

(19)



(11)

EP 4 819 184 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
07.10.2026 Bulletin 2026/41

(51) International Patent Classification (IPC):
H01H 33/662 ^(2006.01)

(21) Application number: **25168606.9**

(52) Cooperative Patent Classification (CPC):
H01H 33/66261; H01H 33/664

(22) Date of filing: **04.04.2025**

(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 ME MK MT NL
NO PL PT RO RS SE SI SK SM TR**
Designated Extension States:
BA
Designated Validation States:
GE KH LA MA MD TN

(72) Inventors:
• **McKeown, Siobhan**
1024 Ecublens (CH)
• **Rault, Julien**
3013 Bern (CH)
• **Lantz, Gabriel**
8005 Zurich (CH)

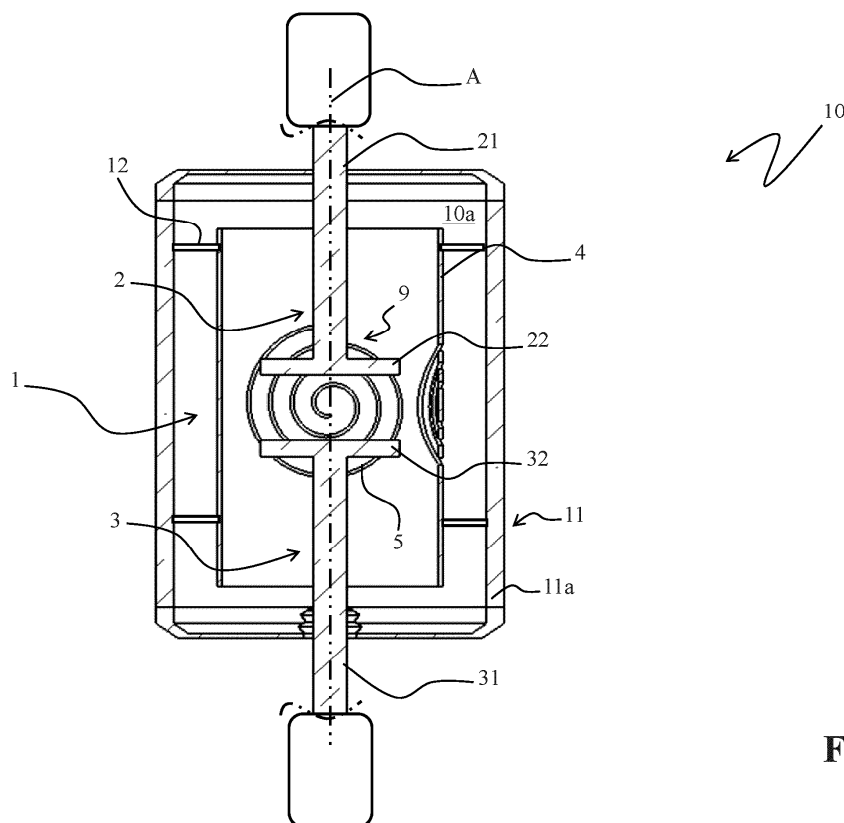
(71) Applicant: **ABB Schweiz AG**
5400 Baden (CH)

(74) Representative: **De Bortoli, Eros et al**
Zanoli & Giavarini S.p.A.
Via Melchiorre Gioia, 64
20125 Milano (IT)

(54) CONTACT ASSEMBLY FOR CIRCUIT INTERRUPTERS

(57) A contact assembly for circuit interrupters, which comprises first and second contact members positioned facing each other along a longitudinal axis and movable relative to each other along said longitudinal axis between an open position and a closed position.

Said contact assembly comprises a carved shield member formed by a hollow piece of conductive material positioned coaxially relative to said second contact members along said longitudinal axis and spaced apart from said first and second contact members.

**FIG. 1****EP 4 819 184 A1**

Description

[0001] The present invention relates to a contact assembly for circuit interrupters, in particular for vacuum circuit interrupters.

[0002] Vacuum interrupters are widely used in switching apparatuses (e.g., circuit breakers, disconnectors, contactors, and the like) for breaking and making currents.

[0003] A vacuum interrupter includes a contact system accommodated in an enclosure where a vacuum atmosphere is obtained. Such a contact system typically includes a pair of electric contacts that are movable relative to each other in such a way to be coupled/uncoupled to make/interrupt a current along an electric line.

[0004] In most cases, the contact system of a vacuum interrupter further includes also a vapor shield, i.e., a conductive element, which generally has a cylindrical shape and surrounds the electric contacts to prevent vapor deposition on ceramic parts, protect ceramic parts from possible arc strikes and shape the electric field between the electric contacts when these latter are open. As is known, in operation, vacuum interrupters have often to interrupt high currents (even in the order of tens of kA) at very high voltages (even in the order of tens of kV).

[0005] For this reason, the contact system of a vacuum interrupter typically includes electric contacts designed with special structural features, which help to control the behaviour of electric arcs arising during the opening manoeuvres in such a way to ensure the requested current interruption performance. As an example, the electric contacts may be designed in such a way to drive possible electric arcs away from the center of the corresponding contact heads, thus preventing overheating phenomena of the contact heads and favouring the arc quenching process.

[0006] The contact systems for vacuum interrupters, which are currently available in the state of the art, can still be improved.

[0007] Experience has shown that, under certain circumstances, during an opening manoeuvre, plasma jets coming from the gap region between the electric contacts under separation may reach the vapor shield, thereby causing electric arcs to jump from the electric contacts to the vapor shield. These undesired phenomena may cause an overheating of the vapor shield and generate a lot of metal vapor, which is detrimental for the current interruption performance and leads to a quick consumption of the vapor shield member that, normally, is not designed for being directly involved in the current interruption process.

[0008] The main aim of the present invention is to provide a contact system for circuit interrupters, in particular for vacuum circuit interrupters, which allows overcoming or mitigating the drawbacks of the known art.

[0009] Within this aim, a purpose of the present invention is to provide a contact assembly, which is capable of interrupting high currents at high operating voltages with

limited restriking phenomena during the current interruption process.

[0010] A further purpose of the present invention is to provide a contact assembly, in which the electric contacts and the vapor shield are subject to limited erosion phenomena during the opening manoeuvres.

[0011] A further purpose of the present invention is to provide a contact assembly, which can be easily arranged in an interruption chamber, particularly in a vacuum interruption chamber.

[0012] A further purpose of the present invention is to provide a contact assembly, which has a relatively simple construction and is relatively cheap to manufacture at industrial levels.

[0013] The above aim and purposes, as well as other purposes that will emerge clearly from the following description and attached drawings, are provided, according to the invention, by a contact assembly, according to the following claim 1 and the related dependent claims.

[0014] In a general definition, the contact assembly of the invention comprises first and second contact members positioned facing each other along a longitudinal axis and movable relative to each other along said longitudinal axis between an open position, in which said contact members are spaced apart from each other by a gap distance, and a closed position, in which said contact members are in contact with each other.

[0015] The contact assembly, according to the invention, further comprises a first shield member formed by a hollow piece of conductive material arranged coaxially with said contact members along said longitudinal axis. Said first shield member surrounds said contact members around said longitudinal axis and has an axial length longer than the gap distance between the contact members, when these latter are in an open position.

[0016] According to some embodiments, the contact assembly, according to the invention, comprises a second shield member formed by a hollow piece of conductive material arranged coaxially with the contact members and the first shield member along said longitudinal axis. Said second shield member surrounds said contact members and said first shield member around said longitudinal axis.

[0017] According to the invention, the first shield member comprises one or more carved regions, each of which includes one or more slots turning around a radial axis perpendicular to the longitudinal axis of the contact members.

[0018] The one or more slots of the first shield member define one or more curved conductive portions of the first shield member. Said curved conductive portions turn around a radial axis perpendicular to the longitudinal axis of the contact members.

[0019] According to some embodiments of the invention, the first shield member comprises at least a carved region including a slot forming multiple loops around a radial axis perpendicular to the longitudinal axis of the contact members.

