(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 811 010 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
13.11.2024 Bulletin 2024/46

(21) Application number: **19734887.3**

(22) Date of filing: **17.05.2019**

(51) International Patent Classification (IPC):
F25D 21/04 *(2006.01)* ***H05B 3/84*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
F25D 21/04; H05B 3/84

(86) International application number:
PCT/IB2019/054100

(87) International publication number:
WO 2019/243913 (26.12.2019 Gazette 2019/52)

(54) FRAMELESS DOOR FOR REFRIGERATOR

RAHMENLOSE TÜR FÜR EINEN KÜHLSCHRANK

PORTE SANS CADRE POUR RÉFRIGÉRATEUR

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

(30) Priority: **19.06.2018 IT 201800006461**

(43) Date of publication of application:
28.04.2021 Bulletin 2021/17

(73) Proprietor: **Cisaplast S.P.A.**
46029 Suzzara (MN) (IT)

(72) Inventors:
- **CIOFI, Claudio**
  50019 Sesto Fiorentino (FI) (IT)
- **STAFFETTA, Alessandro**
  46029 Suzzara (MN) (IT)

(74) Representative: **Corradini, Corrado et al**
Ing. C. Corradini & C. S.r.l.
Via Dante Alighieri 4
42121 Reggio Emilia (IT)

(56) References cited:
EP-A1- 3 033 975
WO-A1-98/30409
GB-A- 2 292 581
US-A- 3 876 862
US-A1- 2007 204 531

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 3 811 010 B1

Description

Field of the art

[0001] The present invention relates to a door for a refrigerator, in particular a frameless door for refrigerators, preferably non-low temperature refrigerators.

Background art

[0002] Refrigerators or refrigerated cabinets are known, used in commercial premises for the sale of food products of various kinds that must be stored at temperatures usually between 0 °C and 10 °C.

[0003] These refrigerated cabinets are provided with doors that must be configured so as to allow customers to view the goods contained in the refrigerator and so that a customer can choose the product even before opening the refrigerator in order to avoid subjecting the products and the refrigerator to continuous temperature changes due to the repeated opening and closing of the doors.

[0004] During the opening of the door, it is also known that, due to the difference in temperature between the environment outside the refrigerator and the internal environment of the refrigerator, condensation is formed which, if not properly removed, remains on the door for a certain period of time also once the door has been closed at least partially, thus compromising the visibility of the contents of the refrigerator and wetting the door and the surrounding areas.

[0005] GB2292581A discloses a frameless door for a refrigerator according to the preamble of claim 1.

[0006] WO98/30409A1 and US2007/204531A1 disclose further doors for a refrigerator including a heating element and an electric cable connecting the heating element to a power supply external to the door.

[0007] A need felt in the field is therefore that of configuring the doors in such a way as to maximize the visibility of the contents of the refrigerator, and at the same time to remedy the formation of condensation when the door is opened and closed.

[0008] An object of the present invention is to meet these needs felt in the sector.

[0009] Another object is to achieve such an object with a simple, rational and relatively cost-effective solution.

[0010] These and other objects are achieved with the features of the invention as described in the independent claim.

[0011] The dependent claims outline preferred and/or particularly advantageous aspects of the invention.

Description of the invention

[0012] In particular the invention provides a frameless door for refrigerators, comprising:- a pair of plates, made of thermally insulating material, facing and joined by a spacer which divides an interspace between the plates of the pair of plates in a closed chamber- a heating element fixed to one of the plates inside the closed chamber;- an electrical connection element provided with at least one elongated section contained in the housing seat (S) and a first end connected to the heating element;- a housing seat (S) ends with an outlet opening at a second side adjacent to the first side of the pair of plates; the electrical connection element being provided with an opposing second end which protrudes out of the outlet opening of the housing seat (S) characterized by comprising:- at least one longitudinal channel parallel to a first side of the pair of plates, the housing seat (S) being contained in the longitudinal channel which extends longitudinally along an axial section of the longitudinal channel, the spacer comprising at least one or two vertical longitudinal members parallel to the second side of the pair of plates and opposed, wherein each vertical longitudinal member is optically transparent.

[0013] Thanks to this solution, an easy-to-construct door with high visibility is provided, provided with an anti-condensation system largely contained in the space occupied by the door.

[0014] A further aspect of the invention provides that the heating element may comprise strips of an electrical resistor deposited on a first inner surface of the plate to which the heating element is fixed, wherein the strips are connected to each other in such a way as to define a single electrical resistance.

[0015] Thanks to this solution, a heating element for the anti-condensation system is provided which is particularly simple and effective.

[0016] Yet another aspect of the invention provides that the heating element may comprise:

- at least two first strips parallel to the first side and proximal to the longitudinal channel, wherein the first strips are aligned with each other and separated from each other by an insulating segment placed in the vicinity of the center line of the first inner surface of the first plate;
- a second strip parallel to the first side and proximal to the first side of the pair of plates opposed to the longitudinal channel; and
- a resistor deposited on the first inner surface that electrically connects a first strip with the second strip and the second strip with the other first strip defining an electrical track.

