(19) Europäisches Patentamt
European Patent Office
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(11) **EP 3 520 921 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
07.08.2019 Bulletin 2019/32

(51) Int Cl.:
B21D 28/28 *(2006.01)* ***E06C 7/08*** *(2006.01)*

(21) Application number: **19153859.4**

(22) Date of filing: **28.01.2019**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **01.02.2018 FI 20185092**

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(54) **A METHOD OF MANUFACTURING AN ANTISLIP LADDER RUNG AND A LADDER RUNG**

(57) A method of manufacturing an antislip ladder rung (1), and an antislip ladder rung (1). The method comprises arranging a tubular rung (1) made of sheet metal, and arranging an antislip roughening (2) to the rung. The method comprises punching the tubular rung in the diametral plane of the rung with a pressing punch (3^1, 3^2) having a plurality of spaced puncturing rods (4) with pointed tips. The puncturing rods (4) are arranged in a row. During the punching stroke, at a first side of the rung, the pointed tips puncture through the wall of the rung forming inlet openings (5) and at the opposite second side of the rung the pointed tips create protrusions (6^1, 6^2) that form the antislip roughening (2). The antislip roughening (2) comprises a plurality of outwardly protruding, from the inside of the rung outwardly pressed, deformations as protrusions (6^1, 6^2) deformed from the material of the wall of the rung.

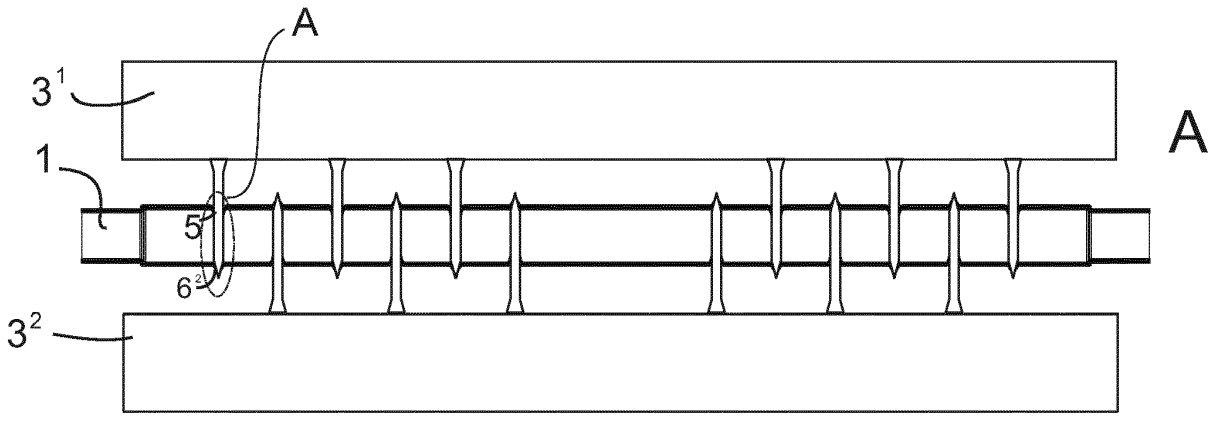

Fig. 5

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to method of manufacturing an antislip ladder rung. Further, the invention relates to an antislip ladder rung.

BACKGROUND OF THE INVENTION

[0002] In prior art there has not been available any feasible method of making an antislip roughening for a ladder rung which is made of sheet metal and which rung has a circular cross section. Document KR20160124706 discloses a ladder rung which prevents a slip. The method comprises a step of forming a rolled pipe, and a step of forming an uneven portion on an outer circumference of the rolled pipe. The uneven portion comprises a plurality of corrugations which are made to the wall of the tubular rung. The problem is that the corrugations do not provide a very good grip to prevent slipping.

OBJECTIVE OF THE INVENTION

[0003] The objective of the invention is to alleviate the disadvantages mentioned above.

[0004] In particular, it is an objective of the present invention to provide a simple and cost-effective method of making an antislip roughening for a tubular rung so that the antislip roughening provides a good grip.

[0005] Further, it is an objective of the present invention to provide an antislip ladder rung the antislip roughening having a good grip.

SUMMARY OF THE INVENTION

[0006] According to a first aspect, the present invention provides a method of manufacturing an antislip ladder rung. The method comprises steps of arranging a tubular rung made of sheet metal, and arranging an antislip roughening to the rung. According to the invention the method comprising a step of punching the tubular rung in the diametral plane of the rung with a pressing punch having a plurality of spaced puncturing rods with pointed tips, said puncturing rods being arranged in a row, and that during the punching stroke, at a first side of the rung the pointed tips puncture through the wall of the rung forming inlet openings and at the opposite second side of the rung the pointed tips create protrusions that form the antislip roughening.

