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(54) **Ultraflat heating assembly**

(57) The present invention relates to an ultraflat heating assembly for use in dry heat electric radiators, comprising a conductor wire (6) wound around a support body (1) made of insulating material having a flat and elongated configuration, wherein the conductor wire (6) transmits heat when electric current flows through said conductor wire (6), at least one insulation plate (2, 3) made of heat resistant and insulating material being attached

to each face of the support body (1), the assembly comprising connectors (4) connected to each end of the conductor wire (6) for connection to an electric power system, and the assembly comprising a cap (5) made of insulating material arranged at each end of the support body (1), wherein said caps (5) are attached to the insulation plates (2, 3) and to the support body (1), closing and insulating the assembly from the outside.

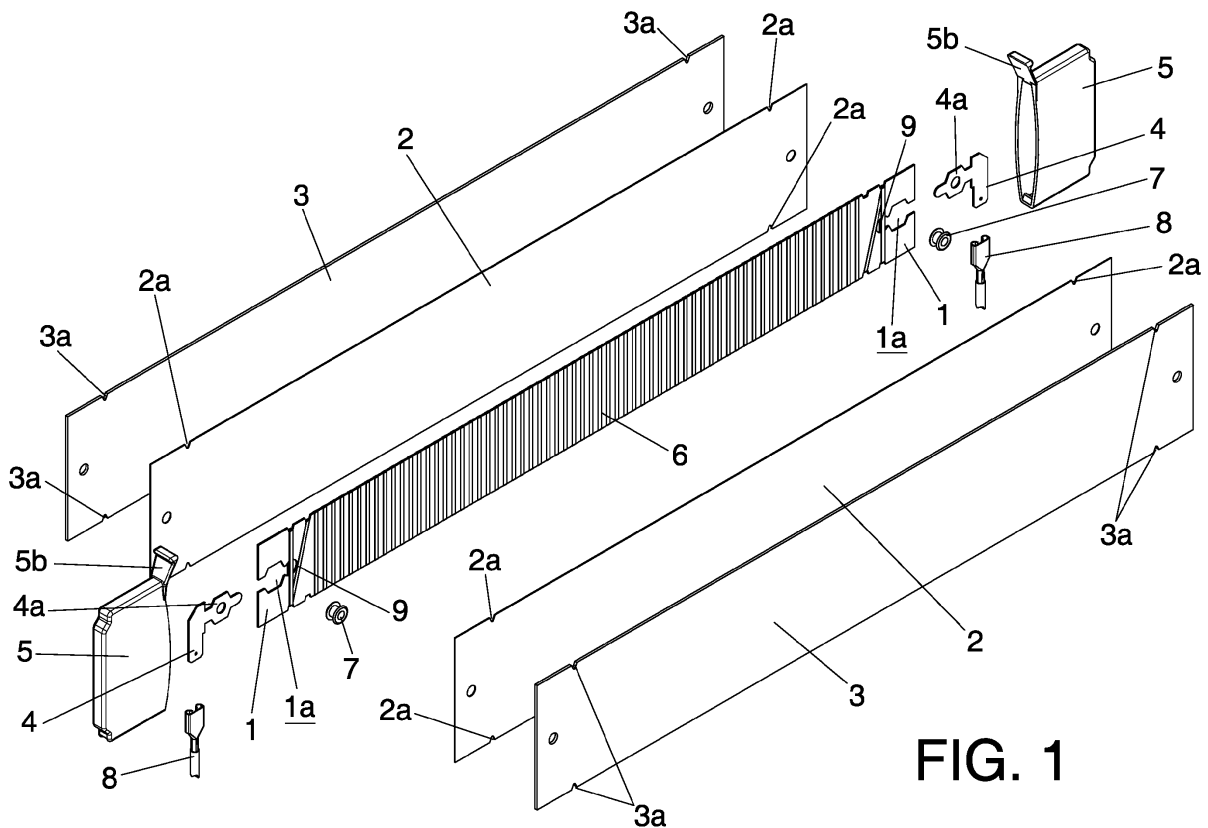


FIG. 1

Description

Field of the Invention

[0001] The present invention relates to an ultraflat heating assembly having application in air conditioning industry, and more specifically in the field of dry heat electric radiators, being constituted as a heat source, mainly, in domestic heaters, subject to other uses or applications. The object of the invention has a simple, low-cost construction, not requiring an outer enclosure, being highly reliable and safe, in addition to being able to be easily integrated in the already existing radiator apparatuses.

Background of the Invention

[0002] On the market there is a large variety of electric resistances and electric heating elements producing heat by Joule effect. Some of these types are air, incandescent, on panel print resistances, with all types of supports and enclosures, this means that each type of resistance is designed to operate at determined temperatures.

[0003] Such resistances transmit heat that they produce by any method, i.e., either by radiation, convection, or conduction. Resistors which transmit heat by conduction have always had an electrically insulated enclosure which also served for transmitting heat, as is described, for example, in the European Patent no. EP-1574803-B1, the Spanish validation of which is published with the no. ES-2338575-T3, in which a dry heat modular electric radiator comprising a heating plate having a base plate, a resistance wire and an external enclosure to insert it tightly into a housing of the radiator is described.

[0004] Currently it has to be considered that in the design and manufacturing of any electric heating element, i.e. of any electric resistance, it is necessary to face two requirements. On one hand, the electric portions under stress must be perfectly insulated, and on the other hand, the heating element must have a sufficient capacity to transmit the heat effectively. By taking these two requirements into account, the currently existing solutions can be considered more or less successful.

Description of the Invention