[0020] According to an embodiment of the invention, the first shield member comprises at least a carved region including a spiral-shaped slot centred on a radial axis perpendicular to the longitudinal axis of the contact members.

[0021] According to some embodiments of the invention, the first shield member comprises at least a carved region including a slot having multiple adjacent slot portions partially turning around a radial axis perpendicular to the longitudinal axis of the contact members. The adjacent slot portions are spaced and arranged side-by-side relative to each other.

[0022] Preferably, the first shield member comprises a plurality of adjacent carved regions distributed around the longitudinal axis of the contact members and positioned at a central section of said shield member, which surrounds a gap region between the contact members, when said contact members are in an open position.

[0023] According to some embodiments of the invention, the first shield member comprises at least a first carved region, which includes a first slot turning around a first radial axis perpendicular to the longitudinal axis of the contact members, and a second carved region, which includes a second slot turning around a second radial axis perpendicular to the longitudinal axis of the contact members.

[0024] In a further aspect, the present invention relates to a circuit interrupter - preferably a vacuum circuit interrupter - comprising a contact assembly as described herein.

[0025] Further features and advantages of the present invention will be more apparent from the description of preferred but not exclusive embodiments of the present invention, shown by way of examples in the accompanying drawings, wherein:

- Figures 1-2 schematically show a vacuum interrupter including a contact assembly, according to an embodiment of the invention, in different operating conditions;
- Figure 3 schematically shows a vacuum interrupter including the contact assembly, according to a further embodiment of the invention;
- Figure 4 schematically shows a carved region of a vapor shield included in the contact assembly, according to the embodiments of figures 1-3;
- Figures 5-6 schematically show a carved region of a vapor shield included in the contact assembly, according to further embodiments of the invention;
- Figures 7A-7B schematically show a vapor shield included in the contact assembly, according to the embodiments of figures 1-3;
- Figures 8-9 schematically show a vapor shield included in the contact assembly, according to further embodiments of the invention;
- Figure 10 schematically shows the operation of the contact assembly, according to the present invention, during an opening manoeuvre of a vacuum

interrupter.

[0026] With reference to the attached figures, the present invention relates to a contact assembly 1 for a circuit interrupter, in particular for a vacuum circuit interrupter.

[0027] A circuit interrupter, which includes the contact assembly 1, is particularly adapted for use in switching apparatuses, e.g., circuit breakers, disconnectors, contactors, or the like, which operate at medium voltage levels, i.e., at voltages higher than 1 kV AC and 1.5 kV DC. In principle, however, such a circuit interrupter may be also used in different applications.

[0028] Figures 1-3, 10 show a vacuum interrupter 10 including the contact assembly 1.

[0029] In the following, the contact assembly 1 will be described with particular reference to this specific application for the sake of simplicity. This choice does not intend to limit the scope of the present invention in any way. The contact assembly 1, according to the invention, may be used with simple adaptations also in circuit interrupters of different type.

[0030] Referring now to the above-mentioned figures, the vacuum interrupter 10 includes an outer enclosure 11 having one or more walls 11a defining an interruption chamber 10a, in which a vacuum atmosphere is obtained.

[0031] Preferably, one or more walls 11a of the outer enclosure 11 can be at least partially made of an electrically insulating material, for example one or more ceramic materials.

[0032] Preferably, the outer enclosure 11 has a cylindrical shape extending along a main longitudinal axis A. In principle, however, it may have an overall shape different from the embodiments shown in figures 1-3.

[0033] In general, the outer enclosure 11 and the contact chamber 10a of the vacuum interrupter can be realized in practice according to solutions of known type. Thus, in the following, these components will be described only in relation to the aspects of interest of the invention, for the sake of brevity.

[0034] The contact assembly 1 is arranged in the interruption chamber 10a of the vacuum interrupter. The contact assembly 1 comprises first and second contact members 2, 3 intended to be connected electrically to corresponding terminals of an electric line.

[0035] The contact members 2, 3 are positioned facing each other along a longitudinal axis A (which, in this case, coincides with the main longitudinal axis of the vacuum interrupter) and are reversibly movable relative to each other along the longitudinal axis A, namely between an open position (figure 1), in which the contact members 2, 3 are spaced apart from each other by a gap distance D (figure 3), and a closed position, in which the contact members 2, 3 are in contact with each other.

[0036] A transition of the contact members 2, 3 from an open position to a closed position forms a closing manoeuvre of the contact assembly while a transition of the contact members 2, 3 from a closed position to an open

position forms an opening manoeuvre of the contact assembly. Preferably, the contact assembly 1 comprises a fixed contact member 2 and movable contact member 3, which can move translationally relative to the fixed contact member along the longitudinal axis A. In particular, the movable contact member 3 can reversibly move between the open position of figure 1, in which it is separated from the fixed contact 2, and the closed position of figure 2, in which it is in contact with the fixed contact 2.

[0037] Preferably, each contact member 2, 3 has a contact head 22, 32 and a contact stem 21, 31 supporting a corresponding contact head.

[0038] The contact head 22, 32 of each contact member 2, 3 can be formed a disk-shaped or cup-shaped piece of conductive material, which is joined to the corresponding contact stem 21, 31 on one side and has a free contact surface 220, 320 on an opposite side (figure 3).

[0039] Preferably, the contact head 22, 32 of each contact member 2, 3 has a larger diameter than the corresponding supporting stem 21, 31.

[0040] Preferably, the contact head 22, 32 of each contact member 2, 3 includes linear or spirally shaped cut-out portions (not shown) and/or can be made of pieces of different conductive materials, according to the needs.

[0041] The contact stem 21, 31 of each contact member 2, 3 can be formed by an elongated piece of conductive material mainly extending along the longitudinal axis A and passing through a corresponding airtight aperture of the outer enclosure 11 of the circuit interrupter.

[0042] In general, the contact members 2, 3 of the contact assembly 1 can be realized in practice according to solutions of known type, for example according to the solutions proposed in the European patent application nr. EP23213881.8. Thus, in the following, these components will be described only in relation to the aspects of interest of the invention, for the sake of brevity. The contact assembly 1 comprises a first shield member 4 formed by a hollow piece of conductive material positioned coaxially with the contact members 2, 3 along the longitudinal axis A.

[0043] In the embodiments shown in the cited figures, the first shield member 4 is spaced apart from both the contact members 2, 3. In this case, in operation, it is preferably at a floating potential relative to said contact members. In other embodiments, however, the first shield member 4 can be in contact with one of the contact members 2, 3, thereby being at the same potential of such a contact member.

[0044] Advantageously, the spacing between the first shield member 4 and the contact members 2, 3 is relatively small. For example, the radius of the first shield member 4 should be around 1.1 times the radius of the contact heads 22, 32 (figures 1-3, 11 are not dimensionally in scale).

[0045] The first shield member 4 is arranged in such a way to surround the contact members 2, 3 around the longitudinal axis A, in practice according to a radial direction relative to this latter. The first shield member 4 has an axial length L longer than the gap distance D between the contact members 2, 3 when these latter are in an open position. For example, the axial length L of the first shield member 4 may be at least twice the gap distance D (figures 1-3, 11 are not dimensionally in scale).

[0046] Preferably, the first shield member 4 is formed by a hollow cylinder of conductive material having the above-mentioned axial length L. In principle, however, the first shield member 4 may be shaped as a cylindroid or a prism having the above-mentioned axial length L. Generally, the first shield member 4 is relatively thin compared to the contact heads 22, 32 of the contact members. For example, the thickness of the first shield member can be of some mm. In some cases, the first shield member 4 can include supporting wings fixed (for example brazed) to the walls 11a of the outer enclosure 11 in such a way to support and maintain it in a suitable operating position relative to the contact members 2, 3. However, other solutions are possible, according to the needs.