[0017] Thanks to this solution, the heating element is adapted to heat the whole surface of the plate uniformly, thus avoiding the formation of condensation on the whole surface.

[0018] According to the invention the spacer comprise one or two vertical longitudinal members parallel to the second side of the pair of plates and opposed, wherein the vertical longitudinal members are optically transparent.

[0019] Thanks to this solution, the door is of the frame-

less type, i.e. without a frame and the vertical longitudinal members keep the pair of plates spaced apart, thus maximizing visibility through the door.

[0020] Another aspect of the invention provides that the spacer may comprise two horizontal longitudinal members parallel to the first side of the pair of plates and opposed, wherein at least one of the horizontal longitudinal members has a longitudinal cavity communicating with the closed chamber through openings, at least one desiccant substance being contained in the longitudinal cavity of at least one horizontal longitudinal member.

[0021] Thanks to this solution, the horizontal longitudinal members create a peripheral spacer with the vertical longitudinal members, and the desiccant substance contained therein allows the dehumidification of the closed chamber, thus further reducing the possibility of condensation forming.

[0022] A further aspect of the invention provides that the door may further comprise a support element for connecting the door to a frame of the refrigerator, the support element being contained in the longitudinal channel parallel at a distance from the spacer.

[0023] Thanks to this solution, a support element for the door to the frame of the refrigerator is provided, without the need for creating a frame of the door itself.

[0024] Another aspect of the invention provides that the electrical connection element may comprise, at the first end, a connector fixed to the spacer accessible from the longitudinal channel and protruding inside the closed chamber by means of two connecting wings in contact with at least one portion of the heating element.

[0025] Thanks to this solution, an electrical connection element that is quickly installed and used is provided.

[0026] Moreover, the invention also provides a refrigerator comprising:

- a frame for defining an access opening of the refrigerator, and
- at least one door as described above, adapted to close at least a portion of the access opening.

[0027] Thanks to this solution, a refrigerator provided with a door having the aforesaid features and the advantages associated to such features is provided.

Brief description of the drawings

[0028] Further features and advantages of the invention will become apparent from the following description, provided by way of non-limiting example with the aid of the figures shown in the accompanying drawings.

Figure 1 is a perspective view of the door in figure 1.
Figure 2 is a front view of a door according to the invention.
Figure 3 is a sectional view of the door in figure 1.
Figure 4 is an enlarged view of a portion of the section of the door in figure 1.
Figure 5 is an enlarged view of another portion of the section of the door in figure 1.
Figure 6 is a view of a connector of a heating element of the door in figure 1.
Figure 7 is a view of a refrigerator provided with the door in figure 1.

Detailed description

[0029] With particular reference to the figures, reference numeral 1 denotes a door of a refrigerator R, a frameless door for a refrigerator.

[0030] The refrigerator R is generally provided with a frame T which defines an access opening E from which access to a refrigerated inner compartment is gained (as is known to the man skilled in the art).

[0031] The door 1 is connected to the frame T of the refrigerator R, for example in a movable manner between a first position, in which it is adapted to close at least a portion of the access opening E to the refrigerator R and a second position, in which it opens the access opening E and makes from the outside of the refrigerator R at least a portion of the inner compartment thereof accessible.

[0032] The door 1 can be hinged to and/or slidably associated with the frame T of the refrigerator R.

[0033] The refrigerator R is, in the example, a commercial type non-low temperature refrigerator (that is, operating at a temperature between 0 °C and 10 °C, for the sale of food products of various kinds.

[0034] The door 1 first comprises a first plate 5, optically transparent, provided with a first inner surface 10, that is, facing towards an environment inside the refrigerator R, and a first outer surface 15, or facing towards an environment outside the refrigerator R. For example, the first plate 5 may have, at the first outer surface 15 thereof, a handle 20 for opening the door 1.

[0035] The first plate 5 may further have an overall rectangular shape, that is, it has two first equal and parallel sides 25, horizontal in the example, and two second equal and parallel sides 30, adjacent and perpendicular to the first sides 25, vertical in the example.

[0036] The first plate 5 is for example made of glass.

[0037] It is not excluded that in other embodiments, the first plate 5 may have another shape and may be made of another thermally insulating material, even if transparent.

[0038] The door 1 then comprises a second plate 35, optically transparent, provided with a second inner surface 40, that is, facing towards the environment inside the refrigerator R, and a second outer surface 45, or facing towards the environment outside the refrigerator R.

[0039] The second plate 35 may further have a rectangular shape, that is it has two first equal and parallel sides 50, horizontal in the example, and two second equal and parallel sides 55, adjacent and perpendicular to the first sides 50, vertical in the example.

[0040] The second plate 35 is for example made of glass or other thermally insulating material, even if transparent.

[0041] The second plate 35 has for example first sides 50 of a length equal to the first sides 25 of the first plate 5 and second sides 55 of a shorter length with respect to the second sides 30 of the first plate 5, however it is not excluded that in other embodiments they may be the same length.