[0005] The present invention relates to an ultraflat heating assembly allowing a simple, low-cost construction, in which the common outer enclosure is eliminated, being at the same time highly reliable and safe, in addition to being able to be easily integrated in dry heat electric radiator apparatuses, such as for example the radiator described in the European Patent no. EP-1574803-B1.

[0006] The heating assembly proposed by the invention comprises an electroresistant conductor wire also called electric resistance, preferably made of chromium-nickel alloy, wound around a support body or core made of heat resistant and insulating material having a

flat and elongated configuration, preferably made of mica, an insulating matter formed by thin mica sheets attached to one another by means of a suitable adhesive.

[0007] The conductor wire transmits heat by conduction when electric current flows through said conductor wire. In addition, at least one insulation plate made of heat resistant and insulating material, preferably mica, is attached to each face of the support body. In turn, the assembly comprises connectors made of steel, coupleable to the ends of the support body and connectable to each end of the conductor wire at a connection point, the support body and a coupling area of the connectors being located between at least one insulation plate, all of this forming a sandwich attached by means of pins, a cap made of elastic and insulating material closing and insulating the heating assembly from the outside is coupled to the sandwich thereof at both ends.

[0008] For an effective protection and insulation of the support plate, the insulation plates, as well as the support plate, have an elongated configuration, meaning they are preferably rectangular plates, it is understood that their smaller sides are their ends, such that the width of the insulation plates, i.e. the dimensions of their smaller side, is greater than the width of the support plate, for the purpose of providing the resistance with an insulation equivalent to the ends not covered by the sheets.

[0009] As has been mentioned, the assembly comprises a cap or elastic cover element made of insulating material, such as rubber, arranged at each end of the sandwich, wherein said caps protect the connectors, since according to a preferred embodiment of the invention they are housed in said caps.

[0010] The assembly thus formed is to replace the heating assembly described in the aforementioned European Patent no. EP-1574803-B1, in which the resistance and the plates were located inside a flexible outer enclosure which was press-fitted into the radiator. The ultraflat heating assembly proposed by the present invention is designed to transmit heat by conduction, and has as an outstanding feature that the outer enclosure has been eliminated in its construction simplifying and limiting its construction to a very few parts and processes. Obviously, in place of a wound electroresistant conductor wire, the possibility of alternatively using a printed circuit with conductive ink is contemplated.