[0007] In an embodiment of the method, the punching stroke is adjusted so that, at the opposite second side of the rung, the pointed tips press permanent deformations as outwardly protruding bulges to the wall of the rung without tearing the wall, the bulges forming the antislip roughening.

[0008] In an embodiment of the method, the punching stroke is adjusted so that, at the opposite second side of the rung, the pointed tips puncture through the wall of the rung to form outwardly protruding punctured openings having torn edges forming the antislip roughening.

[0009] In an embodiment of the method, the method comprises punching the tubular rung in the diametral plane of the rung simultaneously with two pressing punches having punching strokes directed to mutually in opposite directions whereby the antislip roughening is created simultaneously to opposite sides of the rung.

[0010] In an embodiment of the method, after a first punching stroke the rung is rotated about its longitudinal axis to a different position relative to the pressing punch and a second punching stroke is performed.

[0011] In an embodiment of the method, after a first punching stroke the rung is rotated about its longitudinal axis an angle of 120° in one direction and a second punching stroke is performed. After the second punching stroke the rung is turned again about its longitudinal axis an angle of 120° in the same direction as previously and a third punching stroke is performed.

[0012] In an embodiment of the method, the step of arranging a tubular rung made of sheet metal comprises folding a planar piece of sheet metal to tubular form, so that opposite edges of sheet metal abut each other, and welding abutting longitudinal edges together to form a tubular rung having a tubular cross-section.

[0013] In an embodiment of the method, punching is performed with puncturing rods which have a diameter of 4 mm, the tip end of the pointed tip having a diameter of 0,4 mm and the pointed tip having a cone angle of 48,5°.

[0014] According to a second aspect, the present invention provides an antislip ladder rung, the rung being made of sheet metal and having a tubular form with a circular cross-section, the rung comprising an antislip roughening. According to the invention the antislip roughening comprises, at a second side of the rung, a plurality of outwardly protruding from the inside of the rung outwardly pressed deformations as protrusions deformed from the material of the wall of the rung, and at a first side opposite to the second side of the rung, inlet openings, the inlet openings and protrusions being formed in manufacturing when puncturing through the tubular rung.

[0015] In an embodiment of the antislip ladder rung, the protrusions deformed from the material of the wall of the rung are outwardly protruding bulges and/or edges of outwardly punctured openings in the wall of the rung.

[0016] It is to be understood that the aspects and embodiments of the invention described above may be used in any combination with each other. Several of the aspects and embodiments may be combined together to form a further embodiment of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] The accompanying drawings, which are included to provide a further understanding of the invention and constitute a part of this specification, illustrate embodi-

ments of the invention and together with the description help to explain the principles of the invention. In the drawings:

Figure 1 is an axonometric view of an antislip ladder rung according to one embodiment of the invention,

Figure 2 is an axonometric view of a ladder comprising antislip ladder rungs of Figure 1,

Figure 3 is a cross-section III-III from Figure 1,

Figures 4 and 5 illustrate schematically steps of the method according to one embodiment of the invention for of manufacturing an antislip ladder rung,

Figure 6 shows an enlarged detail A from Figure 5, and

Figure 7 shows an alternative detail A from Figure 5.

DETAILED DESCRIPTION OF THE INVENTION

[0018] Figure 1 shows an antislip ladder rung 1 for a ladder. The ladder rung 1 is made of sheet metal, such as sheet steel. The rung 1 has a tubular form with a circular cross-section. The rung 1 comprises an antislip roughening 2. For the user, the antislip roughening 2 provides a good grip for hands and feet while climbing the ladder. One embodiment of the ladder is shown in Figure 2. Such a ladder can be used as a wall ladder or as a roof ladder, or part thereof, to provide safe access to roofs, the ridge of roofs, chimneys, roof hatches and other targets that require maintenance. The antislip roughening 2 comprises a plurality of outwardly protruding, from the inside of the rung outwardly pressed, deformations. They are protrusions, such as bulges 6^1 (see Figure 7) or 6^2 edges of punctures (see Figures 1 and 3) which are deformed from the material of the wall of the rung 1 without adding any material.