[0047] In general, the first shield member 4 has the function of protecting the internal surfaces of the outer enclosure 11 from the vapor deposition of metal material and from possible arc strikes during the opening manoeuvres of the contact assembly. The first shield member 4 has also the function of shaping the electric field between the contact members 2, 3 when these latter are open. Nonetheless, as it will better emerge from the following, by virtue of the solution proposed by the present invention, the first shield member 4 plays an important role in the current interruption process during an opening manoeuvre of the vacuum interrupter. According to the embodiment shown in figure 3, the contact assembly 1 comprises a second shield member 6 formed by a further hollow piece of conductive material positioned coaxially with the contact members 2, 3 and the first shield member 4, along the longitudinal axis A.

[0048] In the embodiments shown in the cited figures, the second shield member 6 is spaced apart from both the contact members 2, 3. In other embodiments, however, the second shield member 6 can be electrically in contact with one of the contact members 2, 3 and/or the first shield member 4.

[0049] Advantageously, the spacing between the first and second shield members 4, 6 is relatively small, for example some mm. The second shield member 6 is arranged in such a way to surround the contact members 2, 3 and the first shield member 4 around the longitudinal axis A, in practice according to a radial direction relative to this latter.

[0050] Preferably, also the second shield member 6 has an axial length longer than the gap distance D between the contact members 2, 3 when these latter

are in an open position. As an example, the axial length of the second shield member 6 can have the same axial length of the first shield member 4.

[0051] Preferably, the second shield member 6 is formed by a hollow cylinder of conductive material. In principle, however, it may be shaped as a cylindroid or a prism.

[0052] Generally, the second shield member 6 is relatively thin compared to the contact heads 22, 32 of the contact members. For example, the thickness of the second shield member can be of some mm as for the first shield member.

[0053] In some cases, also the second shield member 6 can include supporting wings fixed to the walls 11a of the outer enclosure 11 in such a way to support and maintain it in a suitable operating position relative to the contact members 2, 3. However, other solutions are possible, according to the needs.

[0054] In general, the second shield member 6 has the function of providing further protection from the vapor deposition of metal material, during the opening manoeuvres of the contact assembly. Referring to figures 4-10, the essential aspects of the invention are now illustrated in detail. According to the invention, the first shield member 4 comprises one or more carved regions 9, 9a, 9b, each including one or more slots 5, 5a, 5b, 5c, 5d, 5e.

[0055] The above-mentioned slots are carved on the first shield member 4, namely on the one or more curved walls forming this latter.

[0056] Each slot 5, 5a, 5b, 5c, 5d, 5e is arranged in such a way to turn around a radial axis R, R_a , R_b perpendicular to the longitudinal axis A along which the contact members 2, 3 and the shield member 4 are arranged. In other words, each slot 5, 5a, 5b, 5c, 5d, 5e extends along a corresponding path, which is shaped as an open curve turning around the radial axis R, R_a , R_b . The one or more slots 5, 5a, 5b, 5c, 5d, 5e define one or more conductive portions 7, 7a, 7b of the first shield member 4, which turn around the radial axis R, R_a , R_b around which the one or more slots 5, 5a, 5b, 5c, 5d, 5e are arranged.

[0057] Figure 10 schematically shows the operation of the contact assembly 1, according to the invention, during an opening manoeuvre.

[0058] When the contact members 2, 3 separate, electric arcs (here represented as cylindric plasma regions) arise between the contact members.

[0059] As the contact members have contact heads 22, 32 that are generally designed to move the electric arcs towards their outer perimeter (as mentioned above), the arising electric arcs can jump towards the first shield member 4. As shown in figure 10, electric arcs can strike between each of the contact members 2, 3 and the first shield member 4.

[0060] As the first shield member 3 is made of a conductive material, an arc current I can circulate along the first shield member 4 between the arc roots formed on

said shield member.

[0061] However, since the first shield member 4 includes the carved regions 9, each having one or more curved conductive portions 7 defined by one or more curved slots 5, the arc current I is forced to circulate along a curved conductive path, which turns around a radial direction perpendicular to the longitudinal axis A.

[0062] Due to the orientation of such a conductive path, the arc current I generates a magnetic field directed along a radial direction perpendicular to the longitudinal axis A.

[0063] Such a magnetic field combines with the magnetic field generated by other sections of the arc path and alters the magnetic forces acting on the arc which are normally present in absence of the carved regions 9.

[0064] Thus, an electric arc arising between a contact member 2, 3 and the first shield member 4 is subject to a magnetic force F (Lorentz force) directed transversally to the electric arc and promotes a movement the electric arc along a radial radiation perpendicular to the longitudinal axis A. An arising electric arc may be also subject to a magnetic field promoting a diffuse behaviour of the arc on the first shield member 4 as it is generated by magnetic field components aligned axially with the arc.

[0065] An electric arc arising between the first contact member 2 and the first shield member 4 and an electric arc arising between the second contact member 3 and the first shield member 4 are thus subject to magnetic forces F, the combined action of which may promote the movement of the arc roots along the first shield member 4.

[0066] Such a beneficial effect is strictly linked to the circumstance that the arc currents I are forced to circulate along curved conductive paths turning around a radial direction perpendicular to the longitudinal axis A.

[0067] The carved regions 9 of the first shield member 4, in fact, make available one or more curved conductive portions 7, which are delimited by one or more slots 5, to conduct the arc currents I in proximity of a number of possible attachment spots for the electric arcs.

[0068] Besides, computer simulations have confirmed how, in the contact assembly of the invention, the magnetic forces exerted on the electric arcs arising during an opening manoeuvre are quite stronger (2-6 times) than the magnetic forces normally generated in solutions where the vapour shield has no slots or have slots arranged differently.

[0069] In view of the above, it is evident how the solution proposed by the present invention allows controlling very effectively the behaviour of electric arcs arising between the contact members 2, 3 under separation and the first shield member 4, during the opening manoeuvres of the contact assembly.

[0070] Differently from the traditional solutions of the state of the art, the arising electric arcs do not stagnate on specific attachment spots on the first shield member 4. This greatly reduces heat stresses and erosion phenomena on the first shield member and on the contact members and favours the quenching of said electric arcs.

[0071] Figures 4-6 show some embodiments of the invention, in which the first shield member 4 includes carved regions 9 structured in accordance with the above-illustrated essential aspects of the invention.

[0072] According to some embodiments of the invention (figures 4-5), the first shield member 4 comprises at least a carved region 9 including a single slot 5 forming multiple loops around a radial axis R perpendicular to the longitudinal axis A. In practice, the slot 5 extends along a path shaped as an open curve forming multiple loops (each loop covers an angle of 360°) around the radial axis R.

[0073] The slot 5 defines a conductive portion 7, which repeatedly turns around the radial axis R, thereby making available a plurality of possible curved conductive paths for a possible arc current circulating between a pair of arc attachment spots located on the first shield member 4. In the embodiment of figure 4, the carved region 9 includes a single slot 5 extending along a spiral-shaped path centred on the radial axis R. It has been seen that, by virtue of its intrinsic geometric symmetry, this solution is particularly efficient in continuously moving the arc attachment spots along the first shield member 4.

[0074] In the embodiment of figure 5, the carved region 9 includes a single slot 5 extending along a segmented path forming multiple loops around the radial axis R. This solution constitutes a variant of the solution proposed in figure 4, in which the edges of the slot 5 show angles or squared portions rather than being continuously rounded.

[0075] According to other embodiments of the invention (figure 6), the first shield member 4 comprises at least a carved region 9 including a single slot 5 including multiple adjacent slot portions 5a, 5b, 5c turning around a radial axis R perpendicular to the longitudinal axis A.

[0076] The adjacent slot portions 5a, 5b, 5c are spaced one from another and side-by-side relative to each other, so that they define multiple conductive portions 7a, 7b of the first shield member, which turn around the radial axis R. In this way, multiple curved conductive paths are made available for possible arc currents circulating along the first shield member 4.

[0077] Each slot portion 5a, 5b, 5c preferably covers an angle lower than 360° around the radial axis R.

