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(54) CAPTURED CONTACT COIL

(57) The present invention relates to a method for producing a coil (1), wherein a wire (10) cladded with an electrical insulation (11) is wound so as to form a coil bundle (2) comprising a plurality of layers (3) arranged on top of one another, wherein each layer (3) comprises a plurality of windings (4) of the wire (10), wherein a first electrical contact member (100) is arranged in the coil bundle (2) such that a plurality of successive first windings (5) extend over a front side (101a) of a first section (101) of the first electrical contact member (100), wherein each of said first windings (5) comprises a wire section (50) arranged on said front side (101a) of said first section (101) of the first electrical contact member (100), wherein electrical insulation is removed from said wire sections (50) to form exposed wire regions (51), and wherein said exposed wire regions (51) are soldered to said front side (101a) of said first section (101) of said first electrical contact member (101). Furthermore, the present invention relates to a coil.

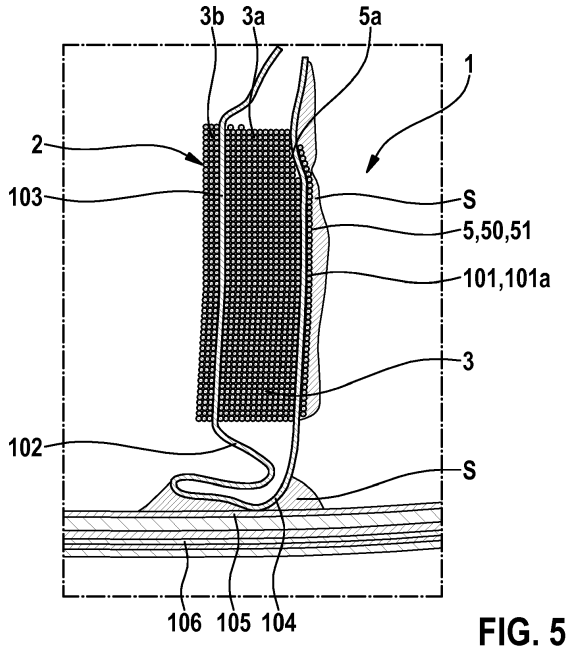

FIG. 5

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Description

[0001] The present invention relates to a method for producing an electrical coil as well as to such a coil, particularly to a coil for an implantable medical device (e.g. a communication coil).

[0002] As known in the state of the art, such coils can be created by tightly wrapping wire around a mandrel (e. g. core of an arbor). However, the ends of such wound wires are usually very difficult to handle when making electrical connections to other components/electrical contacts. Depending on the gauge of the wire used, each end of the coil might be even smaller than 50 μm in diameter. This creates complications in handling, and can lead to breaks in the wire which can cause the component to fail.

[0003] Any technique which requires the manipulation of a single strand of wire in a wrapping or brazing operation becomes a difficult handling problem. The wire is most fragile when manipulated as a strand. The amount of time taken to manually capture wire that is this thin makes the production of these coil assemblies difficult and inefficient.

[0004] Particularly, the wire ends must be grabbed and manipulated, typically with a tweezer, into a specific position. Then the wire position must be held while a securing process takes place.

[0005] Based on the above, the objective of the present invention is to provide a coil as well as a method for producing such a coil that can be easily handled when making electrical connections to the coil.

[0006] This problem is solved by a method for producing a coil having the features according to claim 1.

[0007] According thereto, a method is disclosed, wherein a wire cladded with an electrically insulation is wound so as to form a coil bundle comprising a plurality of layers arranged on top of one another, wherein each layer comprises a plurality of windings of the wire, and wherein upon winding of said coil bundle a first electrical contact member is arranged in the coil bundle (e.g. between neighboring layers) such that a plurality of successive first windings extend over a front side of a first section of the first electrical contact member wherein each of said first windings comprises a wire section arranged on said front side of said first section of the first electrical contact member, wherein electrical insulation is removed from said wire sections to form exposed wire regions, and wherein said exposed wire regions are soldered to said front side of said first section of said first electrical contact member.

[0008] Thus, in other words, the method/coil according to the present invention does not require the same level of extreme precision as required with coils according to the state of the art. An electrical contact member (e.g. a flat elongated conductor such as a thin foil) is placed between the wire windings. Once it is integrated between the windings, an ablation process can be applied to the surface windings which run over the front side of the electrical contact member in order to expose the wire. This means that the inner windings are protected from the removal of the insulation by the electrical contact member itself. Then a generic solder process can electrically connect the electrical contact member to respective windings running over the front side of the electrical contact member.

[0009] Further, according to an embodiment of the method according to the present invention, the first electrical contact member comprises a second section that is connected to the first section of the first electrical contact member via a connecting section, wherein upon winding of the coil bundle the second section is arranged between two neighboring layers of the coil bundle for anchoring the first electrical contact member in the coil bundle, wherein the connecting section of the first electrical contact member is arranged outside the coil bundle for forming an electrical contact configured to be soldered to an electrical contact on a substrate (e.g. a PCB).