[0019] In the embodiment shown in Figure 3, the wall thickness s of the tubular rung 1 is preferably 1,25 mm and diameter d is 25 mm. The protrusions 6^2 have a height e of 2 mm. Figure 3 also shows inlet openings 5 in the wall of the rung. These inlet openings 5 are at the opposite second side of the rung relative to the first side of the protrusions 6^2, and are formed by the puncturing rods 4 when puncturing through the rung 1 in manufacturing (see Figures 4 - 7).

[0020] Figure 3 shows that protrusions 6^2 may be distributed on the circumference of the rung 1 as circumferential groups of three protrusions in each group wherein the protrusions are arranged at intervals of 120° around the periphery of the rung. A plurality of such groups are arranged along the length of the rung 1. Figure 1 shows an embodiment of the rung 1 wherein twelve successive circumferential groups of protrusions are arranged so that an area free of protrusions is arranged in the middle area of the rung 1. The circumferential groups of protrusions are equally spaced by a distance l being 25 mm.

[0021] Figures 4 - 7 schematically show the principle of the method for manufacturing the antislip ladder rung 1 of Figure 1. In the manufacturing method a tubular rung 1 made of sheet metal is arranged. The step of arranging a tubular rung 1 made of sheet metal may comprise folding a planar piece of sheet metal to tubular form m(not shown in Figures), so that opposite edges of sheet metal abut each other. The abutting longitudinal edges are welded together to form a tubular rung having a tubular cross-section. Figures 4 and 5 show arranging the antislip roughening 2 to the rung 1. The method step of arranging the antislip roughening 2 comprises a step of punching the tubular rung 1 in the diametral plane of the rung 1 with a pressing punch 3^1, 3^2. The pressing punch 3^1, 3^2 comprises a plurality of spaced puncturing rods 4 with pointed tips. The puncturing rods 4 are arranged in a row. During the punching stroke, at a first side of the rung the pointed tips puncture through the wall of the rung forming inlet openings 5 and at the opposite second side of the rung the pointed tips create protrusions 6^1 and/or 6^2 that form the antislip roughening 2. The punching stroke may be adjusted so that, at the opposite second side of the rung 1, the pointed tips press permanent deformations as outwardly protruding bulges 6^1 to the wall of the rung without tearing the wall as is illustrated in Figure 7. The punching stroke may also be adjusted so that, at the opposite second side of the rung 1, the pointed tips of the puncturing rod 4 puncture through the wall of the rung 1 to form outwardly protruding punctured openings having torn edges 6^2 forming the antislip roughening, as shown in Figure 6.

[0022] Figures 4 and 5 show punching the tubular rung 1 in the diametral plane of the rung 1 simultaneously with two pressing punches 3^1, 3^2 having punching strokes directed to mutually in opposite directions whereby the antislip roughening is created simultaneously to opposite sides of the rung 1. A first punching stroke the rung 1 may be rotated about its longitudinal axis to a different position and a second punching stroke is performed. For manufacturing the protrusions as illustrated in Figure 3, after a first punching stroke the rung 1 is rotated about its longitudinal axis an angle of 120° in one direction and a second punching stroke is performed. After the second punching stroke, the rung is rotated again about its longitudinal axis an angle of 120° in the same direction as previously, and a third punching stroke is performed.

[0023] Referring to Figure 6, in one embodiment of the method punching is performed with puncturing rods 4 which have a diameter D of 4 mm. The tip end of the pointed tip of the puncturing rod 4 has a diameter Ø of 0,4 mm and the pointed tip has a cone angle α of 48,5°.

[0024] While the present inventions have been described in connection with a number of exemplary embodiments, and implementations, the present inventions are not so limited, but rather cover various modifications, and equivalent arrangements, which fall within the pur-

view of prospective claims.

Claims

1. A method of manufacturing an antislip ladder rung (1), the method comprises steps of:

   - arranging a tubular rung (1) made of sheet metal, and
   - arranging an antislip roughening (2) to the rung, **characterized in that** the method step of arranging the antislip roughening comprises a step of punching the tubular rung in the diametral plane of the rung with a pressing punch (3^1, 3^2) having a plurality of spaced puncturing rods (4) with pointed tips, said puncturing rods being arranged in a row, and that during the punching stroke, at a first side of the rung the pointed tips puncture through the wall of the rung forming inlet openings (5) and at the opposite second side of the rung the pointed tips create protrusions (6^1, 6^2) that form the antislip roughening (2) .