[0011] The cap is entrusted with the following functions:

- Electrically insulating both the connector and the terminal of said connector for connecting to the electric power system, which may be a terminal called faston.
- Being housed in the insulation plates, preventing the movement thereof.

Since there is a cap at each end, the separation between both caps determines the length or dimension of the length of the heating body, thus preventing the axial movement of the electric resistance.

- Allowing the passage of an electric cable to connect the conductor wire to the electric power system through the faston terminal.
- Modifying the trajectory of possible accidental drips of water as to prevent it from being able to penetrate into the support body and the conductor wire. The point where this risk is prevalent is located in the conjunction of the support body and the insulation plates with the cap.

[0012] The possibility that each face of the support body is attached to a first insulation plate made of heat resistant and insulating material, which is in turn attached by an opposite face to a second insulation plate made of heat resistant and insulating material is contemplated.

[0013] The arrangement of a first heat resistant insulation plate at each side, and additionally a second insulation plate at each side allows providing the assembly with class II electric insulation. The number of insulation plates incorporated by the assembly will depend on the type of insulation desired, either class I or class II. If the resistance is to be incorporated to a class II radiator, it is necessary that it comprises two insulation plates per face.

[0014] Likewise, it is contemplated that each end of the support body has a hole, for example made by die-cutting. This hole has a geometry equivalent to that of the coupling area of the connectors, so that said connectors can be fitted in the mentioned holes of the support body. The coupling area of the connectors comprises an opening to house the joint rivet which permanently attaches the support body, the insulating plates and the connector itself, to form a sandwich. The coupling area of the connectors has a point to be welded to the electroresistant wire.

Description of the Drawings

[0015] To complement the description that is being made and for the purpose of aiding to better understand the features of the invention according to a preferred practical embodiment thereof, a set of drawings is attached as an integral part of said description in which the following has been depicted with an illustrative and non-limiting character:

Figure 1 shows an exploded schematic view of the heating assembly object of the invention.

Figure 2 shows an elevational longitudinal section, according to A-A cut line of the assembly of the invention, the components thereof being assembled, as well as a plan view and a cross section view, according to B-B cut line.

Figure 3 shows a perspective view of a cap.

Figure 4 shows three views of the cap, according to an elevational view, a cross section view and a longitudinal section view.

Preferred Embodiment of the Invention

[0016] In view of the described drawings how in one of the possible embodiments of the invention the ultraflat heating assembly proposed by the invention comprises a conductor wire (6) wound around a support body (1) made of micanite having a flat and elongated configuration can be observed. The conductor wire (6) transmits heat by conduction when electric current flows through said conductor wire (6).

[0017] The assembly comprises connectors (4) made of steel, coupleable to the ends of the support body (1) and connectable to each end of the conductor wire (6) at a connection point (9), preferably a welding point, the support body (1) and a coupling area (4a) of the connectors (4) being located between at least one insulation plate (2,3), all of this forming a sandwich attached by means of pins (7), a cap (5) made of elastic and insulating material closing and insulating the heating assembly from the outside is coupled to the sandwich thereof at both ends.

[0018] For an effective protection and insulation of the support plate (1), the insulation plates (2, 3), as well as the support plate (1) have an elongated configuration, meaning that they are preferably rectangular plates, it is understood that their smaller sides are their ends, such that the width of the insulation plates (2, 3), i.e. the dimensions of their smaller side, is greater than the width of the support plate (1) to achieve a sufficient side insulation at the ends of the sandwich.

