular to the second inner dimension L. In the embodiment according to figure 9a, the first section 114 has a substantially rectangular shape with curved edges, but it can also have an oval or rectangular shape or the like. The effect of the non-circular shape of the first section will become more apparent in view of figures 10a to 10d.

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Figures 10a to 10d schematically show different cross-sectional views of the needle guard 10 of the embodiment according to figure 9a, but for exemplary reasons the first inner dimension W is of the same size than the diameter of the second section 116. Due to the design of the first section 114 and the second inner dimension L being greater than the first inner dimension W, the needle shaft 28 can be pivoted relative to needle guard 10 in the protecting state, as can be seen in figures 10a and 10b. In figure 10b, the needle shaft 28 is pivotable such that it contacts the needle contact surface 42. In figure 10a, the needle shaft 28 is pivotable such that it contacts the inner wall surface 78 and the inner side of the first arm 14 at the axial height of edge 62.

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Figures 10c and 10d refers to cross-sectional views taken along the longitudinal axis LA and, with reference to figures 10a and 10b, viewed from right to left, i.e. from the second arm 16 towards the first arm 14. Figures 10c and 10d show that due to the first inner dimension W being smaller than the second inner dimension L, the pivoting movement of the needle shaft

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28 in the direction along the first inner dimension W is more limited than the pivoting movement of the needle shaft 28 in the direction along the second inner dimension L. Therefore, even if the design of the first and second arms 14, 16 does not prevent the needle tip 34 from exiting the inside of the needle guard, for example if there may be no lateral walls in the direction of the first inner dimension W or since there may be a gap between the first and second arm 14, 16 in the direction of the first inner dimension W, the non-circular design of the first section 114 allows to limit the pivoting movement of the needle shaft 28 in the direction of the first inner dimension W.

10 Preferably, the first inner dimension W is slightly larger than the outer needle diameter.

According to another embodiment, the first section 114 may be arranged inside the base portion 12 in a rotated manner, i.e. rotated about the axial direction AD about an predetermined angle. In a preferred embodiment, said angle is of about 90 degrees. By doing so, the pivotability may be rotated by the predetermined angle.

Figure 11a is a bottom view of a needle guard 10 of another embodiment. Figure 11b is cross-sectional view of the needle guard 10 of the embodiment according to figure 11a. Figures 11a and 11b are similar to figures 9a and 9b, but have an alternative design of the stopping element 106, the first section 114 and the second section 116. As an example, an axial extension H1 of the second section 116 is a greater than an axial extension H2 of the first section 114. This contributes to further limiting the pivotability of the needle shaft 28 within the needle guard 10.

Furthermore, the first inner dimension W of the embodiment according to figure 11a and figure 11b is smaller than the one of figured 9a and 9b. This also contributes to further limiting the pivotability of the needle shaft 28 within the needle guard 10.

In addition, the inner diameter of the opening 110 of the stopping element 106 is smaller than the one shown in figures 9a and 9b. This may also contribute to further limiting the pivotability of the needle shaft 28 within the needle guard 10. In addition or instead, the inner diameter of the opening 110 is smaller due to a smaller needle gauge intended for being received within the needle guard 10.

As can be seen in all figures 1 to 11b, one may say that the transverse wall 36 comprises an L-shape or is formed similar to an L. Furthermore, the shorter part of the L projects in the inward direction towards the second arm 16. The proximal wall surface 80 and the inner wall surface 78 form a concave section 95, which can be adapted to receive the needle tip 34 in the protecting state. In other words, one may say that the transverse wall 36 comprises a first wall part 91 mostly extending along the axial direction AD and a second wall part 93 mostly extending in the transverse direction TD to the second arm 16. The second wall part 93 is

located more distal than the first wall part 91. Furthermore, one may say that the second wall part 93 extends distally from the first wall part 91. The second wall part 93 has a greater width measured in the transverse direction than the first wall part 91. The first wall part 91 has a greater length measured in the axial direction than the second wall part 93. The first wall part 91 extends distally from the edge 62. Furthermore, the second wall part 93 can have an increasing axial extension from outside to the second arm 16 in the transverse direction TD. The second arm 16 is adapted to contact the needle shaft 28 by the transverse wall inner surface 66 in the ready state.

Figure 12a is a cross-sectional view of a medical device 300 having a needle guard 10 according to one of the embodiments as precedingly described, wherein the needle guard is in the ready state. The medical device 300 comprises the elastic element 98, which surrounds the needle guard 10 at the intermediate portions 46, 58. The medical device 300 further comprises the needle 30 with needle shaft 28. The needle shaft 28 has a substantial circular cross section except for the engagement portion 112, which is located on a distal portion of the needle shaft 28.