[0010] Further, according to an embodiment of the method according to the present invention, upon winding of said coil bundle, a second electrical contact member is arranged in the coil bundle (e.g. between neighboring layers) such that a plurality of successive second windings extend over a front side of a first section of the second electrical contact member, wherein each of said second windings comprises a wire section arranged on said front side of said first section of the second electrical contact member, wherein electrical insulation is removed from said wire sections of the second windings to form exposed wire regions, and wherein said exposed wire regions of the second windings are soldered to said front side of said first section of said second electrical contact member.

[0011] Further, according to an embodiment of the method according to the present invention, the second electrical contact member comprises a second section that is connected to the first section of the second electrical contact member via a connecting section of the second electrical contact member, wherein upon winding of the coil bundle the second section is arranged between two neighboring layers of the coil bundle for anchoring the second electrical contact member in the coil bundle, wherein the connecting section of the second electrical contact member is arranged outside the coil bundle for forming an electrical contact configured to be soldered to an electrical contact on a substrate (e.g. a PCB).

[0012] Particularly, both connecting sections may comprise a curved shape so as to connect the first and second section of the respective electrical contact member, which first and second sections are integrated into the coil bundle and may extend essentially parallel with respect to each other.

[0013] Further, particularly, the first and/or the second electrical contact member may be formed as an e.g. elongated conducting foil formed e.g. out of Cu or another suitable electrically conducting material.

[0014] Further, according to an embodiment of the

method according to the present invention, said first windings form an innermost layer of windings of the coil bundle. Furthermore, according to an embodiment, said second windings form an outermost layer of windings of the coil bundle.

[0015] Further, according to an embodiment of the method according to the present invention, the wire is wound on an arbor for forming said coil bundle, wherein the arbor comprises a core extending along an axis, the core connecting two opposing plates of the arbor. Further, particularly, each plate comprises a first slot extending from a circumferential edge of the respective plate towards the core. Particularly, these first slots are used for arranging the first electrical contact member in the coil bundle when the coil bundle is formed by winding the wire on the core of the arbor. Further, particularly, each plate comprises a second slot extending from a circumferential edge of the respective plate towards the core. Particularly, these second slots are used for arranging the second electrical contact member in the coil bundle when the wire is wound on the arbor's core.

[0016] Further, according to an embodiment of the method according to the present invention, the first windings are wound on the core of the arbor (e.g. by rotating the arbor about said axis of the core), wherein the first section of the first electrical contact member is laid into said first slots onto said first windings so that said front side of said first section of the first electrical contact member contacts said first windings and a second section (and particularly said connecting section) of the first electrical contact member protrudes out of the arbor through one of the first slots, wherein a plurality of windings is wound onto the first section of the first electrical contact member, wherein the second section of the first electrical contact member is folded back and laid into the first slots on top of said plurality of windings, and wherein a further plurality of windings is wound on top of said second section of the first electrical contact member, particularly such that the connecting section of the first electrical contact member protrudes out of the coil bundle for forming an (e.g. surface-mountable) electrical contact.

[0017] Further, according to an embodiment of the method according to the present invention, after having wound a plurality of windings onto the core, the second section of the second electrical contact member is laid into said second slots on top of said plurality of windings such that the first section (and particularly the connecting section) of the second electrical contact member protrudes out of the arbor through a second slot, wherein after having wound a further plurality of windings on top of said second section of the second electrical contact member, the first section of said second electrical contact member is folded back and laid into the second slots on top of said further plurality of windings, and wherein said second windings are wound on top of said front side of said first section of the second electrical contact member, particularly such that the connecting section of the second electrical contact member protrudes out of the coil bundle for forming an (e.g. surface-mountable) electrical contact.

[0018] Further, according to yet another aspect of the present invention, a coil is disclosed, the coil comprising: a coil bundle comprising a wound wire cladded with an electrical insulation, wherein the wound wire forms a plurality of layers of windings, which layers are arranged on top of one another, and wherein each layer comprises a plurality of windings of said wire, and at least a first electrical contact member for electrically contacting the coil bundle, the first electrical contact member comprising a first section, wherein a plurality of successive first windings extends over a front side of said first section, wherein the first windings each comprise a wire section that is arranged on said front side of said first section of the first electrical contact member and comprises a recess in the electrical insulation to form an exposed wire region that is soldered to said front side of said first section of said first electrical contact member.

[0019] Further, according to an embodiment of the coil according to the present invention, the first electrical contact member comprises a second section that is connected to the first section of the first electrical contact member via a connecting section, wherein the second section is arranged between two neighboring layers of the coil bundle for anchoring the first electrical contact member in the coil bundle, and wherein the connecting section of the first electrical contact member protrudes from the coil bundle and forms an electrical contact, e.g. for making an electrical connection (e.g. by way of soldering) to another electrical contact that may be arranged on a substrate such as a printed circuit board (PCB).

[0020] Further, according to an embodiment of the coil according to the present invention, the coil further comprises a second electrical contact member for electrically contacting the coil bundle, the second electrical contact member comprising a first section, wherein a plurality of successive second windings extend over a front side of said first section of the second electrical contact member, wherein the second windings each comprise a wire section that is arranged on said front side of said first section of the second electrical contact member and comprises a recess in the electrical insulation to form an exposed wire region that is soldered to said front side of said first section of said second electrical contact member.