[0019] Each end of the support body (1) has a hole (1a) in which the connection area (4a) of each connector (4) will be tightly fitted. The two connectors (4) are thus coupleable to the support body (1) for which said connectors (4) have a connection area (4a) with a geometry substantially equivalent to that of the holes (1 a) of the support body (1), said connection area (4a) of the connector also having an opening to house the joint rivet (7) made of brass or another material. With these components the only thing left is to assemble all the mentioned parts except the caps (5). To this end, rivets (7) are used at each end leaving the assembly permanently reinforced with all its components locked without any possibility of moving. The caps (5) are inserted into the heating assembly stretching them and keeping them tight on the insulating plates.

[0020] The connector (4) is a multifunction part which complies with these four tasks:

- Being welded to the conductor wire (6). Having an area specifically designed in the connection area (4a) to carry out this welding accurately and safely.
- Locating and fitting the connector (4) inside the hole (1 a) in this case, the hole of the support body (1) of the assembly. This male (connector (4)) and female (support body (1)) set fit both parts (1, 4), preventing the connector (4) from rotating or moving, both when it is to be welded, and when it is connected to or

disconnected from an electric connection cable (8).

[0021] In addition, each connector (4) can be connected to the connection cable (8) at an end opposite to the connection area (4a). Thus, the other end of the connector (4) made up a male faston terminal/connector arranged to receive the connection cable with its corresponding output connector or female faston.

[0022] As has been indicated, the caps (5) are made of elastic material, allowing their fit insertion and immobilization at the ends of the support body (1), whereby the height of each cap (5) is less than the width of the insulating insulation plates (2, 3) in which said cap (5) is inserted. Rubber-silicone is considered suitable to perfectly comply with these requirements, without excluding other possible materials. To insert and immobilize it in its housing, making use of its elastic characteristics has been contemplated by making the height of the cap (5) less than the height of the insulation plates (2, 3) where it is to be fitted.

[0023] Likewise, each cap (5) comprises at least one protuberance (5a), located inside, preferably one lower and another upper, corresponding with an upper release flange (5b). Such that said protuberances (5a) are configured to fit the cap (5) by elastic deformation in a notch (2a, 3a) of the insulation plates (2, 3) have, said cap (5) thus being fitted in the insulation plates (2, 3).

[0024] As seen in the drawings, the insulation plates (2, 3) have notches (2a, 3a) above and below each end. The cap (5) in turn has corresponding protuberances (5a) provided to be fitted in the aforementioned notches (2a, 3a), although the previously mentioned height difference, and taking into account the special form of a preferred embodiment of the cap (5), it being wider in the center and being narrow towards the upper and lower ends. In order to fit them, the cap (5) is first inserted at the lower portion, the cap (5) is at the same time stretched upwards using to that end the tongue or flange (5b) to insert the cap (5). Next what left to be done is to move it until the notches (2a, 3a) and protuberances (5a) are coupled. The cap (5) is thus perfectly immobilized and completely functional. The cap fits tightly to the insulating plates, as shown in section B-B of Figure 2.

[0025] The invention contemplates the use of a deflector visor provided to place the resistance in vertical position. To place it in a horizontal or inclined position, the deflector visor must be placed along the dimension exposed to the eventual drips of water.

[0026] Finally, it must be mentioned that that each cap (5) has a lower opening (5c) for connecting the output connector (8) with the connector (4) housed in the cap (5), which allows the connectors (4) housed in the cap (5) to be connected to the electric power system through an faston output connector (8), which facilitates and expedites the installation thereof in a radiator protecting it from water and insulating the current.

[0027] In view of this description and set of drawings, the person skilled in the art will understand that the em-

bodiments of the invention which have been described can be combined in many ways within the object of the invention. The invention has been described according to several preferred embodiments thereof, but for the person skilled in the art it will be evident that multiple variations can be introduced in said preferred embodiments without exceeding the object of the claimed invention.