[0042] The second plate 35 faces the first plate 5, that is, the second outer surface 45 thereof faces the first inner surface 10 of the first plate 5, and is joined thereto by means of a spacer 60, as will be better described hereinafter, so as to define an interspace 65 between the first plate 5 and the second plate 35.

[0043] In use, one of the first plate 5 and the second plate 35 is proximal to an inner compartment of the refrigerator R, for example the second plate 35, and the other of the first plate 5 and the second plate 35 (i.e. the first plate 5) is distal from said inner compartment of the refrigerator R.

[0044] In particular, the first plate 5 and the second plate 35 are connected, by means of the spacer 60, so that the second sides 30 of the first plate 5 are coplanar with the second sides 55 of the second plate 35, and for example so that at least a first side 25 of the first plate 5 is coplanar with a first side 50 of the second plate 35.

[0045] The spacer 60 first comprises a first horizontal longitudinal member 70, for example upper.

[0046] Said first horizontal longitudinal member 70 is, for example, of a polygonal section and is interposed between the first plate 5 and the second plate 35 in the proximity of a first side 25, 50 of the same first plate 5 and of the second plate 35.

[0047] The first horizontal longitudinal member 70 is, for example, internally hollow and extends by a length substantially equal to the length of the first sides 25, 50 of the first plate 5 and of the second plate 35 (and parallel thereto).

[0048] Said first horizontal longitudinal member 70 is for example made of non-transparent or transparent plastic material.

[0049] The first horizontal longitudinal member 70 is fixed to the first plate 5 and to the second plate 35 or to the first inner surface 10 of the first plate 5 and to the second outer surface 45 of the second plate 35, for example by means of a transparent or non-transparent adhesive/sealant.

[0050] The spacer 60 then comprises a second horizontal longitudinal member 75, for example lower.

[0051] Said second horizontal longitudinal member 75 is, for example, of a polygonal section and is interposed between the first plate 5 and the second plate 35 in the proximity of the first side 25, 50 of the first plate 5 and of the second plate 35 which is distal from the first horizontal longitudinal member 70.

[0052] The second horizontal longitudinal member 75 is, for example, internally hollow and extends by a length substantially equal to the length of the first sides 25, 50 of the first plate 5 and of the second plate 35 (parallel thereto).

[0053] Said second horizontal longitudinal member 75 is for example made of non-transparent or transparent plastic material.

[0054] The second horizontal longitudinal member 75 is fixed to the first plate 5 and to the second plate 35, or to the first inner surface 10 of the first plate 5 and to the second outer surface 45 of the second plate 35, by means of a transparent or non-transparent adhesive/sealant.

[0055] The first horizontal longitudinal member 70 and/or the second horizontal longitudinal member 75 are adapted to contain a desiccant substance G, for example in the form of granules, at a longitudinal inner cavity thereof (at full development) and have openings F which allow said inner cavity to be in fluid communication with the interspace 65 defined between the first plate 5 and the second plate 35.

[0056] For example, the first horizontal longitudinal member 70 has openings F at a face thereof facing the second horizontal longitudinal member 75 and, if provided, the second horizontal longitudinal member 75 has openings F at a face thereof facing the first horizontal longitudinal member 70.

[0057] The spacer 60 further comprises a first vertical longitudinal member 80, for example in the form of a parallelepiped.

[0058] The first vertical longitudinal member 80 is optically transparent and, for example, is made of Plexiglas.

[0059] Said first vertical longitudinal member 80 extends from the first horizontal longitudinal member 70 to the second horizontal longitudinal member 75, and is in contact with the same so as to be sealably (head) joined thereto, in the proximity of a second side 30, 55 of the first plate 5 and of the second plate 35.

[0060] In particular, the first vertical longitudinal member 80 is positioned so as to be completely contained in the interspace 65 defined between the first plate 5 and the second plate 35 and that a surface (outer) thereof is coplanar with a second side 30, 55 of the first plate 5 and of the second plate 35.

[0061] The first horizontal longitudinal member 80 is fixed to the first plate 5 and to the second plate 35, or to the first inner surface 10 of the first plate 5 and to the second outer surface 45 of the second plate 35, by means of (a respective layer of) adhesive/sealant, preferably optically transparent.

[0062] The spacer 60 further comprises a second vertical longitudinal member 85, for example in the form of a parallelepiped.

[0063] The second vertical longitudinal member 85 is optically transparent and, for example, is made of Plexiglas.

[0064] Said second vertical longitudinal member 85 extends from the first horizontal longitudinal member 70 to the second horizontal longitudinal member 75, and is in contact with the same so as to be sealably (head) joined

thereto, in the proximity of a second side 30, 55 of the first plate 5 and of the second plate 35 distal from the first horizontal longitudinal member 70.

[0065] In particular, the second vertical longitudinal member 85 is positioned so as to be completely contained in the interspace 65 defined between the first plate 5 and the second plate 35 and that a surface (outer) thereof is coplanar with said second side 30, 55 of the first plate 5 and of the second plate 35 distal from the first horizontal longitudinal member 70.