[0021] Further, according to an embodiment of the coil according to the present invention, the second electrical contact member comprises a second section that is connected to the first section of the second electrical contact member via a connecting section of the second electrical contact member, wherein the second section of the second electrical contact member is arranged between two neighboring layers of the coil bundle for anchoring the second electrical contact member in the coil bundle, and wherein the connecting section of the second electrical contact member protrudes from the coil bundle and forms an electrical contact, e.g. for making an electrical connection (e.g. by way of soldering) to another electrical

contact that may be arranged on a substrate such as a PCB.

[0022] Further, according to an embodiment of the coil according to the present invention, said first windings form an innermost layer of windings of the coil bundle and/or wherein said second windings form an outermost layer of windings of the coil bundle.

[0023] Further, according to an embodiment of the coil according to the present invention, the first section of the first electrical contact member is arranged between said innermost layer and an adjacent neighboring layer arranged on top of said innermost layer, and wherein the second section of the first electrical contact member is arranged between two further neighboring layers for anchoring the first electrical contact member in the coil bundle.

[0024] Further, according to an embodiment of the coil according to the present invention, the first section of the second electrical contact member is arranged between said outermost layer and an adjacent neighboring layer arranged below said outermost layer, and wherein the second section of the second electrical contact member is arranged between two further neighboring layers of the coil bundle for anchoring the second electrical contact member in the coil bundle.

[0025] Further features and embodiments of the present invention shall be described below with reference to the Figures, wherein

Fig. 1 shows a plan view onto a plate of an arbor for winding a coil according to the method of the present invention;

Fig. 2 shows a further view of the arbor shown in Fig. 1 showing its two plates connected by a core of the arbor;

Fig. 3 shows an electrical contact member of the coil before soldering of the contact member to windings of the coil bundle;

Fig. 4 shows the electrical contact member according to Fig. 3 after soldering;

Fig. 5 shows a cross-section of a coil bundle of a coil according to the present invention and its first electrical contact member; and

Fig. 6 shows a further cross-section of the coil bundle of Fig. 5 and its second electrical contact member.

[0026] Figs. 1 and 2 show an arbor 30 that can be used in the method according to the present invention in order to wind a wire 10 for forming a coil bundle 2 of a coil 1 according to the present invention.

[0027] Particularly, the arbor 30 comprises a core (also denoted as mandrel) 31 extending along an axis A about which the core 31 is rotated to wind the wire 10 onto the core 31. The arbor 30 further comprises two parallel (e. g. circular) plates 32, 33 that are connected by the core 31, so that the wire 10 can be wound in several layers to form the coil bundle 2. Further, for positioning of electrical contact members 100, 200 (as will be described in more detail below), each plate 32, 33 comprises a first slot 300 extending from a circumferential edge 32a, 33a of the respective plate 32, 33 towards the perimeter of the core 31 as well as a second slot 301 also extending from the circumferential edge 32a, 33a of the respective plate 32, 33 towards the perimeter of the core 31. The first slots 300 face each other in said axial direction A. Further, also the second slots 301 face each other in said axial direction A.

[0028] Now, for integrating a first electrical contact member into the coil bundle 2 as indicated in Fig. 5, a single layer of wire, i.e. a plurality of first windings 5, is wrapped around the core 31 of the arbor 30, and then a first section 101 of a first electrical contact member 100, e.g. in form of a conductive elongated foil, is pulled over the top of this (innermost) layer 5 of the coil bundle 2 to be formed through the space created by the first slots 300 in the plates 32, 33. Particularly, a front side 101a of this first section 101 contacts the first windings 5.

[0029] After e.g. approximately three quarters of the bundle 2 are wrapped, a second section 103 of this first electrical contact member / foil 100, which second section 103 is connected to the first section 101 via a connecting section 102, is pulled back through the same slots 300, such that the connecting section 102 forms a bend protruding from the body of the coil 1 enough to provide a stand-off. The second section 103 is now arranged between two adjacent layers 3a, 3b of the bundle 2 and faces the first section 101 of the first electrical contact member 100.

[0030] Once the bundle 2 has finished being wrapped, wire sections 50 of the single innermost layer 5 (i.e. the first windings) which are separated from the remaining bundle 2 by the first electrical contact member (e.g. foil) 100 have their insulation 11 removed in the area immediately in front of the front side 101a of the first section 100 of the first electrical contact member (e.g. foil) 100.

[0031] Solder S is then laid over the respective region of exposed wire 51 of said wire sections 50 to electrically connect the coil bundle to the first electrical contact member 100.

[0032] This first electrical contact member (e.g. foil) 100 now represents one of the coil terminations. Particularly, the connecting section 102 forms an electrical contact 104 that can be electrically connected to a contact 105 on a substrate 106 such as a printed circuit board by means of solder S.

[0033] A similar second electrical contact member 200 laid into the bundle 2 (e.g. at the other side of the coil bundle 2) can be processed in a similar way and may become the other termination of the coil 1.

[0034] For this, as shown in Figs. 3, 4 and 6, a second

electrical contact member 200 is provided, which comprises a first section 201 having a front side 201 a, which first section 201 is connected to a second section 203 via a connecting section 202 of the second electrical contact member 200. Also here, the second electrical contact member may be formed out of an elongated foil (see also above).