The medical device 300 further comprises a catheter hub 302 comprising a catheter port 304, which catheter port 304 is covered by a port cap 306. The needle guard 10 is received within a catheter hub 302 at a proximal portion of the catheter hub 302. The edges 50, 62 are in contact with an inner surface 308 of the catheter hub 302. The inner diameter at the inner surface 308 is slightly greater than the inner diameter proximal to the inner surface 308, but when pulling the needle shaft 28 out of the catheter hub 302, the engagement of the stopping element 106 with the engagement portion 112 is adapted to provide a force sufficiently large to pull the needle guard 10 proximally out of the catheter hub 302.

The medical device 300 further comprises a needle cover 310 adapted to cover the needle shaft 28 extending through the catheter hub 302 along the axial direction AD distally out of the catheter hub 302. The needle cover 310 is adapted to be attachable to and detachable from the catheter hub 302. Therefore, an inside portion 311 on a proximal end of the needle cover 310 is adapted to provide frictional engagement with an outside portion 312 on the distal end of the catheter hub 302.

The medical device 300 further comprises a needle hub 314, in which the needle 30 is fixedly arranged such that it extends along the axial direction AD. The needle hub 314 further comprises a luer end 316 comprising a luer lock 318. The luer end 316 is covered by a luer cap 320. An inside surface portion 322 on a distal end portion of the needle hub 314 receives an outer surface portion 324 on a proximal portion of the catheter hub 302.

Despite single features have been described in the context of a particular embodiment, said features may be also combined with features of different embodiments. In addition, single features may be extracted from particular embodiments and claimed as separate features. In particular, angles and surfaces described in the context of one embodiment can be transferred
5 to or combined with other embodiments. In addition, features with the same reference sign apply to all figures, even when not explained explicitly in the context of each figure.

CLAIMS:

1. A needle guard (10) for a medical device (300), in particular for a safety IV catheter device, wherein the needle guard (10) is configured to slidably receive a needle (30) having a
5 needle shaft (28) and a needle tip (34), wherein the needle guard (10) has a longitudinal axis (LA) defining an axial direction (AD), the needle guard (10) comprising:
 - a base portion (12);
 - a first arm (14); and
 - a second arm (16);
- 10 wherein the first arm (14) and the second arm (16) extend substantially in axial direction (AD) from a distal side (18) of the base portion (12),
 - wherein the first arm (14) and the second arm (16) have a distal portion (20, 24) in axial distance from the base portion (12) and a proximal portion (22, 26) axially proximate to the base portion (12);
- 15 wherein the base portion (12) comprises a passage (108) extending in axial direction (AD) therethrough from a proximal side (32) of the base portion (12) to the distal side (18) of the base portion (12) for movably receiving the needle shaft (28);
 - wherein the first arm (14) has a transverse wall (36) transversely provided at the distal portion (20) of the first arm (14),
- 20 wherein the second arm (16) has an axial protrusion (38) axially provided at the distal portion (24) of the second arm (16);
 - wherein the needle guard (10) has a ready state, in which the needle shaft (28) extends through the needle guard (10) such that the needle tip (34) protrudes in axial direction (AD) beyond the needle guard (10) such that the needle shaft (28) extends between the transverse wall (36) and the axial protrusion (38), and
- 25 wherein the needle guard (10) has a protecting state, in which the needle shaft (28) is retracted such that the needle tip (34) is located between the first arm (14) and the second arm (16) in a protected position,
 - wherein in the protecting state of the needle guard (10) the distal portion (20) of the first arm (14) and the distal portion (24) of the second arm (16) are in an engaged position such that the axial protrusion (38) of the second arm (16) approaches the transverse wall (36) of the first arm (14).
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2. The needle guard (10) according to claim 1, wherein in the protecting state of the needle guard (10) the transverse wall (36) of the first arm (14) and the axial protrusion (38) of the second arm (16) form a gap (39) between one another in transverse direction (TD).
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3. The needle guard according to claim 2, wherein when viewing from the base portion (12) distally and along the axial direction, the gap (36) is hidden by the second arm (16).

4. The needle guard (10) according to one of the preceding claims, wherein the axial protrusion (38) of the second arm (16) has an axial protrusion inner surface (94) adapted to face the first arm (14) and wherein the transverse wall (36) of the first arm (14) has a transverse wall inner surface (66) adapted to face the second arm (16), wherein in the protecting state, the transverse wall inner surface (66) and the axial protrusion inner surface (94) at least partly approach each other.