[0066] The second horizontal longitudinal member 85 is fixed to the first plate 5 and to the second plate 35, or to the first inner surface 10 of the first plate 5 and to the second outer surface 45 of the second plate 35, by means of (a respective layer of) adhesive/sealant, preferably optically transparent.

[0067] The spacer 60, thus shaped (or shaped like a frame defined by the union of the first horizontal longitudinal member 70, the first vertical longitudinal member 80, the second horizontal longitudinal member 75 and the second horizontal longitudinal member 85), defines a closed perimeter and divides the interspace 65 between the first plate 5 and the second plate 35 into a closed chamber 90 (inside the spacer 60) and into at least one longitudinal channel 95, 100 parallel to the first sides 25, 50 of the first plate 5 and of the second plate 35 (outside the spacer 60 and in any case contained in the overall dimensions of the first plate 5 and of the second plate 35).

[0068] In particular, the closed chamber 90 is enclosed between the first inner surface 10 of the first plate 5 and the second outer surface 45 of the second plate 35 and superiorly defined by the first horizontal longitudinal member 70, inferiorly by the second horizontal longitudinal member 75, and laterally by the first vertical longitudinal member 80 and by the second vertical longitudinal member 85.

[0069] The longitudinal channel 95,100 is defined by the portion of interspace 65 not occupied by the closed chamber 90 and, therefore, laterally defined by the first inner surface 10 of the first plate 5 and the second outer surface 45 of the second plate 35, or portions of the first plate 5 and of the second plate 35 which extend above and/or below beyond the closed chamber 90.

[0070] In this embodiment, the spacer 60 divides the interspace 65 into the closed chamber 90 and into a first longitudinal channel 95 (upper), formed between the first horizontal longitudinal member 70 and the first sides 25, 50 of the first plate 5 and of the second plate 35, and into a second longitudinal channel 100 (lower), formed between the second horizontal longitudinal member 75 and the first sides 25, 50 of the first plate 5 and of the second plate 35 distal from the first horizontal longitudinal member 70.

[0071] In practice, the first longitudinal channel 95 (upper) is inferiorly defined by (an outer face of) the first horizontal longitudinal member 70 and laterally by the portions protruding above the closed chamber 90 of the first plate 5 and of the second plate 35; the second longitudinal channel 100 (lower) is superiorly defined by (an outer face of) the second horizontal longitudinal member 75 and laterally by the portions protruding below the closed chamber 90 of the first plate 5 and of the second plate 35; the first longitudinal channel 95 and the second longitudinal channel 100 being open at the opposite ends (placed at the second sides 30, 55 of the first plate 5 and of the second plate 35).

[0072] In particular, the inner cavity of the first horizontal longitudinal member 70 which contains said desiccant substance G is in fluid communication with the closed chamber 90 in order to dehumidify the closed chamber 90 itself.

[0073] It is not excluded that in other embodiments, there may be only one longitudinal channel (upper) defined between one of the first horizontal longitudinal member 70 and the second horizontal longitudinal member 75 and a first side 25, 50 of the first plate 5 and of the second plate 35, in this case one of the first horizontal longitudinal member 70 and the second horizontal longitudinal member 75 is fixed to the first plate 5 and to the second plate 35 so as to be totally contained in the interspace 65 and so that a surface (outer) thereof is coplanar with a first side 25, 50 of said first plate 5 and second plate 35.

[0074] The door 1 further comprises a heating element 105, preferably located in the closed chamber 90.

[0075] The heating element 105 is fixed to one of the first plate 5 and the second plate 35, for example it is fixed to the first plate 5 (that is, the one placed farthest from the inner compartment of the refrigerator R).

[0076] The heating element 105 may comprise an electrical resistance adapted to release heat when it is crossed by an electric current.

[0077] For example, the heating element 105 comprises two first electrically conductive strips 110 of metal material.

[0078] The first strips 110 are for example aligned with each other and separated by an insulating segment 115, placed in the proximity of the center line of the first inner surface 10 of the first plate 5, i.e. the insulating segment 115 is substantially equidistant from the second sides 30 of the first plate 5. The insulating segment 115, in the example, is defined by a portion of first insulating or non-conductive (i.e., not coated with conductive elements) plate 5.

[0079] The first strips 110 are for example formed in the proximity of the first longitudinal channel 95, parallel to a first side 25 of the first plate 5.

[0080] The heating element 105 further comprises a second electrically conductive strip 120 of metal material, parallel to the first strips 110 and formed at a first side 25 of the first plate 5 distal from the first side 25 proximal to the first two strips 110.

[0081] The first strips 110 and the second strip 120 are, for example, deposited by screen printing.

[0082] For example, the metal material of the first strips

110 and of the second strip 120 is silver or silver oxide, however, it is not excluded that in other embodiments, another metal or other electrically conductive material may be used.

[0083] The heating element 105 further comprises a resistor 125 fixed to the first inner surface 10 of the first plate 5.

[0084] The resistor 125 is for example a metal powder deposited on the first inner surface 10 of the first plate 5, for example by means of screen printing, preferably a silver or silver oxide powder (which does not affect the visibility allowed by the first plate 5 and the second plate 35, as finely dispersed on the surface or localized in thin and substantially optically transparent strips).