2. The method according to claim 1, **characterized in that** the punching stroke is adjusted so that, at the opposite second side of the rung (1), the pointed tips press permanent deformations as outwardly protruding bulges (6^1) to the wall of the rung without tearing the wall, the bulges forming the antislip roughening.

3. The method according to claim 1, **characterized in that** the punching stroke is adjusted so that, at the opposite second side of the rung, the pointed tips puncture through the wall of the rung to form outwardly protruding punctured openings having torn edges (6^2) forming the antislip roughening.

4. The method according to any one of the claims 1 to 3, **characterized in that** the method comprises punching the tubular rung (1) in the diametral plane of the rung simultaneously with two pressing punches (3^1, 3^2) having punching strokes directed to mutually in opposite directions whereby the antislip roughening is created simultaneously to opposite sides of the rung.

5. The method according to any one of the claims 1 to 4 **characterized in that** after a first punching stroke the rung (1) is rotated about its longitudinal axis to a different position and a second punching stroke is performed.

6. The method according to any one of the claims 1 to 5, **characterized in that** after a first punching stroke the rung (1) is rotated about its longitudinal axis an angle of 120° in one direction and a second punching stroke is performed, and that after the second punching stroke, the rung is turned again about its longitudinal axis an angle of 120° in the same direction as previously, and a third punching stroke is performed.

7. The method according to any one of the claims 1 to 6, **characterized in that** the step of arranging a tubular rung (1) made of sheet metal comprises folding a planar piece of sheet metal to tubular form, so that opposite edges of sheet metal abut each other, and welding abutting longitudinal edges together to form a tubular rung having a tubular cross-section.

8. The method according to any one of the claims 1 to 7, **characterized in that** punching is performed with puncturing rods (4) which have a diameter of 4 mm, the tip end of the pointed tip having a diameter of 0,4 mm and the pointed tip having a cone angle of 48,5°.

9. An antislip ladder rung (1), the rung being made of sheet metal and having a tubular form with a circular cross-section, the rung (1) comprising an antislip roughening (2), **characterized in that** the antislip roughening (2) comprises, at a second side of the rung, a plurality of outwardly protruding from the inside of the rung outwardly pressed deformations as protrusions (6^1, 6^2) deformed from the material of the wall of the rung, and at a first side opposite to the second side of the rung, inlet openings (5), the inlet openings and protrusions being formed in manufacturing when puncturing through the tubular rung.

10. The antislip ladder rung according to claim 9, **characterized in that** the protrusions deformed from the material of the wall of the rung are outwardly protruding bulges (6^1) and/or edges (6^2) of outwardly punctured openings in the wall of the rung.