5. The needle guard (10) according to claim 1, wherein in the protecting state of the needle guard (10) the transverse wall (36) of the first arm (14) and the axial protrusion (38) of the second arm (16) at least partly contact each other.

6. The needle guard (10) according to claim 5, wherein the axial protrusion (38) of the second arm (16) has an axial protrusion inner surface (94) adapted to face the first arm (14) and wherein the transverse wall (36) of the first arm (14) has a transverse wall inner surface (66) adapted to face the second arm (16), wherein in the protecting state, the transverse wall inner surface (66) and the axial protrusion inner surface (94) at least partly contact each.

7. The needle guard (10) according to claim 6, wherein the transverse wall inner surface (66) is adapted to contact the needle shaft (28) at a point or along a line contact or two-dimensionally along a surface portion in the ready state.

8. The needle guard (10) according to one of the preceding claims, wherein the axial protrusion (38) of the second arm (16) extends at the distal end (56) of the second arm (16) such that it forms a recess (44), wherein preferably the transverse wall (36) of the first arm (14) is adapted to protrude and/or to engage into this recess (44) in the protecting state of the needle guard (10).

9. The needle guard (10) according to one of the preceding claims, wherein an inner surface of the transverse wall (36), in particular the transverse wall inner surface (66), forms an angle (i) with an imaginary line extending in the axial direction (AD), which is in the ready state between 0 and 15 degrees, preferably around 10 degrees, and/or which is in the protecting state less than 5 degree, preferably around 0 degree.

10. The needle guard (10) according to one of the preceding claims, wherein in the ready state, the axial protrusion inner surface (94) is arranged distantly to the needle shaft (28).

11. The needle guard (10) according to one of the preceding claims, wherein an inner surface of the axial protrusion (38), in particular the axial protrusion inner surface (94), forms an angle (j) with an imaginary line extending in the axial direction (AD), which is in the ready

state between 0 and 10 degrees, preferably around 5 degrees, and/or in the protecting state between 0 and 15 degrees, preferably around 8 degrees.

12. The needle guard (10) according to one of the preceding claims, wherein the distal portion (24) of the second arm (16) further comprises a needle contact surface (42) proximally arranged to the axial protrusion (38) for at least partly contacting the needle shaft (28) in the ready state.

13. The needle guard (10) according to claim 12, wherein the needle contact surface (42) is adapted to contact the needle shaft (28) in the ready state at a point or along a line contact or two-dimensionally along a surface portion.

14. The needle guard (10) according to one of the preceding claims, wherein the transverse wall (36) forms the distal most portion of the first arm (14) and/or the axial protrusion (38) forms the distal most portion of the second arm (16).

15. The needle guard (10) according to one of the preceding claims, wherein the axial protrusion (38) has an outer surface (88) forming an angle (d) with an imaginary line extending in the axial direction (AD), which is in the ready state between 0 and 15 degrees, preferably about 7 degrees, and/or in the protecting state between 0 and 15 degrees, preferably about 12 degrees.

16. The needle guard (10) according to one of the preceding claims, wherein the transverse wall (36) has an axial end surface (76) forming an angle (h) with an imaginary line extending in the axial direction (AD), which is in the ready state between 75 and 90 degrees, preferably about 80 degrees, and/or in the protecting state between 85 and 95 degrees, preferably about 90 degrees.

17. The needle guard (10) according to one of the preceding claims, wherein the axial protrusion (38) has an axial end surface forming an angle (m) with an imaginary line extending in the axial direction (AD), which is in the ready state between 85 and 95 degrees, preferably about 90 degrees, and/or in the protecting state between 80 and 90 degrees, preferably about 83 degrees.

18. The needle guard (10) according to one of the preceding claims, wherein each of the first arm (14) and the second arm (16) has an intermediate portion (46, 58) proximal to the distal portion (20, 24), which intermediate portion (46, 58) is adapted to be at least partly surrounded by an elastic element (98).

19. The needle guard (10) according to claim 18, wherein the elastic element (98) is designed to urge the first and second arm (16) in transverse direction (TD) against each other to the protecting state when surrounding the intermediate portion (46, 58).

5 20. The needle guard (10) according to one of the preceding claims, wherein at least one of the first and second arm (14, 16) is adapted to urge against each other in transverse direction (TD) in the protecting state, wherein preferably at least one of the first and second arm (16) is preloaded such that the respective arm urges towards a relaxed position in transverse direction (TD) and/or towards the other of the first or second arm (16).

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21. The needle guard (10) according to one of the preceding claims, wherein at least one of the first and second arm (14, 16) is in a relaxed position in the protecting state.