[0085] The resistor 125 is adapted to put one of the first two strips 110 in electrical communication with the second strip 120 and the second strip 120 with the other of the first two strips 110 so as to form an electrically conductive track (which longitudinally crosses the first inner surface 10 of the first plate 5).

[0086] The heating element 105 is connected to a power source by an electrical connection element 130.

[0087] The electrical connection element 130 comprises, for example, a pair of cables 135, which are connected (directly or indirectly) to a proximal end of the heating element 105 and with another distal end to an electric power source, for example directly to the mains or to a battery.

[0088] In particular, a cable of the pair of cables 135 is connected, at the distal end (connected to the electric power source), to a positive supply pole, and the other cable of the pair of cables 135 is connected, at the distal end thereof, to a negative supply pole.

[0089] In this way, a cable of the pair of cables 135 connects the positive supply pole with one of the first strips 110, for example in a portion of the first strip 110 proximal to the insulating segment 115, and the other cable of the pair of cables 135 connects the negative supply pole to the other of the first strips 110, for example in a portion of the other first strip 110 proximal to the insulating segment 115.

[0090] In a first embodiment not shown, the proximal end of the pair of cables 135 may be connected to the heating element 105 directly, for example by means of two respective welding points.

[0091] In particular, a proximal end of one of the cables of the pair of cables 135 is connected directly to one of the two first strips 110 and the other cable of the pair of cables 135 is connected to the other of the first strips 110.

[0092] Starting from the proximal end connected to the heating element 105, the pair of cables 135 is adapted to cross, substantially vertically, the first horizontal longitudinal member 70 so as to (radially) protrude from the closed chamber 90.

[0093] The pair of cables 135 then extends parallel to the first sides of the first plate 5 and of the second plate 35, received in a housing seat S formed in the first longitudinal channel 95, or completely contained therein.

[0094] For example, the pair of cables 135 is received in a housing seat S which extends, throughout its development, substantially parallel to the first sides 25, 50 of the first plate 5 and of the second plate 35.

[0095] Said housing seat S extends from a first side 25, 50 of said first plate 5 and second plate 35 up to about half of the longitudinal extension of the first longitudinal channel 95 (approximately at the center line of the first plate 5, or of the door 1), for example in the proximity of the insulating segment 115.

[0096] In practice, the housing seat S extends substantially by half of the longitudinal (horizontal) development of the first longitudinal channel 95.

[0097] In the example, the housing seat S is constructed such that a portion of an outer face of the first horizontal longitudinal member 70 defines a wall of the housing seat S. The housing seat S, or that wall defined by the outer face of the first horizontal longitudinal member 70, is then (superiorly) closed by an interface surface, for example concave with concavity facing the outer face of the first horizontal longitudinal member 70.

[0098] Such an interface surface is defined, for example, by a sealant W inserted in the first longitudinal channel 95, for example so as to substantially fill all of said first longitudinal channel 95 (except the housing seat S for the pair of cables 135), being flush with at least a first side 50 of the second plate 35.

[0099] In practice, the interface surface is a surface formed by the sealant W at the interface with the cables of the pair of cables 135 and which surrounds the same defining, in fact, between that interface surface and the wall defined by the outer face of the first horizontal longitudinal member 70, the housing seat S.

[0100] The housing seat S opens at a second side 30, 55 of the first plate 5 and of the second plate 35 through an outlet opening 140, which in fact defines an open end of the housing seat S facing the outside of the door 1.

[0101] The pair of cables 135 then protrudes from the interspace 65 defined between the first plate 5 and the second plate 35, or from the first longitudinal channel 95, through said outlet opening 140 of the housing seat S placed at the second side 30 of the first plate 5 and second plate 35.

[0102] Said second side 30, 55 from which the pair of cables 135 protrudes, in use, will be the side of the door 1 proximal to the hinging (or fixing) area thereof to the frame T of the refrigerator R.

[0103] In a preferred embodiment, shown in the figures, the electrical connection element 130 (in addition to the pair of cables 135) also comprises a connector 150, which connects the proximal end of the cables of the pair of cables 135 to the heating element 105.

[0104] In practice, in this embodiment the cables of the pair of cables 135 are indirectly connected to the heating element 105 by interposing said connector 150.

[0105] For example, the connector 150 is adapted to cross the first horizontal longitudinal member 70 (and/or the second horizontal longitudinal member 75), thus pro-

viding, in the direction of crossing of the current, a proximal end (directly) connected to the cables of the pair of cables 135, which is located inside (or leads into) the first longitudinal channel 95 (and/or second longitudinal channel 100), and a distal end (directly) connected to the heating element 105 (i.e. to the pair of first strips 110), which is located inside (or leads into) the closed chamber 90.

[0106] In the example, the first horizontal longitudinal member 70 and/or the second horizontal longitudinal member 75 of the spacer 60, for example the first horizontal longitudinal member 70, are made of two homologous half-portions 145.