[0078] Each slot portion 5a, 5b, 5c is preferably arc-shaped in the sense that it extends along an arc-shaped path turning around the radial axis R. In principle, however, each slot portion 5a, 5b, 5c can extend along a curved segmented path turning around the radial axis R, similarly to the embodiment of figure 5.

[0079] As it can be easily understood, the carved regions 9 of the first shield member 4 can be realized according to further variants, all conceived in such a way to make available multiple curved conductive paths (turning around radial directions perpendicular to the longitudinal axis A) for possible arc currents circulating along the first shield member 4 during the opening manoeuvres of the circuit assembly.

[0080] Figures 7A-7B, 8-9 show some examples of how the carved regions 9 of the first shield member 4 can be distributed along the first shield member. In these examples, each carved region 9 includes a single spiral-shaped slot in accordance with the embodiment of figure 4. It is however intended that the carved regions 9 may be realized also in accordance with other illustrated embodiments or further variants of the invention.

[0081] Preferably, the first shield member 4 comprises a plurality of adjacent carved regions 9 distributed around the longitudinal axis A.

[0082] Preferably, the carved regions 9 are positioned at a central section 4a of the first shield member, which surrounds a gap region 8 (figure 1) between the first and second contact members 2, 3, when these latter are in an open position.

[0083] As it is evident, this solution greatly favours driving possible arc currents, which are generated during the opening manoeuvres of the contact assembly, along the curved conductive paths made available by the aforesaid carved regions 9 as said conductive paths are located at the most probable attachment spots for the electric arcs.

[0084] In the solution of figures 7A-7B, the first shield member 4 includes a plurality of enlarged carved regions 9 (compared to the overall size of the first shield member), which are arranged in a row along the perimeter of the central section 4a of the first shield member.

[0085] In the solution of figure 8, the first shield member 4 includes a plurality of relatively small carved regions 9 (compared to the overall size of the first shield member), which are arranged in multiple parallel rows along the perimeter of the central section 4a of the first shield member. The carved regions 9 of adjacent rows are advantageously staggered relative to each other in such a way to cover more effectively the central section 4a of the first shield member.

[0086] Figure 9 shows a further embodiment of the invention, in which the first shield member 4 comprises at least a first carved region 9a, which includes a first slot 5d extending along a first curved path turning around a first radial axis R_a perpendicular to the longitudinal axis A, and a second carved region 9b preferably adjacent to the first carved region 9a), which includes a second slot 5e extending along a second curved path turning around a second radial axis R_b perpendicular to said longitudinal axis A. The first and second slots 5d, 5e of the first and second carved regions 9a, 9b are interconnected in such a way to form a single prolonged slot. This solution improves the coverage of the central section 4a of the first shield member by the carved regions 9.

[0087] The first shield member 4 can include a plurality of carved regions 9 arranged along the perimeter of the central section 4a of the first shield member and having their corresponding slots mutually interconnected.

[0088] According to other variants, the first shield member 4 can include distinct pairs of carved regions 9 arranged along the perimeter of the central section 4a of

the first shield member. Each pair of carved regions 9 can be realized according to the solution shown in figure 9.

[0089] The contact assembly, according to the invention, allows achieving the intended aim and objects.

[0090] As described above, an essential aspect of the contact assembly, according to the invention, consists in that the first shield member, which is directly exposed to electric arcs striking between the contact members, directly intervenes in the current interruption process during an opening manoeuvre of the vacuum interrupter by actively contributing to drive the arising electric arcs in such a way to improve the current interruption capabilities of the circuit interrupter. In this sense, the first shield member of the contact assembly of the invention can be considered as an "ancillary contact" intervening in the current interruption process.

[0091] By virtue of its improved capabilities in controlling the behaviour of electric arcs arising during opening manoeuvres, the contact assembly, according to the invention, can effectively and reliably interrupt high currents at high operating voltages with limited restriking phenomena. At the same time, the main components of the contact assembly, in particular the first shield member, are subject to limited heat stresses erosion phenomena compared to the currently available solutions of the state of the art.

[0092] The contact assembly, according to the invention, has a compact structure, which can be easily arranged in the interruption chamber of a circuit interrupter.

[0093] From a manufacturing standpoint, the contact assembly, according to the invention, is realizable at industrial level, at costs comparable to the traditional solutions of the state of the art.

Claims

1. A contact assembly (1) for circuit interrupters, said contact assembly comprising first and second contact members (2, 3) positioned facing each other along a longitudinal axis (A) and movable relative to each other along said longitudinal axis between an open position, in which said contact members are spaced apart from each other by a gap distance (D), and a closed position, in which said contact members are in contact with each other, wherein said contact assembly further comprises a first shield member (4) formed by a hollow piece of conductive material positioned coaxially with said contact members (2, 3) along said longitudinal axis (A),

wherein said first shield member (4) surrounds said contact members (2, 3) around said longitudinal axis (A) and has an axial length (L) larger than said gap distance (D), **characterised in that** said first shield member (4) comprises one or more carved regions (9, 9a, 9b), each including one or more slots (5, 5a, 5b, 5c, 5d, 5e)

turning around a radial axis (R , R_a , R_b) perpendicular to said longitudinal axis (A),

wherein said one or more slots define one or more curved conductive portions (7, 7a, 7b) of said first shield member (4), said curved conductive portions turning around said radial axis (R , R_a , R_b).

2. A contact assembly, according to claim 1, **characterised in that** said first shield member (4) comprises at least a carved region (9) including a slot (5) forming multiple loops around a radial axis (R) perpendicular to said longitudinal axis (A).

3. A contact assembly, according to claim 2, **characterised in that** said first shield member (4) comprises at least a carved region (9) including a single spiral-shaped slot (5) centred on said radial axis (R).

4. A contact assembly, according to claim 1, **characterised in that** said first shield member (4) comprises at least a carved region (9) including a slot (5) including multiple adjacent slot portions (5a, 5b, 5c) turning around a radial axis (R) perpendicular to said longitudinal axis (A), said adjacent slot portions being spaced and arranged side-by-side relative to each other.

5. Contact assembly, according to one of the previous claims, **characterised in that** said first shield member (4) comprises a plurality of adjacent carved regions (9) distributed around said longitudinal axis (A) and positioned at a central section (4a) of said shield member, said central section (4a) surrounding a gap region (8) between said first and second contact members (2, 3), when said first and second contact members (2, 3) are in an open position.

6. Contact assembly, according to one of the previous claims, **characterised in that** it comprises at least:

- a first carved region (9a) including a first slot (5a) turning around a first radial axis (R_a) perpendicular to said longitudinal axis (A);
- a second carved region (9b) including a second slot (5b) turning around a second radial axis (R_b) perpendicular to said longitudinal axis (A);

wherein said first and second slots (5a, 5b) are interconnected.

7. Contact assembly, according to one of the previous claims, **characterised in that** it comprises a second shield member (6) formed by a hollow piece of conductive material positioned coaxially with said contact members (2, 3) and said first hollow shield member (4) along said longitudinal axis (A), wherein said second shield member (6) surrounds

said contact members (2, 3) and said first shield member (4) around said longitudinal axis (A).

8. A vacuum interrupter (10) including an outer enclosure (11) defining an interruption chamber (10a), in which a vacuum atmosphere is obtained, **characterised in that** it comprises a contact assembly (1), according to one of the previous claims, arranged in said interruption chamber (10a).
9. A switching apparatus for low or medium voltage electric systems **characterised in that** it comprises a vacuum interrupter (10), according to claim 8.