22. The needle guard (10) according to one of the preceding claims, wherein at least one
15 of the first and second arm (14, 16) is pretensioned in the ready state, wherein preferably the pretension is such that the first and/or second arm (14, 16) urges towards the protecting state.

23. The needle guard (10) according to one of the preceding claims, wherein at least one
20 of the first and second arm (14, 16) is pretensioned in the ready state and in the protecting state, and has a relaxed position between its positions in the ready state and the protecting state.

24. The needle guard (10) according to any of claims 18 to 23, wherein the intermediate
25 portion (46) of the second arm (16) has an inner surface (86) adapted to face the needle shaft (28), which forms an angle (a) with an imaginary line extending in the axial direction (AD), which angle (a) is in the ready state between 5 and 10 degrees, preferably about 10 degrees, and/or in the protecting state between 10 and 20 degrees, preferably about 13 degrees.

25. The needle guard (10) according to one of claims 18 to 24, wherein the intermediate
30 portion (46) of the second arm (16) has an outer surface, which forms an angle (c) with an imaginary line extending in the axial direction (AD), which is in the ready state between 5 and 15 degrees, preferably about 10 degrees, and/or in the protecting state between 10 and 20 degrees, preferably about 16 degrees.

35 26. The needle guard (10) according to one of claims 18 to 25, wherein the intermediate portion (58) of the first arm (14) has an inner surface (70) adapted to face the needle shaft (28), which forms an angle (f) with an imaginary line extending in the axial direction (AD), which angle (f) is in the ready state between 0 and 10 degrees, preferably about 3 degrees, and/or in the protecting state between 0 and 15 degrees, preferably about 8 degrees.

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27. The needle guard (10) according to one of the preceding claims, wherein the distal portion (20) of the first arm (14) has an inner wall surface arranged proximal to the transverse wall (36), which inner wall surface forms an angle (g) with an imaginary line extending in the axial direction (AD), which is in the ready state between 5 and 20 degrees, preferably about 13
5 degrees, and/or in the protecting state between 15 to 30 degrees, preferably about 23 degrees.

28. The needle guard (10) according to one of the preceding claims, wherein the proximal portion (26) of the second arm (16) has a proximal inner surface (82) adapted to face the needle shaft (28), which proximal inner surface (82) forms an angle (b) with an imaginary line
10 extending in the axial direction (AD), which is in the ready state between 15 and 25 degrees, preferably about 19 degrees, and/or in the protecting state between 15 and 25 degrees, preferably about 19 degrees.

29. The needle guard (10) according to claim 28, wherein the angle (b) is substantially the
15 same in the ready state and in the protecting state.

30. The needle guard (10) according to one of the preceding claims, wherein the proximal portion (22) of the first arm (14) has an inner surface (68) adapted to face the needle shaft (28), which inner surface (68) forms an angle (e) with an imaginary line extending in the axial
20 direction (AD), which is in the ready state between 10 and 30 degrees, preferably about 20 degrees, and/or in the protecting state between 10 and 30 degrees, preferably about 20 degrees.

31. The needle guard (10) according to claim 26, wherein the angle (e) is substantially the
25 same in the ready state and in the protecting state.

32. The needle guard (10) according to one of the preceding claims, wherein the inner surface (70) of intermediate portion (58) of the first arm (14) and the inner surface (68) of the proximal portion (22) of the first arm (14) form an angle (o) of between 150 and 170 degrees,
30 preferably about 160 degrees, in the protecting state and/or ready state.

33. The needle guard (10) according to claim 32, wherein the inner surface (70) of the intermediate portion (58) of the first arm (14) is located adjacent to the inner surface (68) of the proximal portion (22) of the first arm (14).
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34. The needle guard (10) according to one of the preceding claims, wherein the inner surface (86) of the intermediate portion (46) of the second arm (16) and an inner surface (84) of the proximal portion (26) of the second arm (16) form an angle (p) of between 140 and 160 degrees, preferably 150 degrees, in the protecting state and/or ready state, wherein optionally

the inner surface (84) of the proximal portion (26) is arranged distal and/or adjacent to the proximal inner portion (82).

35. The needle guard (10) according to claim 34, wherein the inner surface (86) of the intermediate portion (46) of the second arm (16) is located adjacent and/or distal to the inner surface (84) of the proximal portion (26) of the second arm (16).

36. The needle guard (10) according to one of the preceding claims, wherein the first arm (14) towers the second arm (16) at least in the ready state.