[0107] In such an embodiment, the half-portions 145 are aligned and connected to each other (at a center line area of the door 1), for example, by means of the connector 150.

[0108] In particular, the connector 150 is placed between the two half-portions 145, substantially equidistant from the second sides 30 of the first plate 5 and of the second plate 35, and connected thereto by means, for example, of a prismatic (sealed) interlocking coupling, in practice, the electrical connecting element 130 itself forms a portion of the first horizontal longitudinal member 70, or a portion of spacer 60.

[0109] The connector 150 has a first portion (which defines the distal end thereof) inserted into the closed chamber 90 in contact with the first strips 110 of the heating element 105 and a second portion (which defines the proximal end thereof) facing towards (or leading into) the first longitudinal channel 95 (being accessible therefrom).

[0110] Said connector 150 is inserted into and fixed to the half-portions 145 of the first horizontal longitudinal member 70 so as to form itself a portion of said first horizontal longitudinal member 70 or of spacer 60 (in practice, the connector 150 closes the facing open ends of the two half-portions 145).

[0111] For example, the connector 150 has a substantially "H" shape, that is, it has a first section 155 and a second section 160 parallel to each other and an intermediate section 165 connecting said first section 155 and said second section 160 orthogonal thereto.

[0112] The first section 155 is, for example, made of plastic material and can provide a central body 170, for example, having a polygonal (irregular) section.

[0113] The central body 170 has a first metal contact and a second metal contact, electrically isolated from each other.

[0114] For example, the first metal contact is associated with the central body 170 at a first channel 175 and the second metal contact is associated with the central body 170 at a second channel 180.

[0115] The first channel 175 and the second channel 180 extend in a direction perpendicular to a longitudinal axis of the central body 170, and have an inlet opening directed towards, and accessible from, the first longitudinal channel 95.

[0116] The first section 155 then has two lateral pins 185 formed at opposite sides of the central body 170.

[0117] The lateral pins 185 extend in a direction parallel to a longitudinal axis of the central body 170, or they form a lateral extension of the central body 170 itself.

[0118] The lateral pins 185 have, for example, a shape homologous to that of the central body 170 and are adapted to be inserted each in a half-portion 145 of the first horizontal longitudinal member 70 so as to achieve a prismatic sealing coupling with the same (closing in fact the facing open ends of the same half-portions).

[0119] The intermediate portion 165 has a first metal sheet 190 extending from the first channel 175 of the first section 155 and connected to the metal contact of said first channel 175, and a second metal plate 195 which protrudes from the second channel 180 and is connected to the metal contact of said second channel 180 of the first section 155.

[0120] The first metal sheet 190 and the second metal sheet 195 are placed parallel to and at a distance from each other, so as to be electrically insulated, and extend in a direction orthogonal to the first section 155.

[0121] The second section 160 has a first metal wing 200, for example substantially in the shape of a "C", which forms an extension without interruption of the first metal sheet 190 of the intermediate section 165, and a second metal wing 205, for example substantially in the shape of a "C", forming an extension without interruption of the second metal sheet 195 of the intermediate section 165.

[0122] The first metal wing 200 and the second metal wing 205 are aligned with each other and extend orthogonally to the intermediate section 165 in opposite directions.

[0123] Each metal wing 200, 205 is then provided with a plate 210, for example of a rectangular shape.

[0124] The plates 210 are coplanar and lie in use on a plane parallel to a lying plane of the first plate 5.

[0125] In use, the first section 155 is aligned with the two half-portions 145 of the first horizontal longitudinal member 70 and is connected thereto by means of the lateral pins 185 formed on the opposite sides of the central body 170.

[0126] The intermediate section 165 is thus placed inside the closed chamber 90 and the second section 160 is in contact with the heating element 105, i.e. the plates 210 of the first metal wing 200 and the second metal wing 205 are in contact each with a respective first strip 110 of the heating element 105 (for example, forcibly due to an elastic force due to the shape of the metal wings 200 and 205 themselves).

[0127] In this preferred embodiment, the cables of the pair of cables 135 are (directly) connected with their proximal end - which is located outside the closed chamber 90 and is located inside the first longitudinal channel 95 (and/or second channel longitudinal 100) - to the connector 150.

[0128] More in detail, a cable of the pair of cables 135 is inserted and electrically connected in the first channel

175 of the first section 155 by means of the metal contact therein, and the other cable of the pair of cables 135 is connected and electrically connected in the second channel 180 of the first section 155 by means of the metal contact therein.

[0129] Starting from their proximal end, the cables of the pair of cables 135 extend (also in this case) parallel to the first sides 25, 50 of the first plate 5 and of the second plate 35, received in the housing seat S formed in the first channel longitudinal 95, or completely contained therein.

[0130] Preferably, the pair of cables 135 is received in a housing seat S which extends, throughout its development, substantially parallel to the first sides 25, 50 of the first plate 5 and of the second plate 35.