[0035] After having wound a plurality of windings onto the core 31, the second section 203 of the second electrical contact member 200 is laid into said second slots 301 on top of said plurality of windings wound onto the core 31 such that the first section (201) of the second electrical contact member (200) protrudes out of the arbor 30 through one of the second slots 301, wherein after having wound a further plurality of windings on top of said second section 203 of the second electrical contact member 200, the first section 201 of said second electrical contact member 200 is folded back and laid into the second slots 301 on top of said further plurality of windings, such that the connecting section 202 also protrudes from the body of the coil 1 (see also above). Thereafter, second windings 6 forming an outermost layer 6 of the coil bundle 2 are wound on top of said front side 201a of said first section 201 of the second electrical contact member 200. Also here, electrical insulation is removed from those wire sections 60 of the second windings 6 that are arranged on top of said front side 201a to provide exposed wire regions 61 that are then soldered to the front side 201a by means of a suitable solder S as before. Also here, the second section 203 of the second electrical contact member is arranged/anchored between two adjacent layers 3c, 3d of the coil bundle 2.

[0036] Also here, the connecting section 202 forms an electrical contact 204 that can be electrically connected to a contact 205 on said substrate 106 by means of solder S.

[0037] Due to the present invention, the coil 1 is now a surface mountable component which can be connected to a substrate 106 with a normal solder fillet.

[0038] Particularly, the coil 1 can be manufactured without the need for handling, stripping and adhering the single strands of fine wire 10 which are part of the traditional coil assembly process. Advantageously, the respective electrical contact member 100, 200 protects the remaining windings when removing electrical insulation from said wire sections 50, 60 of said first or second windings 5, 6.

[0039] Once assembled, the coil according to the present invention is ready for typical SMT processes, with stand-off electrical contact members 100, 200 that remove the problem of coplanarity by separating the two surfaces.

Claims

1. A method for producing a coil (1), wherein a wire (10) cladded with an electrical insulation (11) is wound so as to form a coil bundle (2) comprising a plurality of layers (3) arranged on top of one another, wherein each layer (3) comprises a plurality of windings (4) of the wire (10), wherein a first electrical contact member (100) is arranged in the coil bundle (2) such that a plurality of successive first windings (5) extend over a front side (101a) of a first section (101) of the first electrical contact member (100), wherein each of said first windings (5) comprises a wire section (50) arranged on said front side (101a) of said first section (101) of the first electrical contact member (100), wherein electrical insulation is removed from said wire sections (50) to form exposed wire regions (51), and wherein said exposed wire regions (51) are soldered to said front side (101a) of said first section (101) of said first electrical contact member (100).

2. The method according to claim 1, wherein the first electrical contact member (100) comprises a second section (103) that is connected to the first section (101) of the first electrical contact member (100) via a connecting section (102), wherein the second section (103) is arranged between two neighboring layers (3a, 3b) of the coil bundle (2) for anchoring the first electrical contact member (100) in the coil bundle (2), wherein the connecting section (102) of the first electrical contact member (100) is arranged outside the coil bundle (2) for forming an electrical contact (104) configured to be soldered to an electrical contact (105) on a substrate (106).

3. The method according to claim 1 or 2, wherein a second electrical contact member (200) is arranged in the coil bundle (2) such that a plurality of successive second windings (6) extend over a front side (201a) of a first section (201) of the second electrical contact member (200), wherein each of said second windings (6) comprises a wire section (60) arranged on said front side (201a) of said first section (201) of the second electrical contact member (200), wherein electrical insulation is removed from said wire sections (60) of the second windings (6) to form exposed wire regions (61), and wherein said exposed wire regions (61) of the second windings (6) are soldered to said front side (201a) of said first section (201) of said second electrical contact member (200).

4. The method according to claim 3, **wherein** the second electrical contact member (200) comprises a second section (203) that is connected to the first section (201) of the second electrical contact member (200) via a connecting section (202) of the second electrical contact member (200), wherein the second section (202) is arranged between two neighboring layers (3c, 3d) of the coil bundle (2) for anchoring the second electrical contact member (200) in the coil bundle (2), wherein the connecting section (202) of the second electrical contact member (200)

is arranged outside the coil bundle (2) for forming an electrical contact (204) configured to be soldered to an electrical contact (205) on a substrate (106).

5. The method according to one of the preceding claims, **wherein** said first windings (5) form an innermost layer of windings of the coil bundle (2) and/or wherein said second windings (6) form an outermost layer of windings of the coil bundle (2).

6. The method according to one of the preceding claims, **wherein** the wire (10) is wound on an arbor (30) for forming said coil bundle (2), wherein the arbor (30) comprises a core (31) extending along an axis (A), the core (31) connecting two opposing plates (32, 33) of the arbor (30).

7. The method according to claim 6, **wherein** each plate (32, 33) comprises a first slot (300) extending from a circumferential edge (32a, 33a) of the respective plate (32, 33) towards the core (31), and/or wherein each plate (32, 33) comprises a second slot (301) extending from a circumferential edge (32a, 33a) of the respective plate (32, 33) towards the core (31).