37. The needle guard (10) according to one of the preceding claims, wherein the axial protrusion (38) and the transverse wall (36) each have a design adapted to mate with each other at least in the protecting state.

38. The needle guard (10) according to one of the preceding claims, wherein the axial protrusion (38) has a greater, smaller or substantially the same axial extension than the transverse wall (36).

39. The needle guard (10) according to one of the preceding claims, wherein the axial protrusion (38) and/or the transverse wall (36) comprises a locking feature (100), which allows to lock the first and second arm (14, 16) with each other.

40. The needle guard (10) according to claim 39, wherein the locking feature (100) comprises a groove (104) and a protrusion (102), wherein the groove (104) is adapted to receive the protrusion (102) in the protecting state in a locking manner.

41. The needle guard (10) according to claim 40, wherein the groove (104) is formed at the transverse wall (36) and/or the axial protrusion (38), wherein the protrusion (102) is formed at the other one of the axial protrusion (38) and the transverse wall (36).

42. The needle guard (10) according to one of the preceding claims, wherein the axial protrusion (38) extends further proximal in axial direction (AD) than the transverse wall (36).

43. The needle guard (10) according to one of the preceding claims, wherein the axial protrusion inner surface (94) comprises a surface part extending further proximal in axial direction (AD) than the transverse wall inner surface (66).

44. The needle guard (10) according to one of the preceding claims, wherein a proximal end of the axial protrusion (38) is located further proximal in axial direction (AD) than a proximal end (80) of the transverse wall (36) by a distance.

45. The needle guard (10) according to claim 44, wherein the distance is the same or smaller than an axial extension of the transverse wall inner surface (66).

5 46. The needle guard (10) according to one of the preceding claims, wherein a distal end (56) of the axial protrusion (38) is located further distal in axial direction (AD) than a distal end (54) of the transverse wall (36).

10 47. The needle guard (10) according to one of the preceding claims, wherein an axial length of the transverse wall (36) measured in the axial direction (AD) and/or a width of the transverse wall (36) measured in the transverse direction (TD) is larger than a diameter of the needle shaft (28) by a factor.

15 48. The needle guard (10) according to claim 47, wherein the factor is at least greater than 1,5, 2, 2,5, 3, 3,5, 4, 4,5, 5 or 10.

20 49. The needle guard (10) according to one of the preceding claims, further comprising a stopping element (106) arranged at the passage (108) of the base portion (12), wherein the stopping element (106) has an opening (110) configured to slidably receive the needle shaft (28).

25 50. The needle guard (10) according to claim 49, wherein at least the base portion (12) comprises a first material and the stopping element (106) comprises a second material different from said first material, wherein preferably the second material is of greater hardness and/or stiffness than the first material.

30 51. The needle guard (10) according to claim 49, wherein at least the base portion (12) comprises a first material and the stopping element (106) comprises a second material, which is the same as the first material.

52. The needle guard (10) according to claim 50 or 51, wherein the second material comprises metallic material, non-metallic material and/or plastic material.

35 53. The needle guard (10) according to any of claims 49 to 52, wherein the opening of the stopping element (106) has an inner diameter which is smaller than a minimum inner dimension of the passage (108) seen in the transverse direction (TD).

40 54. The needle guard (10) according to any of claims 49 to 53, wherein the stopping element (106) is integrally formed with the base portion (12).

55. The needle guard (10) according to any of claims 49 to 54, wherein the stopping element (106) is arranged at the passage (108) of the base portion (12) such that a middle axis of the opening (110) forms an angle with an imaginary line extending in the axial direction (AD), wherein preferably the angle is at least 5 degrees, more preferably at least 10 degrees.

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56. The needle guard (10) according to any of claims 49 to 55, wherein the stopping element (106) is tiltedly arranged at the passage (108) of the base portion (12).

57. The needle guard (10) according to any of claims 49 to 56, wherein the stopping element (106) is arranged at the passage (108) of the base portion (12) in such a way that the opening (110) of the stopping element (106) is adapted to form a line contact, in particular a ring-line contact, or at least one point contact with the needle shaft (28).

58. The needle guard (10) according to one of the preceding claims, wherein in the ready state at least one of the first and second arm (14, 16) is adapted to contact the needle shaft (28).

59. The needle guard (10) according to one of the preceding claims, wherein the second arm (16) has an axial extension in the axial direction (AD) which is greater, smaller or substantially the same as the axial extension of the first arm (14).

60. The needle guard (10) according to one of the preceding claims, wherein in the protecting state the first arm (14) and the second arm (16) do not overlap in the transverse direction (TD) when seen from the base portion (12) in the axial direction (AD).