10 Claims

1. Ultraflat heating assembly comprising a conductor wire (6) wound around a support body (1) made of heat resistant and insulating material having a flat and elongated configuration, wherein the conductor wire (6) transmits heat when electric current flows through said conductor wire (6), at least one insulation plate (2, 3) made of heat resistant and insulating material being attached to each face of the support body (1), **characterized in that** the assembly comprises connectors (4) coupleable to the ends of the support body (1) and connectable to the conductor wire (6) at a connection point (9), the support body (1) and a coupling area of the connectors (4a) located between at least one insulation plate (2,3), all of this forming a sandwich attached by means of pins (7), a cap (5) made of elastic and insulating material closing and insulating the heating assembly from the outside is coupled to the sandwich thereof at both ends.
2. Ultraflat heating assembly according to claim 1, wherein each face of the support body (1) is attached to a first insulation plate (2) made of heat resistant and insulating material, which is in turn attached by a face opposite to a second insulation plate (3) made of heat resistant and insulating material.
3. Ultraflat heating assembly according to any of the preceding claims, wherein each end of the support body (1) has a hole (1a) in which a connection area (4a) comprising each connector (4) is tightly fit.
4. Ultraflat heating assembly according to claim 3, wherein each connector (4), at an end opposite to the connection area (4a), can be connected to a connection cable for connecting to the electric power system through an output connector (8) comprising the electric connection means (8) of the assembly.
5. Ultraflat heating assembly according to any of the preceding claims, wherein the caps (5) have a height less than the width of the insulating insulation plates (2, 3).
6. Ultraflat heating assembly according to claim 5, wherein each cap (5) comprises at least one protuberance (5a), located inside, configured to fit by elastic deformation of the cap (5) in a notch (2a, 3a) of

the insulation plates (2, 3) have, said cap (5) thus being fitted in the insulation plates (2, 3).

7. Ultraflat heating assembly according to any of claims 4 to 6, wherein each cap (5) has a lower opening (5c) the connection of the output connector (8) with the connector (4) housed in the cap (5).

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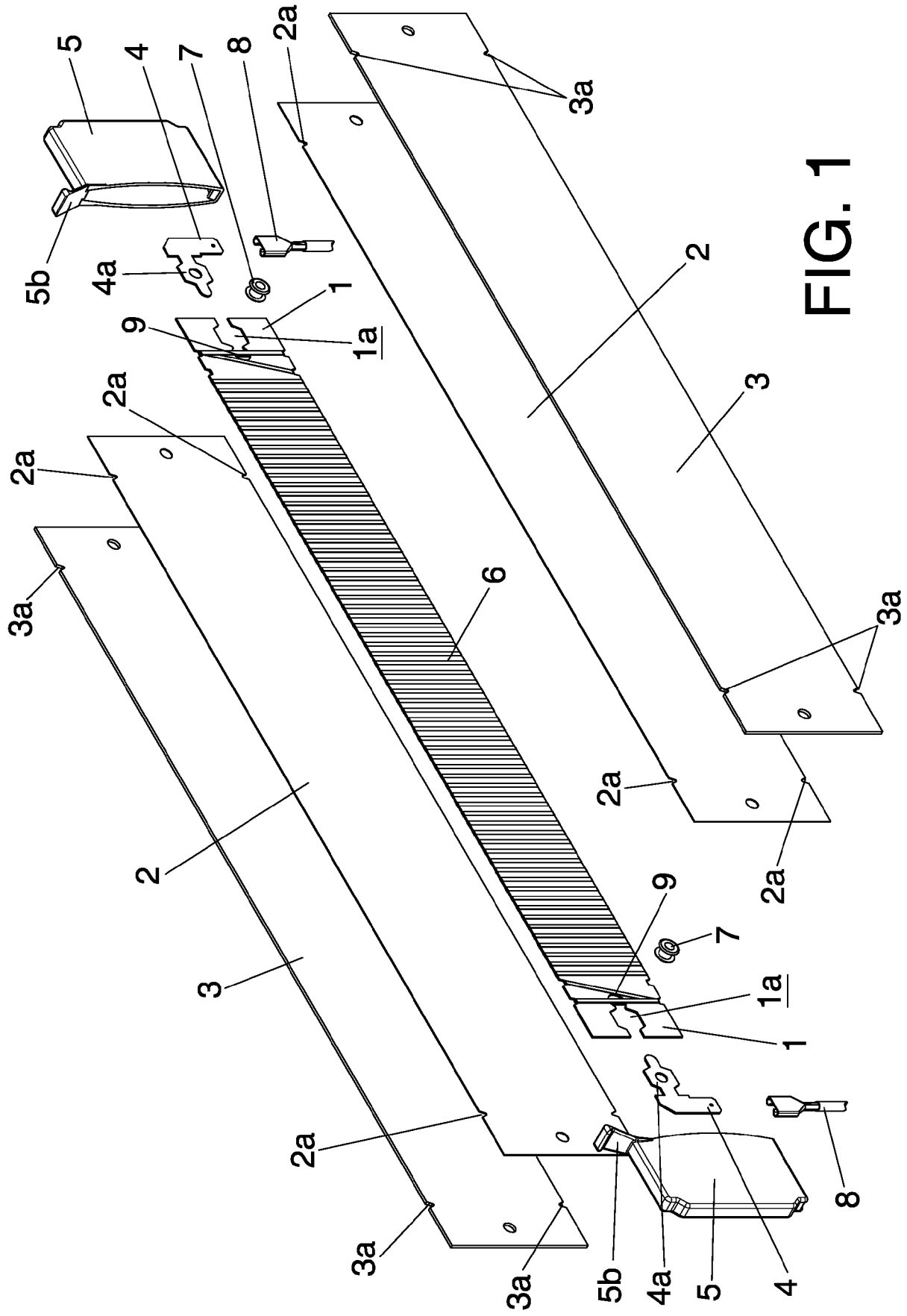