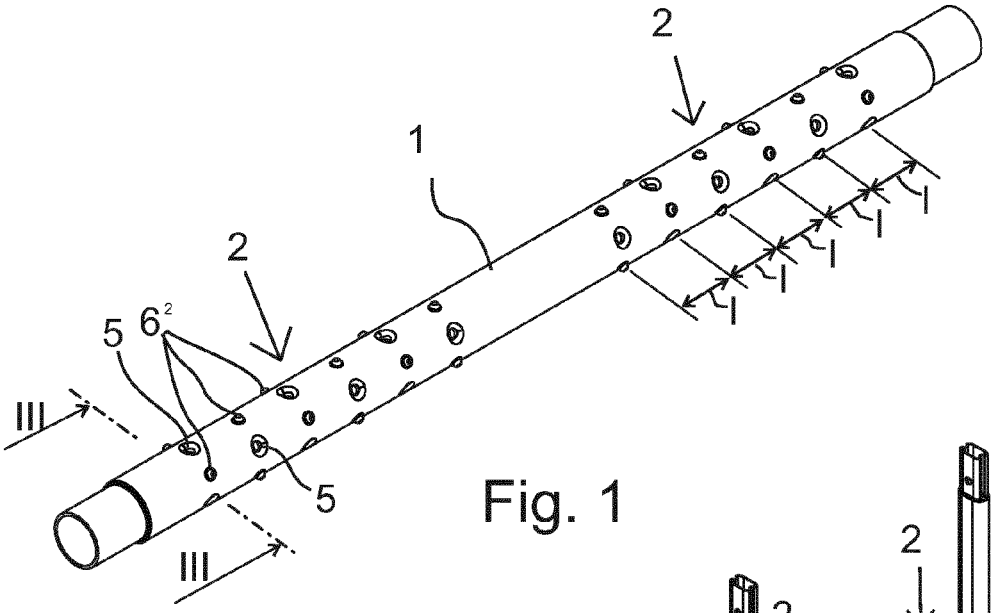

Fig. 1

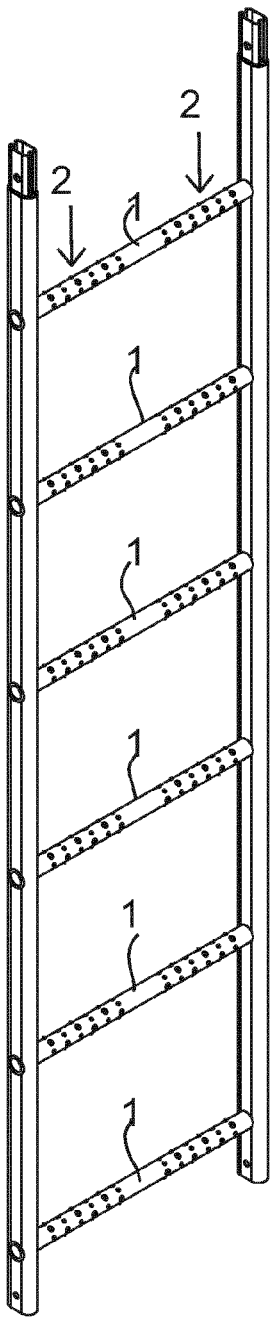

Fig. 2

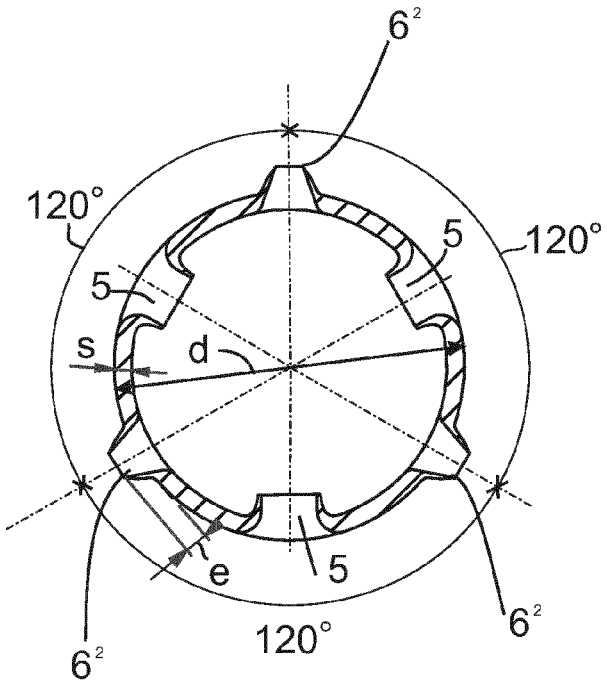

Fig. 3

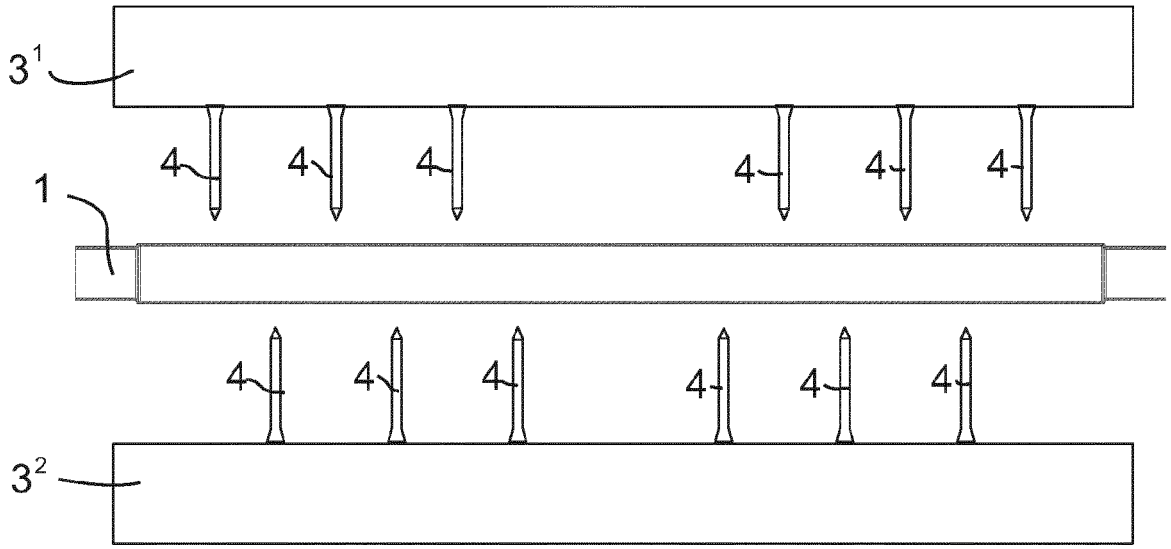

Fig. 4

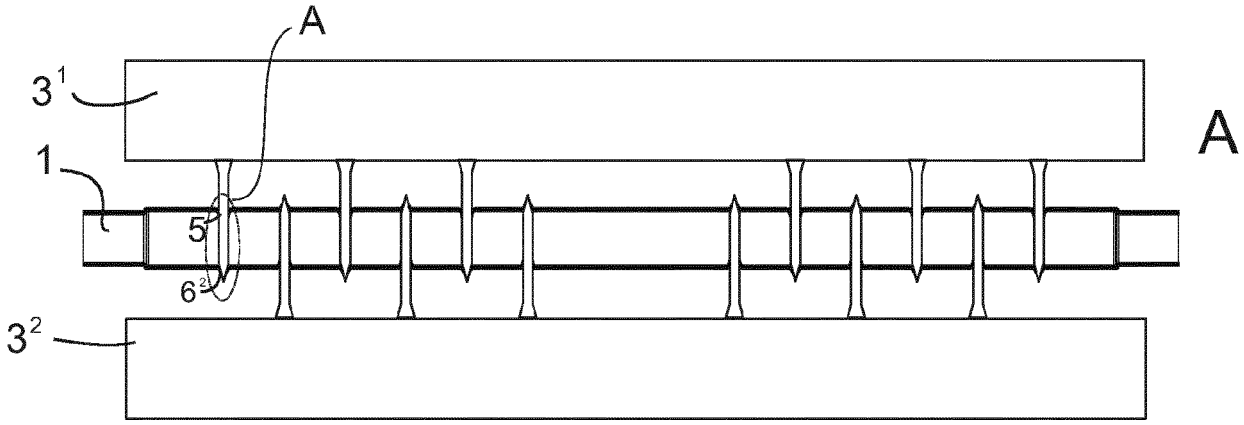

Fig. 5

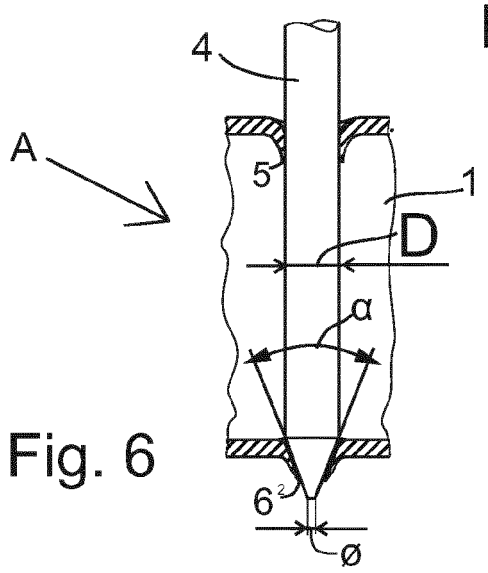

Fig. 6

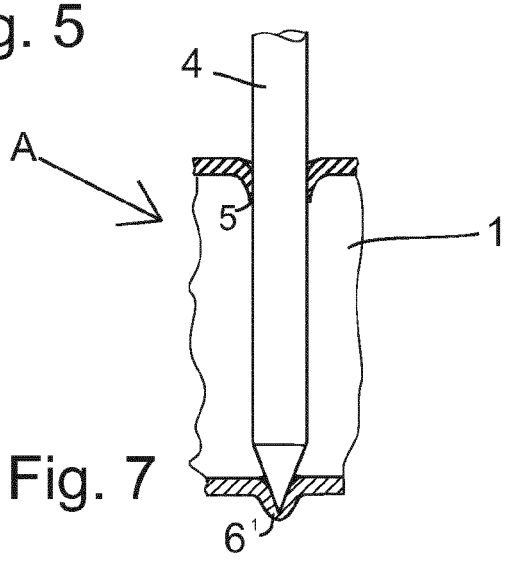

Fig. 7

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EUROPEAN SEARCH REPORT

Application Number
EP 19 15 3859

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	5 June 2019	Vassoille, Philippe

CATEGORY OF CITED DOCUMENTS

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