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61. The needle guard (10) according to claim 60, wherein in the protecting state there is no gap between the first arm (14) and the second arm (16) in the transverse direction (TD) when seen from the base portion (12) in the axial direction (AD).

62. The needle guard (10) according to any of claims 1 to 59, wherein in the protecting state the first arm (14) and the second arm (16) overlap in the transverse direction (TD) when seen from the base portion (12) in the axial direction (AD).

63. The needle guard (10) according to one of the preceding claims, wherein the distal portion (24) of the second arm (16) comprises an inner protrusion (118) adapted to face the first arm (14).

64. The needle guard (10) according to claim 63, wherein the inner protrusion (118) is adapted to contact the needle shaft (28) at least in the ready state.

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65. The needle guard (10) according to any of claims 63 to 64, wherein the axial protrusion (38) comprises the inner protrusion (118) or wherein the axial protrusion (38) distally extends from the inner protrusion (118) in the axial direction (AD).
- 5 66. The needle guard (10) according to any of claims 63 to 65, wherein the transverse wall (36) forms an axial gap (119) with the inner protrusion (118) in the axial direction (AD).
67. The needle guard (10) according to claim 66, wherein the inner protrusion (118) is arranged more proximal than the transverse wall inner surface (66).
- 10 68. The needle guard (10) according to any of claims 66 to 67, wherein the axial gap (119) is at least 0,05 mm, preferably at least 1 mm.
69. The needle guard (10) according to any of claims 66 to 68, wherein the axial gap (119) is smaller than an axial extension of the transverse wall (36), wherein preferably the axial gap (119) is at least 5 % of the axial extension of the transverse wall (36).
- 15 70. The needle guard (10) according to any of claims 63 to 69, wherein at least in the protecting state the inner protrusion (118) is adapted to urge the needle shaft (28) towards the first arm (14), in particular towards the transverse wall (36).
- 20 71. The needle guard (10) according to one of the preceding claims, wherein the passage (108) comprises a minimum inner dimension seen in the transverse direction (TD) which is substantially the same as an outside diameter of the needle shaft (28).
- 25 72. The needle guard (10) according to claim 71, wherein the minimum inner dimension and the outer diameter of the needle shaft (28) are configured to form a close fit ratio.
73. The needle guard (10) according to one of the preceding claims, wherein at least one of the first and second arm (14, 16) has an outer surface comprising at least one indent section (101, 103), which reduces the transverse extension of the corresponding arm (14, 16).
- 30 74. The needle guard (10) according to claim 73, wherein the indent section (101, 103) has a substantially planar profile and/or wherein the outer surface of the arm (14, 16) comprising the indent section (101, 103) is substantially non-circular.
- 35 75. The needle guard (10) according to claim 73 or 74, wherein the base portion (12), the distal portion (20, 24) and/or the intermediate portion (46, 58) of the first and/or second arm (14, 16) forms the at least one indent section (101, 103).
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76. The needle guard (10) according to any one of the preceding claims, wherein at least one of the first and second arm (14, 16) has the outer surface comprising a contact surface adapted to at least partly contact an inner wall of a receiving element, in particular a catheter hub 302.

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77. The needle guard (10) according to claim 76, wherein the contact surface comprises at least one form-fit section (52, 64), which is adapted to form-fit an inner wall of the receiving element at least in the ready state.

10 78. The needle guard (10) according to claim 77, wherein the form-fit section (52, 64) comprises a substantially circular form, wherein in particular the form-fit section (52, 64) is substantially ring-shaped.

15 79. The needle guard (10) according to claim 77 or 78, wherein the distal portion (20, 24), the intermediate portion (46, 58) and/or the proximal portion (22, 26) of the first and/or second arm (14, 16) comprises the form-fit section (52, 64), wherein preferably a proximal end of the distal portion (20, 24) of the first and/or second arm (14, 16) comprises the form-fit section (52, 64).

20 80. The needle guard (10) according to any of claims 77 to 79, wherein the gap (39) formed by the transverse wall (36) and the axial protrusion (38) in the transverse direction (TD) in the protecting state is smaller than a length of at least one of the form-fit sections (52, 64) in the axial direction (AD) and/or transverse direction (TD).

25 81. The needle guard (10) according to any of claims 77 to 80, wherein, the gap (39) is smaller than a width of the transverse wall (36) and/or the axial protrusion (38) measured in the transverse direction (TD).

30 82. The needle guard (10) according to any of claims 77 to 81, wherein, the gap (39) is smaller than a further gap formed by the first arm (14) and the second arm (16) at the intermediate portion (46, 58) in the transverse direction (TD).