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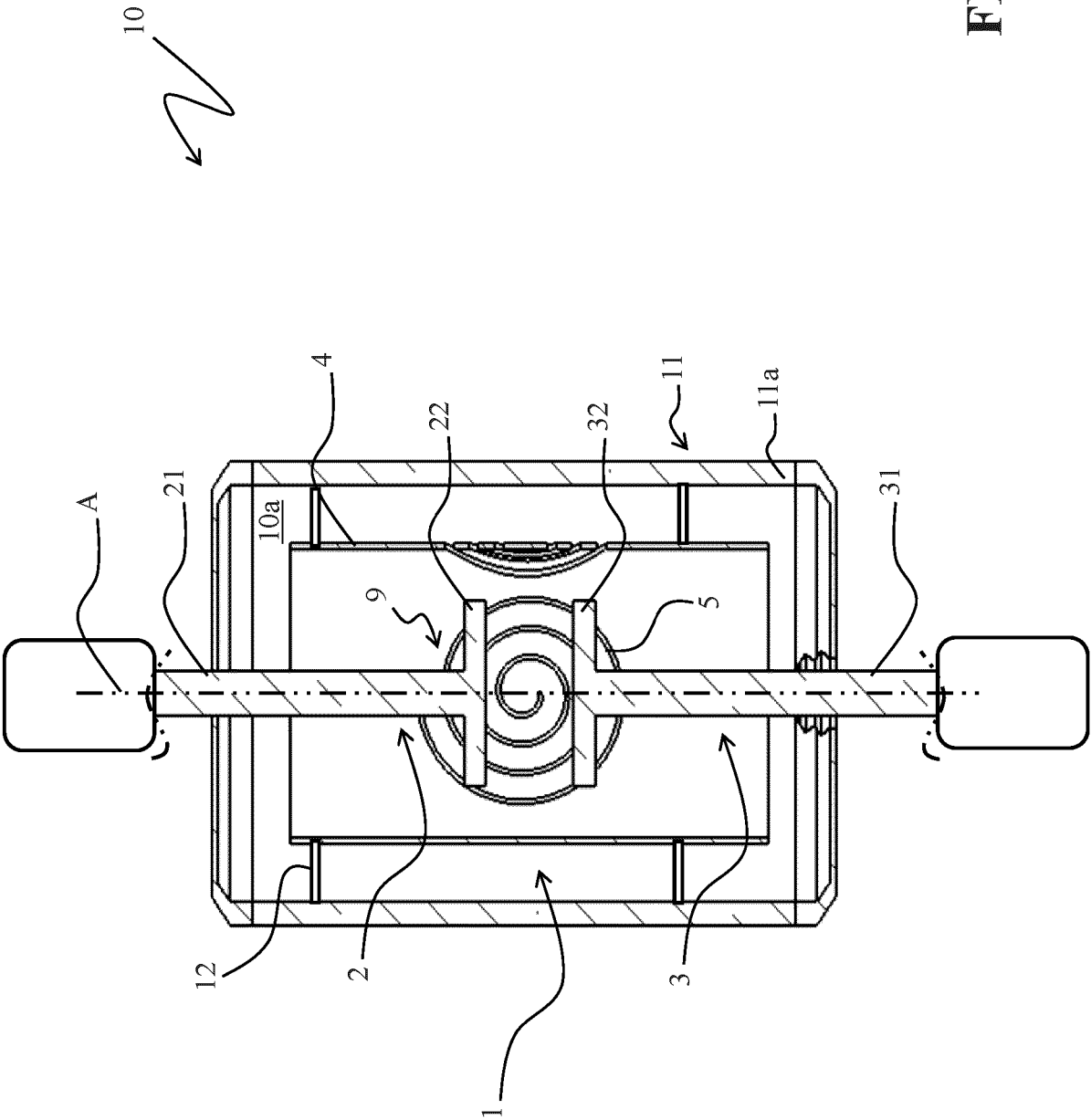