[0131] Also in this case, the housing seat S extends from a first side 25, 50 of said first plate 5 and second plate 35 up to about half of the longitudinal extension of the first longitudinal channel 95 (approximately at the center line of the first plate 5, or of the door 1), for example in the proximity (of the first channel 175 and of the second channel 180 of the first section 155) of the connector 150, or up to a portion of interspace 65 substantially equidistant from the second sides 30, 55 of said first plate 5 and second plate 35.

[0132] In practice, the housing seat S extends substantially by half of the longitudinal (horizontal) development of the first longitudinal channel 95.

[0133] Also in this case, the housing seat S is formed so that a portion of the outer face of the first horizontal longitudinal member 70 defines a wall of the housing seat S and (the housing seat S as a whole or) such a wall defined by the outer face of the first horizontal longitudinal member 70 is (superiorly) closed by the interface surface (as described above), for example concave with concavity facing towards the outer face of the first horizontal longitudinal member 70.

[0134] Such an interface surface, as said, is defined by a sealant W inserted in the first longitudinal channel 95, for example so as to substantially fill all of said first longitudinal channel 95 (except the housing seat S for the pair of cables 135), being flush with at least a first side 25 of the second plate 35.

[0135] In practice, the interface surface is a surface formed by the sealant W at the interface with the cables of the pair of cables 135 and which surrounds the same defining, in fact, between that interface surface and the wall defined by the outer face of the first horizontal longitudinal member 70, the housing seat S.

[0136] The housing seat S opens at a second side 30 of the first plate 5 and of the second plate 35 through the outlet opening 140, which in fact defines an open end of the housing seat S facing the outside of the door 1.

[0137] The pair of cables 135 protrudes from the interspace 65 defined between the first plate 5 and the second plate 35, or from the first longitudinal channel 95, through said outlet opening 140 of the housing seat S placed at the second side 30 of the first plate 5 and second plate 35.

[0138] Said second side 30 from which the pair of cables 135 protrudes, in use, will be the side of the door 1 proximal to the hinging (or fixing) area thereof to the frame T of the refrigerator R.

[0139] The door 1 still further comprises a first support element 215 for hooking the door 1 itself to the frame T of the refrigerator R, at the first sides 25, 50 of the first plate 5 and of the second plate 35 proximal to the first horizontal longitudinal member 70.

[0140] The first support element 215 is allocated (or completely contained) in the first longitudinal channel 95, for example embedded in the sealant W inserted in the first longitudinal channel 95, and is interposed between the first horizontal longitudinal member 70, kept at a distance therefrom by the sealant W itself, and the first sides 25, 50 of the first plate 5 and of the second plate 35 proximal to said first horizontal longitudinal member 70.

[0141] The first support element 215 is fixed to the first plate 5 and to the second plate 35.

[0142] For example, said first support element 215 is parallelepiped-shaped and is fixed so as to be totally contained in the first housing channel 95 and that an outer surface thereof is coplanar with at least one of the first sides 25 of the first plate 5 and the first sides 50 of the second plate 35 proximal to the first horizontal longitudinal member 70.

[0143] Said first support element 215 is configured, for example, as a bar extending along the entire longitudinal extension of the first upper side 25, 50 of the first plate 5 and of the second plate 35 and is provided with slots for receiving hinge pins associated with the frame T of the refrigerator R.

[0144] For example, the first support element 215 is made of aluminum or other metal material or other rigid material in general.

[0145] The door 1 further comprises a second support element 220 for hooking the door 1 itself to the frame T of the refrigerator R, at the first sides 25, 50 of the first plate 5 and of the second plate 35 proximal to the second horizontal longitudinal member 75. The second support element 220 is allocated (or completely contained) in the second longitudinal channel 100, for example embedded in the sealant W inserted in the second longitudinal channel 100, and is interposed between the second horizontal longitudinal member 75 (and in contact therewith) and the first sides 25, 50 of the first plate 5 and of the second plate 35 proximal to said second horizontal longitudinal member 75.

[0146] The second support element 220 is fixed to the first plate 5 and to the second plate 35.

[0147] For example, said second support element 220 is parallelepiped-shaped and is fixed so as to be totally contained in the second housing channel 100 and so that an outer surface thereof is coplanar with at least one of the first sides 25 of the first plate 5 and the first sides 50 of the second plate 35 proximal to the second horizontal longitudinal member 75.

[0148] The second support element 220 is configured,

for example, as a bar extending along the entire longitudinal extension of the first side 25, 50 of the first plate 5 and of the second plate 35 and is provided with slots for receiving hinge pins associated with the frame T of the refrigerator R.

[0149] For example, the second support element 220 is made of aluminum other metal material or other rigid material in general.

[0150] For example, on the first outer surface 15 of the first plate 5, a layer of (optically non-transparent) paint P may be deposited, for example by screen printing or other deposition technique, so as to hide the portion of door 1 from the first support element 215, or from a first side 25 of the first plate 5, to the surface of the first horizontal longitudinal member 70 facing the closed chamber 90.