8. The method according to claim 7, **wherein** the first windings (5) are wound on the core (31) of the arbor (30), wherein the first section (101) of the first electrical contact member (101) is laid into said first slots (300) so that said front side (101a) of said first section (101) of the first electrical contact member (100) contacts said first windings (5) and a second section (103) of the first electrical contact member (100) protrudes out of the arbor (30) through one of the first slots (300), wherein a plurality of windings is wound onto the first section (101) of the first electrical contact member (100), wherein the second section (103) of the first electrical contact member (100) is folded back and laid into the first slots (300) on top of said plurality of windings, and wherein a further plurality of windings is wound on top of said second section (103) of the first electrical contact member (100).

9. The method according to claim 7 or 8, **wherein** after having wound a plurality of windings onto the core (31), the second section (203) of the second electrical contact member (200) is laid into said second slots (301) on top of said plurality of windings wound onto the core (31) such that the first section (201) of the second electrical contact member (200) protrudes out of the arbor (30) through one of the second slots (301), wherein after having wound a further plurality of windings on top of said second section (203) of the second electrical contact member (200), the first section (201) of said second electrical contact member (200) is folded back and laid into the second slots (301) on top of said further plurality of windings, and wherein said second windings (6) are wound on top of said front side (201a) of said first section (201) of the second electrical contact member (200).

10. A coil (1), comprising:

- a coil bundle (2) comprising a wound wire cladded with an electrical insulation (11), wherein the wound wire (10) forms a plurality of layers (3) of windings, which layers (3) are arranged on top of one another, and wherein each layer (3) comprises a plurality of windings of said wire (10),
- at least a first electrical contact member (100) for electrically contacting the coil bundle (2), the first electrical contact member (100) comprising a first section (101), wherein a plurality of successive first windings (5) extends over a front side (101a) of said first section (101), wherein the first windings (5) each comprise a wire section (50) that is arranged on said front side (101a) of said first section (101) of the first electrical contact member (100) and comprises a recess in the electrical insulation (11) to form an exposed wire region (51) that is soldered to said front side (101a) of said first section (101) of said first electrical contact member (100).

11. The coil according to claim 10, **wherein** the first electrical contact member (100) comprises a second section (103) that is connected to the first section (102) of the first electrical contact member (100) via a connecting section (102), wherein the second section (103) is arranged between two neighboring layers (3a, 3b) of the coil bundle (2) for anchoring the first electrical contact member (100) in the coil bundle (2), and wherein the connecting section (102) of the first electrical contact member (100) protrudes from the coil bundle (2) and forms an electrical contact (104).

12. The coil according to claim 10 or 11, **wherein** the coil (1) further comprises a second electrical contact member (200) for electrically contacting the coil bundle (2), the second electrical contact member (200) comprising a first section (201), wherein a plurality of successive second windings (6) extend over a front side (201a) of said first section (201) of the second electrical contact member (200), wherein the second windings (6) each comprise a wire section (60) that is arranged on said front side (201a) of said first section (201) of the second electrical contact member (200) and comprises a recess in the electrical insulation to form an exposed wire region (61) that is soldered to said front side (201a) of said first section (201) of said second electrical contact member (200).

13. The coil according to claim 12, **wherein** the second electrical contact member (200) comprises a second section (203) that is connected to the first section (201) of the second electrical contact member (200) via a connecting section (202) of the second electrical contact member (200), wherein the second section (203) of the second electrical contact member (200) is arranged between two neighboring layers (3c, 3d) of the coil bundle (2) for anchoring the second electrical contact member (200) in the coil bundle (2), and wherein the connecting section (202) of the second electrical contact member (200) protrudes from the coil bundle (2) and forms an electrical contact (204).

14. The coil according to one of the claims 10 to 13, **wherein** said first windings (5) form an innermost layer of windings of the coil bundle (2) and/or wherein said second windings (6) form an outermost layer of windings of the coil bundle (2).

15. The coil according claim 14, **wherein** the first section (101) of the first electrical contact member (100) is arranged between said innermost layer (5) and an adjacent neighboring layer (5a) arranged on top of said innermost layer (5); and/or wherein the first section (201) of the second electrical contact member (200) is arranged between said outermost layer (6) and an adjacent neighboring layer (6a) arranged below said outermost layer (6).