FIG. 1

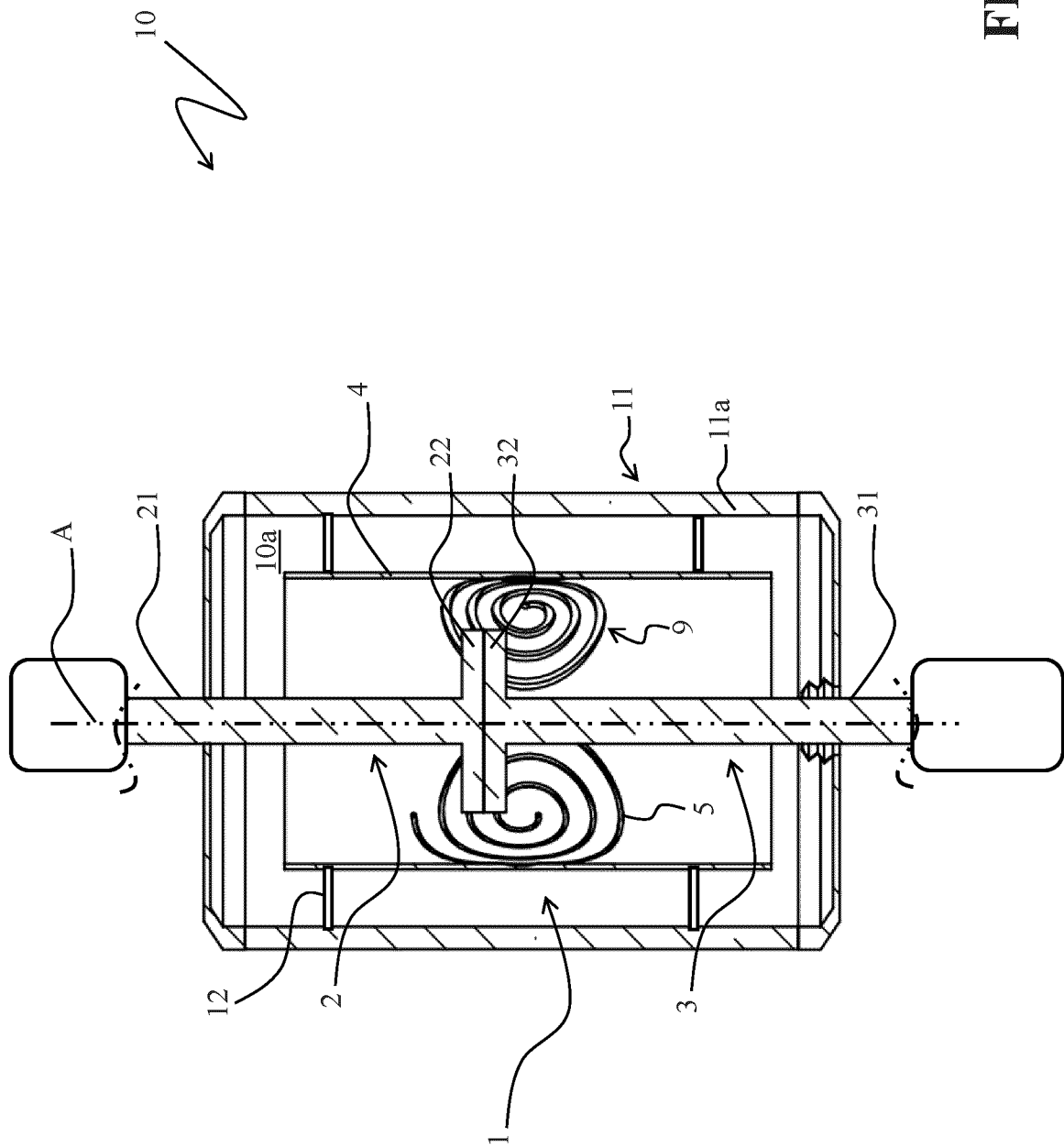


FIG. 2

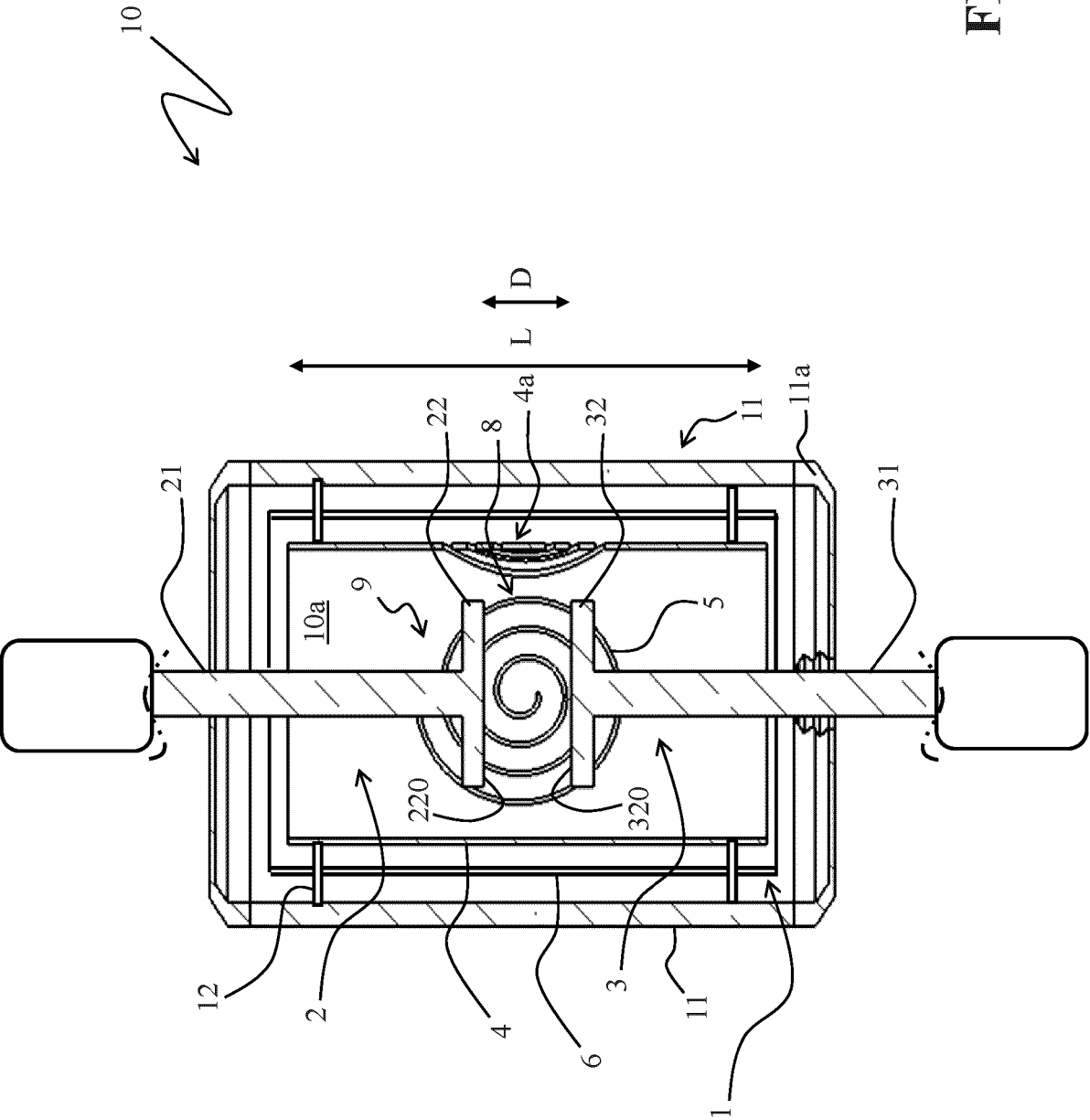


FIG. 3

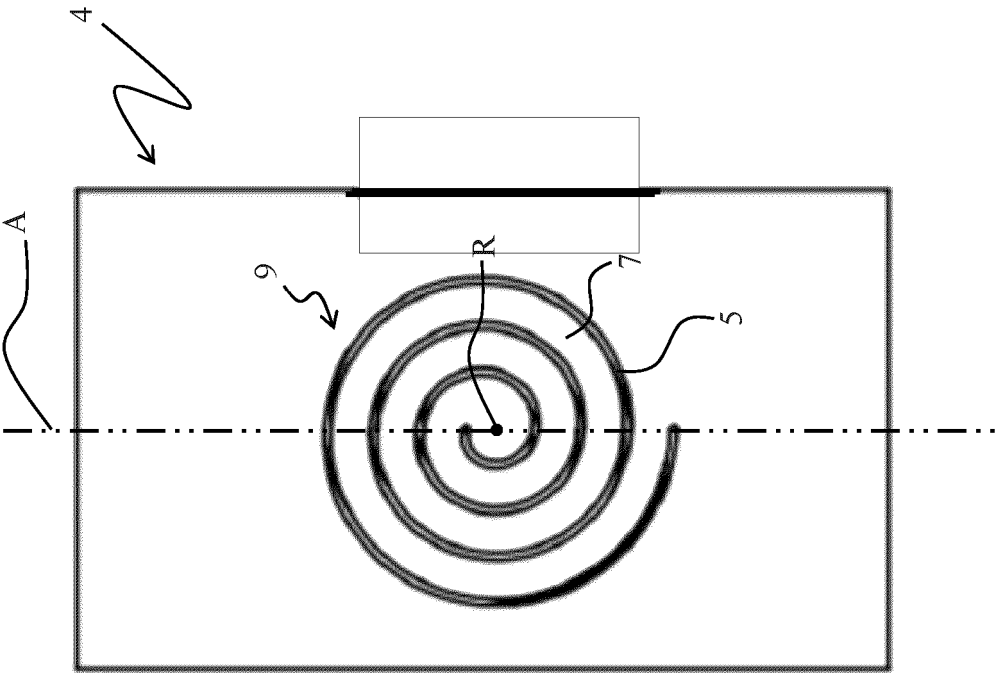


FIG. 4

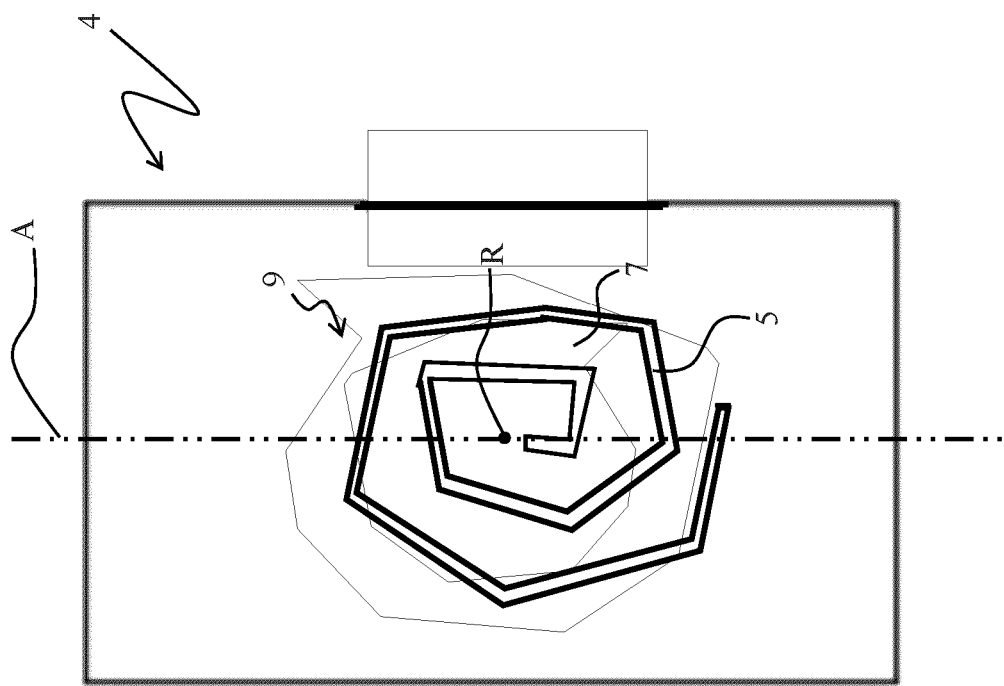


FIG. 5

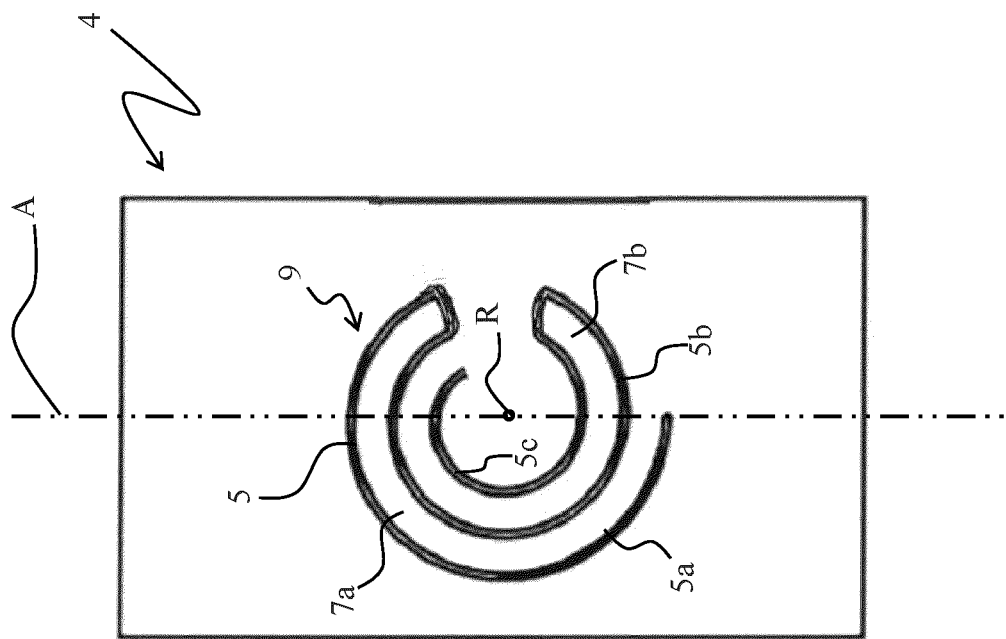


FIG. 6