35 83. The needle guard (10) according to any one of the preceding claims, wherein the axial protrusion (38) has a width that is smaller than, the same as or greater than a width of the transverse wall (36), wherein preferably the width is measured in a direction perpendicular to the axial direction (AD) and/or perpendicular or parallel to the transverse direction (TD).

40 84. The needle guard (10) according to any one of the preceding claims, wherein the axial protrusion (38) has a length measured in the axial direction (AD) that is smaller than, the same as or greater than a length of the transverse wall (36) measured in the axial direction (AD).

85. The needle guard (10) according to any one of the preceding claims, wherein a width of the axial protrusion (38) measured in the transverse direction (TD) and towards the first arm (14) tapers from proximal to distal or is substantially constant or increases from proximal to distal.

86. The needle guard (10) according to any one of the preceding claims, wherein a width of the axial protrusion (38) measured in the transverse direction (TD) and not towards the first arm (14) tapers from proximal to distal or is substantially constant or increases from proximal to distal.

87. The needle guard (10) according to any one of the preceding claims, wherein the transverse wall (36) comprises a distal tip (97) and a proximal tip (99), wherein both tips (97, 99) face the axial protrusion (38), wherein the proximal tip (99) is located more proximal than the distal end (56) of the second arm (16).

88. The needle guard (10) according to claim 87, wherein the distal tip (97) is located more proximal or more distal than the distal end (56) of the second arm (16).

89. The needle guard (10) according to any one of the preceding claims, wherein the passage (108) has a first section (114) comprising a non-circular shape.

90. A needle guard (10) for a medical device (300), in particular for a safety IV catheter device, wherein the needle guard (10) is configured to slidably receive a needle having a needle shaft (28) and a needle tip (34), wherein the needle guard (10) has a longitudinal axis (LA) defining an axial direction (AD), the needle guard (10) comprising:

- a base portion (12);
- a first arm (14); and
- a second arm (16);

wherein the first arm (14) and the second arm (16) extend substantially in axial direction (AD) from a distal side (18) of the base portion (12),

wherein the first arm (14) and the second arm (16) have a distal portion (20, 24) in axial distance from the base portion (12) and a proximal portion (22, 26) axially proximate to the base portion (12);

wherein the base portion (12) comprises a passage (108) extending in axial direction (AD) therethrough from a proximal side (32) of the base portion (12) to the distal side (18) of the base portion (12) for movably receiving the needle shaft (28);

wherein the needle guard (10) has a ready state, in which the needle shaft (28) extends through the needle guard (10) such that the needle tip (34) protrudes in axial direction (AD) beyond the needle guard (10);

wherein the needle guard (10) has a protecting state, in which the needle shaft (28) is retracted such that the needle tip (34) is located between the first arm (14) and the second arm (16) in a protected position; and

wherein the passage (108) has a first section (114) comprising a non-circular shape.

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91. The needle guard (10) according to claim 89 or 90, wherein the first section (114) has a first inner dimension (W) and a second inner dimension (L), wherein the first inner dimension (W) is smaller than the second inner dimension (L).

10

92. The needle guard (10) according to claim 91, wherein the second inner dimension (L) is oriented substantially orthogonal to the first inner dimension (W).

93. The needle guard (10) according to claim 91 or 92, wherein the second inner dimension (L) is at least 10 %, preferably at least 25 %, greater than the first inner dimension (W).

15

94. The needle guard (10) according to any of claims 89 to 93, wherein the first section (114) has a substantially rectangular shape and/or a substantially rectangular shape with curved edges and/or oval shape.

20

95. The needle guard (10) according to any one of claims 89 to 94, wherein the passage (108) further has a second section (116), wherein the second section (116) is different to the first section (114) in shape.

25

96. The needle guard (10) according to claim 95, wherein the second section (116) is located more distal or proximal than the first section (114) when viewed in the axial direction (AD).

97. The needle guard (10) according to claim 95 or 96, wherein the second section (116) has a substantially circular shape.

30

98. The needle guard (10) according to any of claims 95 to 97, wherein the second inner dimension (L) is measured in a direction from the first arm (14) to the second arm (16) or substantially perpendicular to said direction.

35

99. The needle guard (10) according to any of claims 95 to 98, wherein the first inner dimension (W) of the first passage (108) is substantially the same size than an inner dimension of the second section (116), in particular an inner diameter of the second section (116).

40

100. The needle guard (10) according to any of claims 95 to 99, wherein the first section (114) has a smaller, same or larger axial extension than the second section (116).