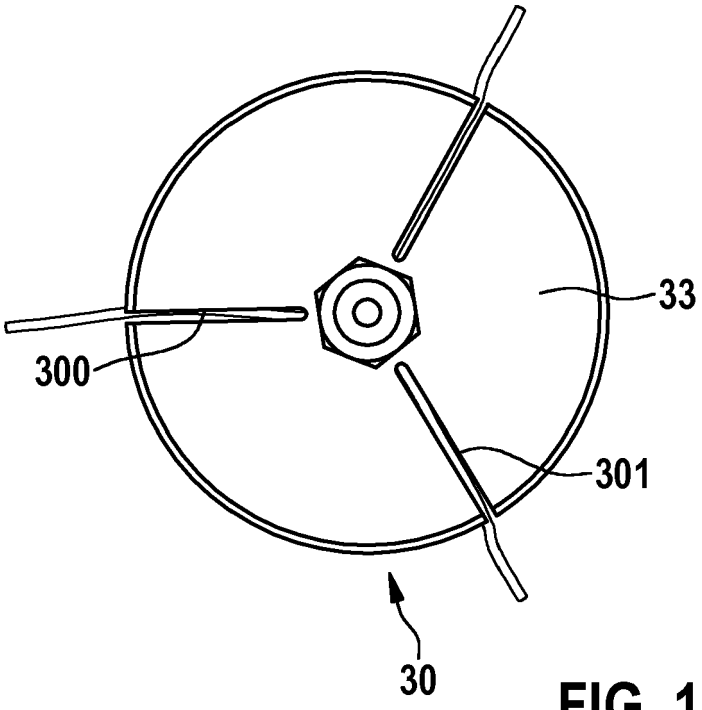


FIG. 1

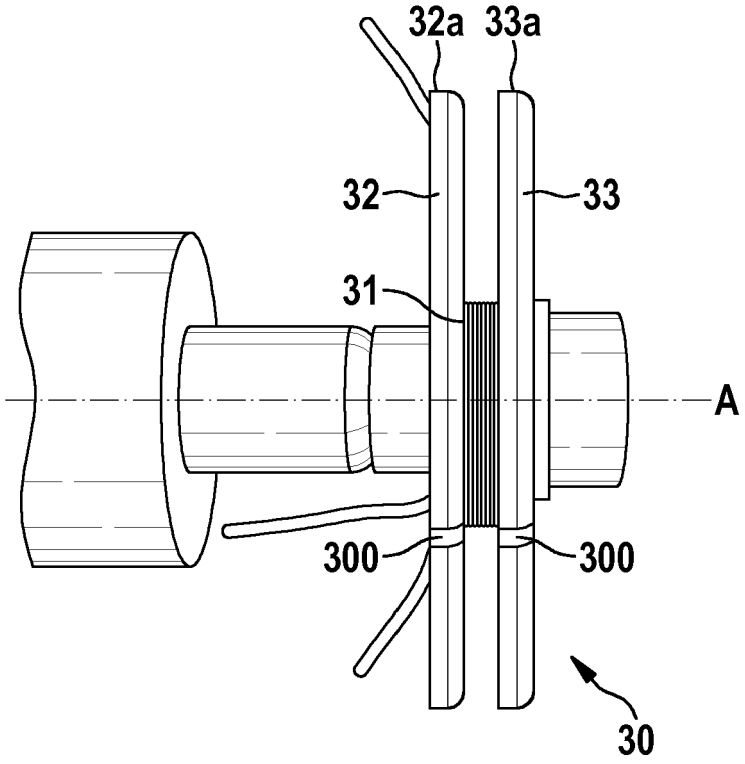


FIG. 2