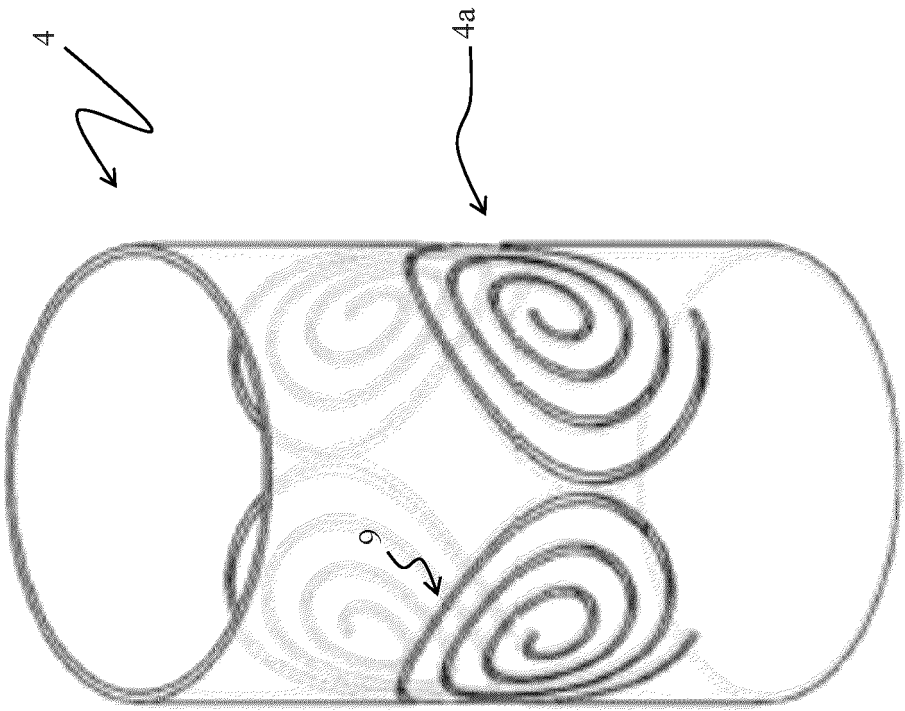


FIG. 7B

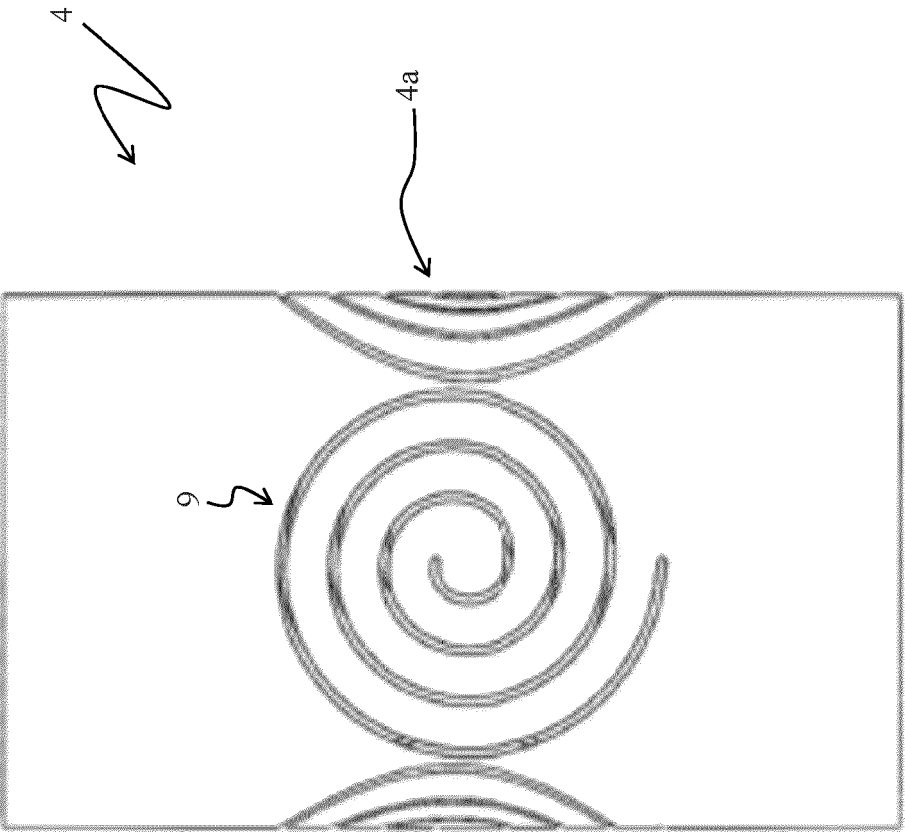


FIG. 7A

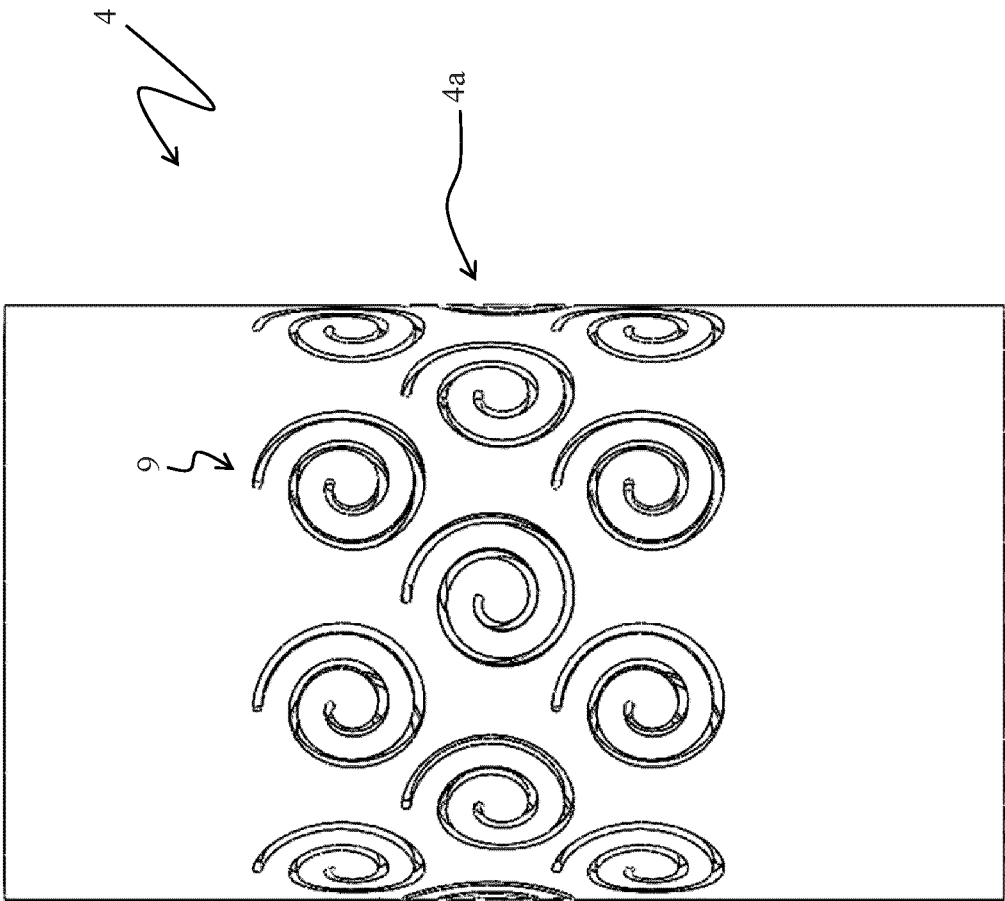


FIG. 8

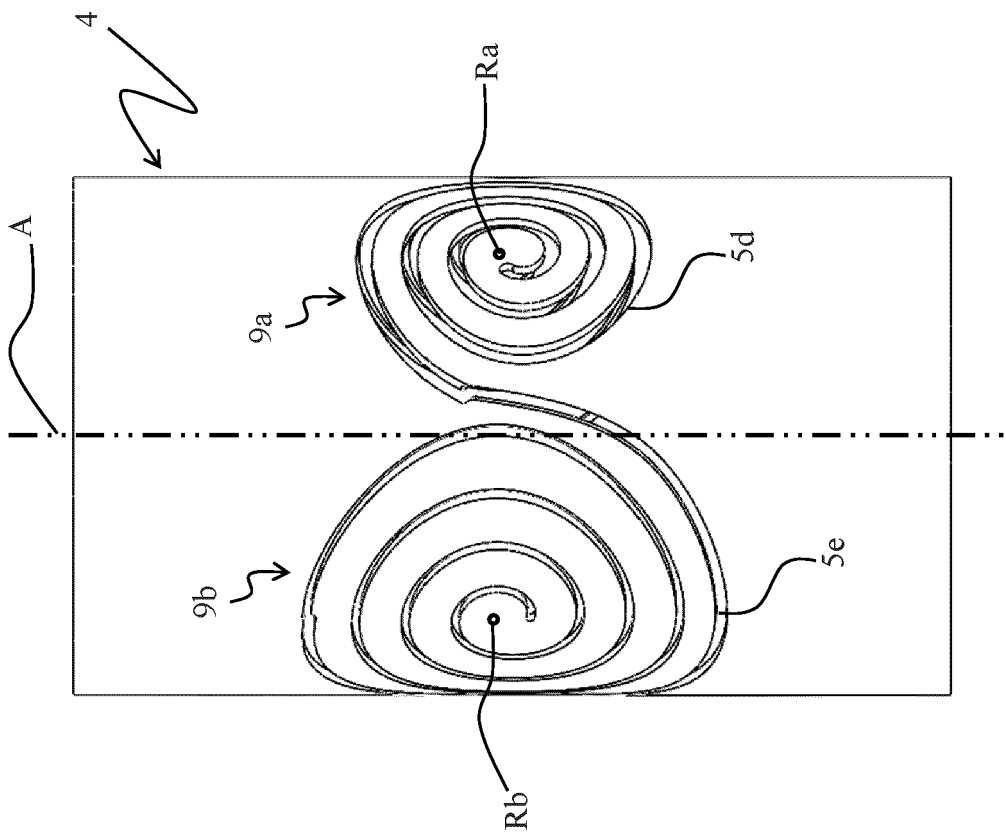


FIG. 9

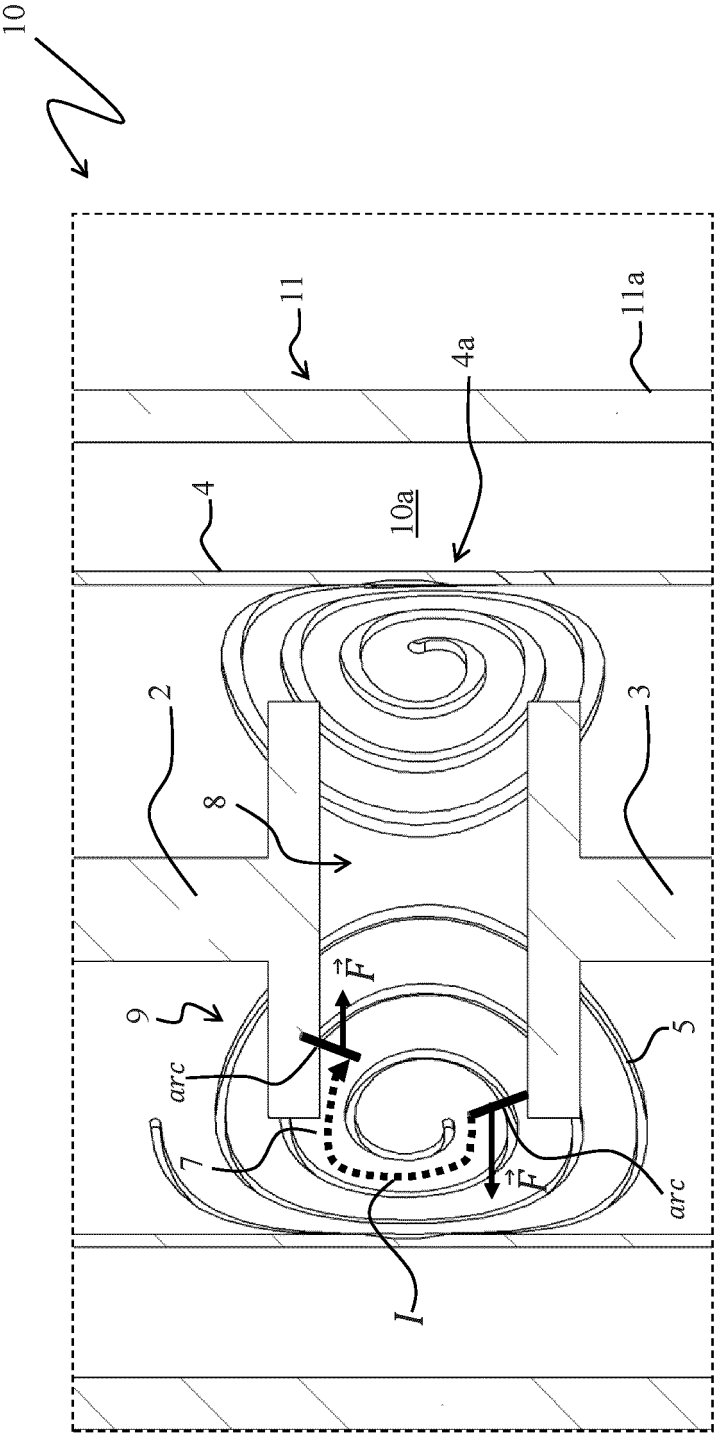


FIG. 10



EUROPEAN SEARCH REPORT

Application Number

EP 25 16 8606

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			H01H
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Place of search		Date of completion of the search	Examiner
Munich		12 September 2025	Socher, Günther
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