101. A medical device (300) having a needle guard (10) according to one of claims 1 to 100 and an elastic element (98) at least partly surrounding the needle guard (10), wherein the elastic element (98) is configured to urge the first and second arm (14, 16) in transverse
5 direction (TD) against each other to the protecting state.

102. The medical device (300) according to claim 101, wherein the elastic element (98) comprises an elastic band.

103. The medical device (300) according to claim 101 or 102, further comprising a needle (30) with a needle shaft (28).

104. The medical device (300) according to claim 103, wherein the needle (30) is formed by an intravenous catheter needle.

105. The medical device (300) according to any of claims 101 to 104, further comprising at least one of the following:

- a catheter hub (302) comprising a catheter port (304);
- a needle cover (310) adapter to cover the needle (30), wherein preferably the needle
20 cover (310) is adapted to be attachable to the catheter hub (302);
- a luer end (316) comprising a luer lock (318);
- a needle hub (314) comprising the needle (30), wherein preferably the needle hub (314) is adapted to be attachable to the catheter hub (302).

106. A needle guard (10) for a medical device (300), in particular for a safety IV catheter device, wherein the needle guard (10) is configured to slidably receive a needle having a needle shaft (28) and a needle tip (34), wherein the needle guard (10) has a longitudinal axis (LA) defining an axial direction (AD), the needle guard (10) comprising:

- a base portion (12);
 - 30 - a first arm (14); and
 - a second arm (16);
- wherein the first arm (14) and the second arm (16) extend substantially in axial direction (AD) from a distal side (18) of the base portion (12),
- wherein each of the first arm (14) and the second arm (16) having an edge forming a
35 form-fit section (52, 64),
- wherein the first arm (14) and the second arm (16) have a distal portion (20, 24) in axial distance from the base portion (12) and a proximal portion (22, 26) axially proximate to the base portion (12);

wherein the base portion (12) comprises a passage (108) extending in axial direction (AD) therethrough from a proximal side (32) of the base portion (12) to the distal side (18) of the base portion (12) for movably receiving the needle shaft (28);

wherein the first arm (14) has a transverse wall (36) transversely provided at the distal
5 portion (20) of the first arm (14),

wherein the transverse wall (36) does not cover and/or go beyond the edge (50) of second arm (16) in transverse direction (TD).

107. The needle guard (10) according to claim 106, wherein the second arm (16) has an
10 axial protrusion (38) axially provided at the distal portion (24) of the second arm (16).

108. The needle guard (10) according to one of the preceding claims, wherein the transverse wall (36) has a distal tip (97) and a proximal tip (99).

15 109. The needle guard (10) according to one of the preceding claims, wherein the axial protrusion (38) protrudes more distal than the proximal tip (99) of the transverse wall (36).

110. The needle guard (10) according to one of the preceding claims, wherein the proximal tip (99) is located more proximal than the distal end (56) of the second arm (16).
20

111. The needle guard (10) according to any one of the preceding claims, wherein the transverse wall (36) forms a concave section (95), which can be adapted to receive the needle tip (34) in the protecting state.

25 112. The needle guard (10) according to any one of the preceding claims, wherein the concave section (95) is substantially aligned with and/or intersected by the longitudinal axis (LA) in the protecting state.

113. The needle guard (10) according to any one of the preceding claims, wherein the
30 concave section (95) is aligned with and/or intersected by a middle axis of the passage (108).

114. The needle guard (10) according to any one of the preceding claims, wherein the transverse wall (36) comprises an L-shape or is formed similar to an L-shape.

35 115. The needle guard (10) according to any one of the preceding claims, wherein the transverse wall (36) comprises a first wall part (91) mostly extending along the axial direction (AD) and a second wall part (93) mostly extending in the transverse direction (TD) towards the second arm (16).

116. The needle guard (10) according to claim 115, wherein the second wall part (93) is located more distal than the first wall part (91), wherein preferably the second wall part (93) extends distally from the first wall part (91).

5 117. The needle guard (10) according to claim 115 or 116, wherein the second wall part (93) has a greater width measured in the transverse direction (TD) and towards the second arm (16) than the first wall part (91), and/or wherein the first wall part (91) has a greater length measured in the axial direction (AD) than the second wall part (93).

10 118. The needle guard (10) according to any one of the preceding claims, wherein the second arm (16) is adapted to contact the needle shaft (28) by the transverse wall inner surface (66) in the ready state.

15 119. The needle guard (10) according to any one of the preceding claims, wherein the transverse wall (36) is tapered from proximal to distal along the axial direction (AD), in particular when seen in transverse direction (TD) from the second arm (16) towards the first arm (14).