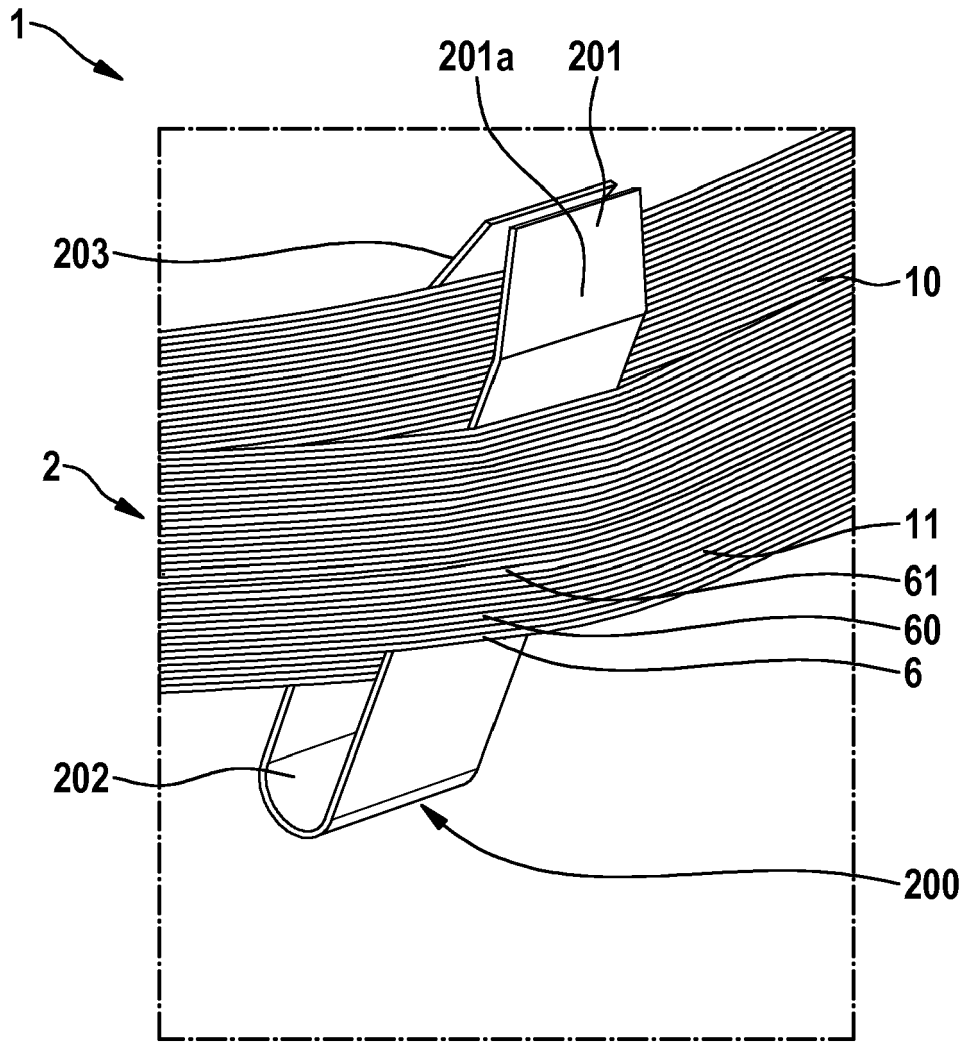


FIG. 3

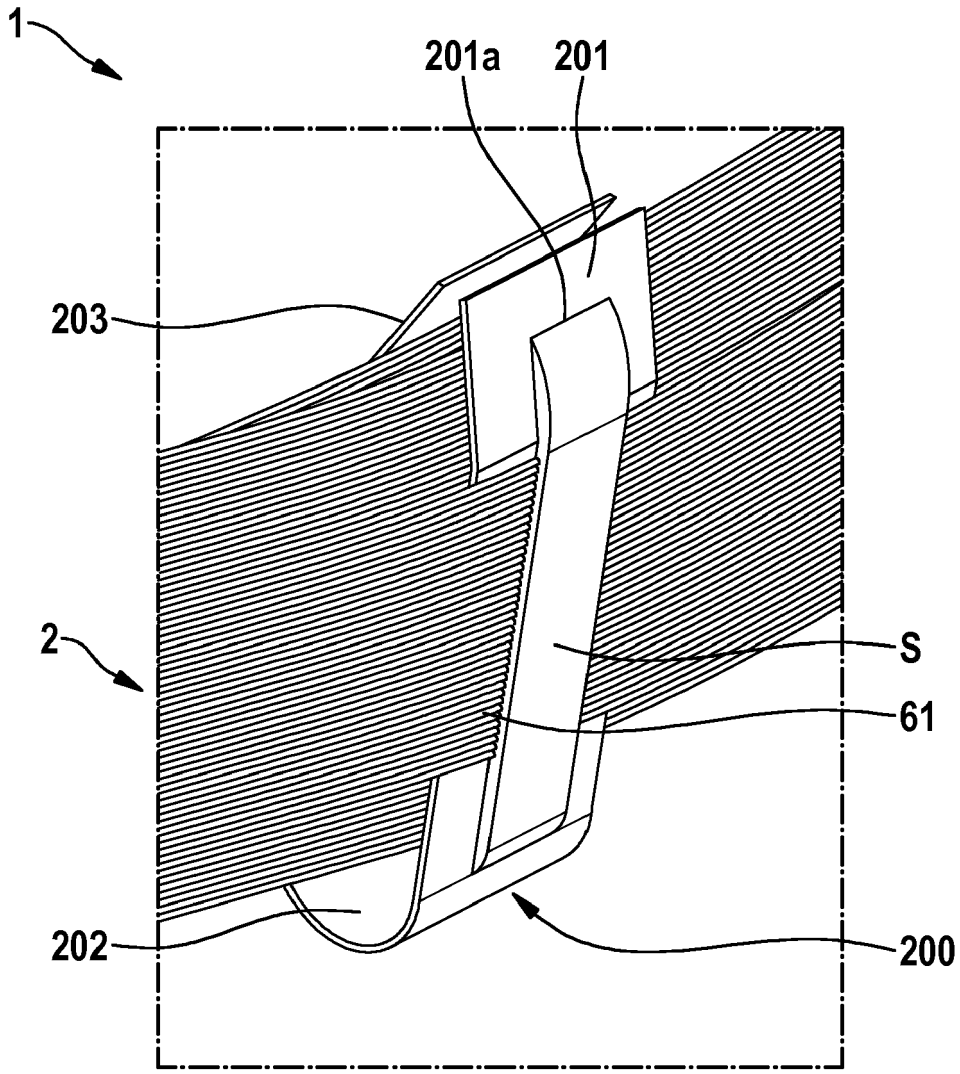
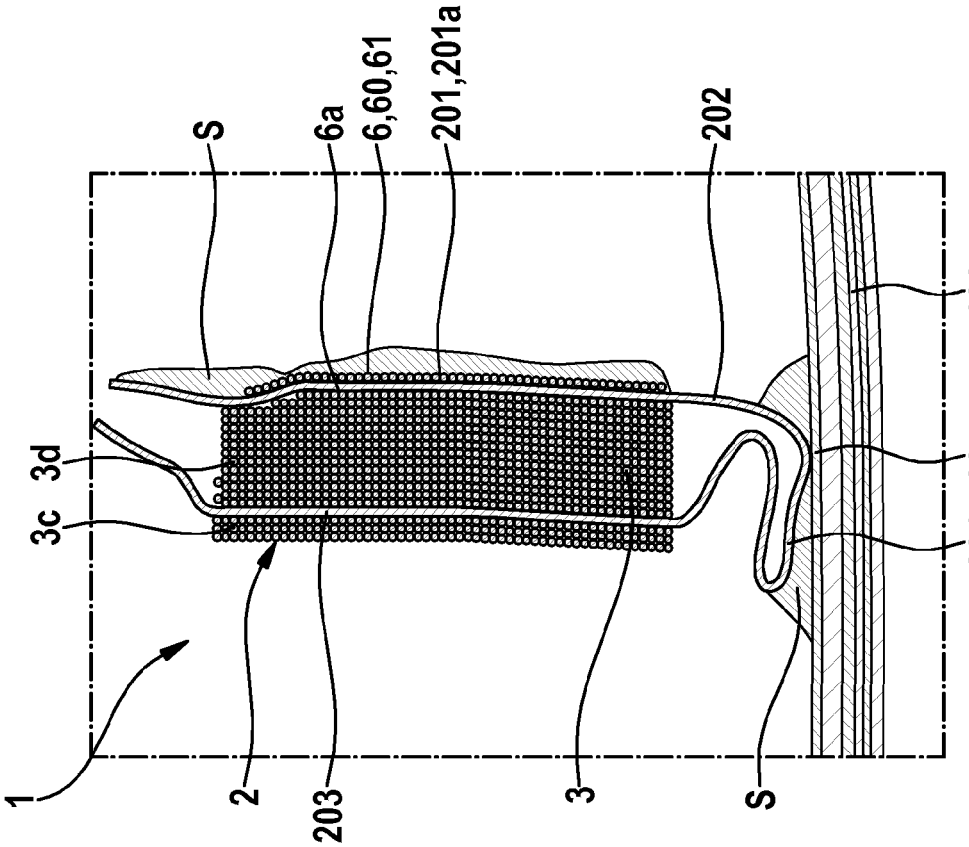