FIG. 1

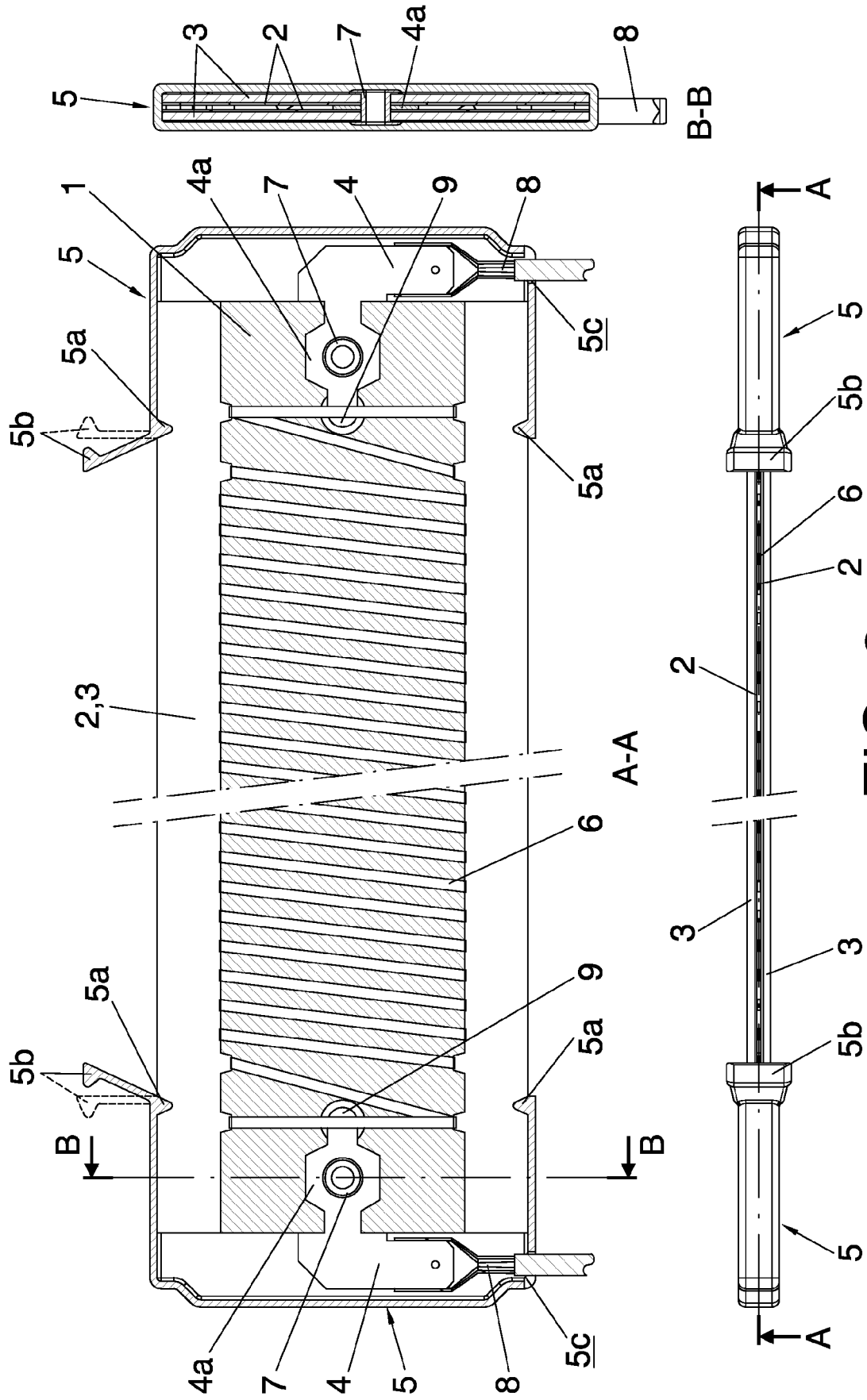


FIG. 2

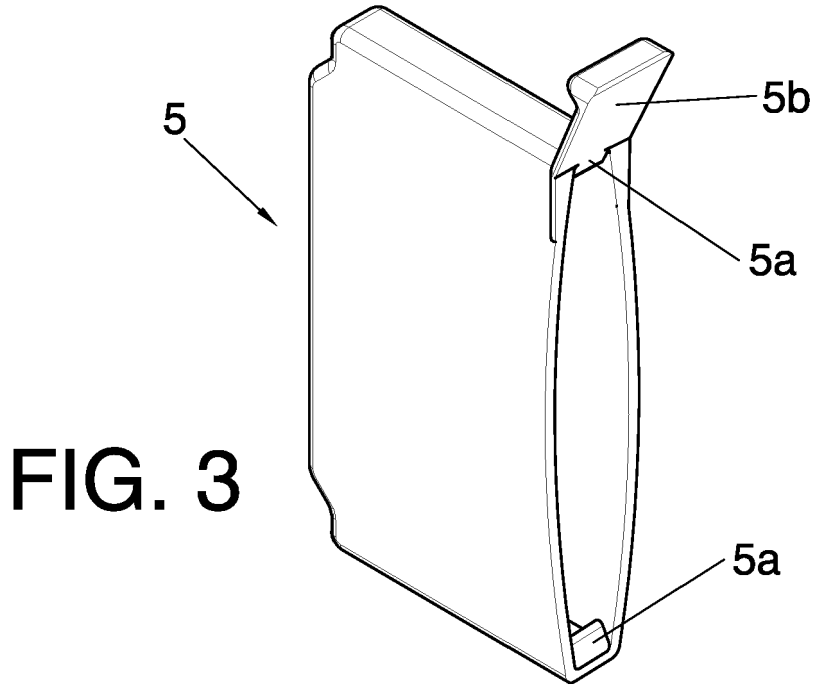


FIG. 3

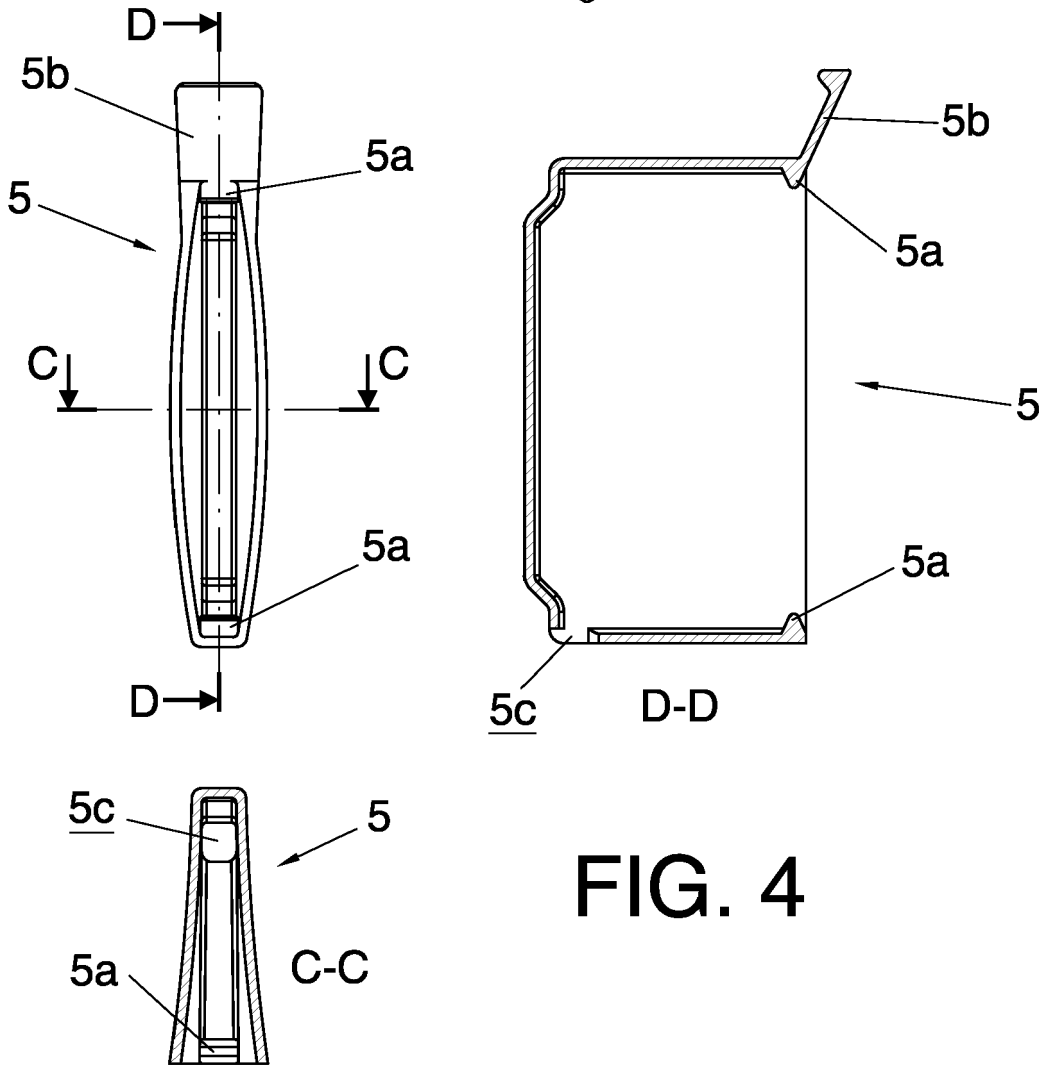


FIG. 4



EUROPEAN SEARCH REPORT

Application Number
EP 11 38 2371

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Place of search Munich		Date of completion of the search 27 April 2012	Examiner de la Tassa Laforgue	
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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