FIG. 4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2
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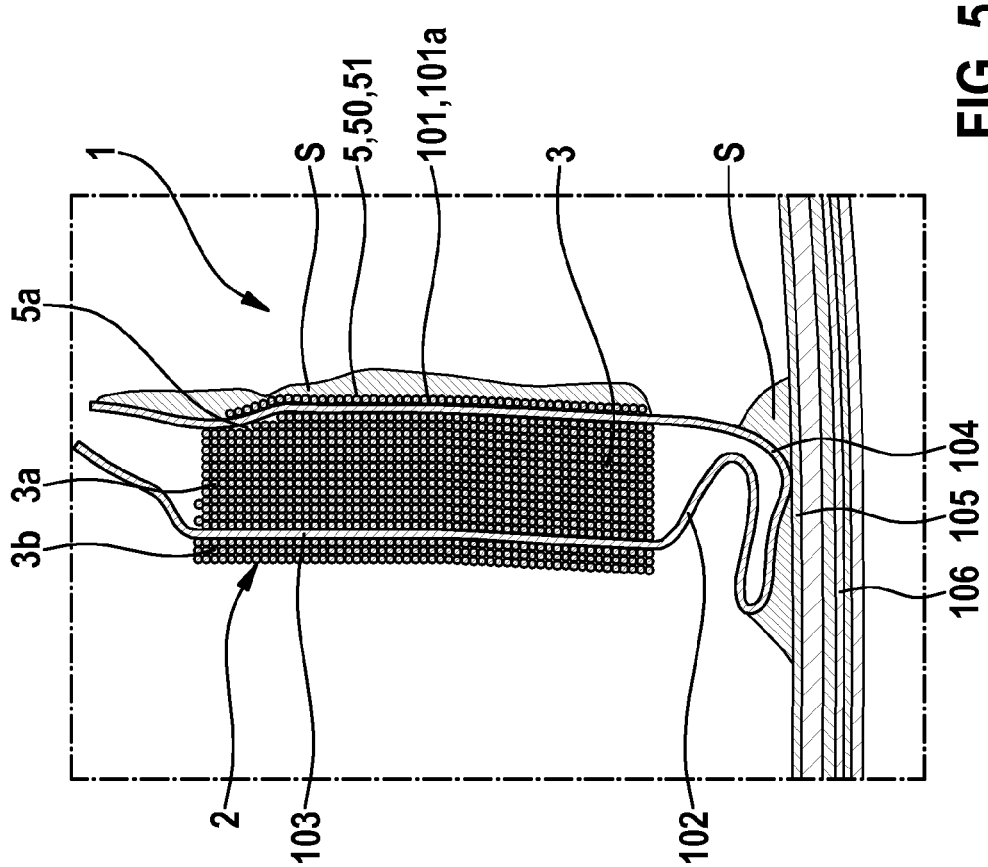
S

FIG. 6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106
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FIG. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 17 19 6758

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	GB 275 471 A (BRITISH ELECTRIC TRANSFORMER C; JAN ROOTHAAN) 11 August 1927 (1927-08-11) * page 3, left-hand column, paragraph 43-55 * * figures 12-16 *	1-15	INV. H01F27/29 H01F27/28 H01F41/10 H01F5/04
A	US 2 154 070 A (FRANZ ERWIN E) 11 April 1939 (1939-04-11) * page 1, right-hand column, line 13 - page 2, left-hand column, line 15 * * figures 1-6 *	1-15	
A	US 3 142 030 A (LENOX WARREN S ET AL) 21 July 1964 (1964-07-21) * column 2, line 24 - column 4, line 15; figures 1-10 *	1-15	

TECHNICAL FIELDS SEARCHED (IPC)

H01F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	22 March 2018	Kardinal, Ingrid

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 17 19 6758

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22-03-2018

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US 2154070 A	11-04-1939	NONE	
US 3142030 A	21-07-1964	NONE	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82