[0151] A further layer of (optically non-transparent) paint P, also for example deposited by screen printing or other deposition technique, may be deposited on the first outer surface 15 of the first plate 5, so as to hide (also) the portion of door 1 from the second support element 220, or from the other first side 25 of the door, to the second horizontal longitudinal member 75, or to a surface of the second horizontal longitudinal member 75 facing the first horizontal longitudinal member 70.

[0152] The invention thus conceived is susceptible to numerous modifications and variations, all of which are within the scope of the inventive concept.

[0153] In practice, the materials used as well as the shapes and sizes may be any according to the requirements, without departing from the protection scope of the following claims.

Claims

1. A frameless door (1) for refrigerators, comprising:

- a pair of plates (5, 35), made of thermally insulating material, facing and joined by a spacer (60) which divides an interspace (65) between the plates of the pair of plates (5, 35) in a closed chamber (90)
- a heating element (105) fixed to one of the plates (5, 35) inside the closed chamber (90);
- an electrical connection element (130) provided with at least one elongated section contained in a housing seat (S) and a first end connected to the heating element (105);
- said housing seat (S) ends with an outlet opening (140) at a second side (30, 55) adjacent to the first side of the pair of plates (5, 35); the electrical connection element (130) being provided with an opposing second end which protrudes out of the outlet opening (140) of the housing seat (S)

characterized by comprising:

- at least one longitudinal channel (95, 100) parallel to a first side (25, 50) of the pair of plates, the housing seat (S) being contained in the longitudinal channel (95,100) which extends longitudinally along an axial section of the longitudinal channel (95,100), the spacer (60) comprising at least one or two vertical longitudinal members (80, 85) parallel to the second side (30, 55) of the pair of plates (5, 35) and opposed, wherein each vertical longitudinal member (80, 85) is optically transparent.

2. The door according to claim 1, wherein the heating element (105) comprises strips (110, 120) of an electrical resistor deposited on a first inner surface (10) of the plate (5) to which the heating element (105) is fixed, wherein the strips (110, 120) are connected to each other in such a way as to define a single electrical resistance.

3. The door according to claim 2, wherein the heating element (105) comprises:

- at least two first strips (110) parallel to the first side (25, 50) and proximal to the longitudinal channel (95), wherein the first strips (110) are aligned with each other and separated from each other by an insulating segment (115) placed in the vicinity of the center line of the first inner surface (10);
- a second strip (120) parallel to the first side (25, 50) and proximal to the first side (25, 50) of the pair of plates (5, 35) opposed to the longitudinal channel (95) proximal to the first strips (110); and
- a resistor (125) deposited on the first inner surface (10) that electrically connects a first strip (110) with the second strip (120) and the second strip (120) with the other first strip (110) defining an electrical track.

4. The door according to claim 1, wherein the spacer (60) comprises two horizontal longitudinal members (70, 75) parallel to the first side (25, 50) of the pair of plates (5, 35) and opposed, wherein at least one of the horizontal longitudinal members (70, 75) has a longitudinal cavity communicating with the closed chamber (90) through openings (F), at least one desiccant substance (G) being contained in the longitudinal cavity of at least one horizontal longitudinal member (70, 75).

5. The door (1) according to claim 1, wherein each plate of the pair of plates (5, 35) is optically transparent.

6. The door (1) according to claim 1, further comprising a support element (215) for connecting the door (1) to a frame (T) of the refrigerator (R), the support el-

ement (215) being contained in the longitudinal channel (95) parallel at a distance from the spacer (60).

7. The door (1) according to claim 1, wherein the electrical connection (130) element comprises at the first end a connector (150) fixed to the spacer (60) accessible from the longitudinal channel (95) and protruding inside the closed chamber (90) by means of connecting wings (200, 205) in contact with at least one portion of the heating element (105).

8. A refrigerator (R) comprising:

- a frame (T) for defining an access opening (E) of the refrigerator (R), and
- at least one door (1) according to claim 1, adapted to close at least a portion of the access opening (E).

Patentansprüche

1. Rahmenlose Tür (1) für Kühlschränke, umfassend:

- ein Paar von Platten (5, 35) aus wärmeisolierendem Material, die einander gegenüberliegen und durch einen Abstandhalter (60) verbunden sind, der einen Zwischenraum (65) zwischen den Platten des Paars von Platten (5, 35) in eine geschlossene Kammer (90) unterteilt
- ein Heizelement (105), das an einer der Platten (5, 35) innerhalb der geschlossenen Kammer (90) befestigt ist;
- ein elektrisches Verbindungselement (130), das mit mindestens einem länglichen Teilabschnitt, der in einem Gehäusesitz (S) enthalten ist, und einem ersten Ende, das mit dem Heizelement (105) verbunden ist, versehen ist;
- wobei der Gehäusesitz (S) mit einer Auslassöffnung (140) an einer zweiten Seite (30, 55) angrenzend an die erste Seite des Paars von Platten (5, 35) endet; das elektrische Verbindungselement (130) mit einem gegenüberliegenden zweiten Ende versehen ist, das aus der Auslassöffnung (140) des Gehäusesitzes (S) hervorsteht

dadurch gekennzeichnet, dass sie Folgendes umfasst:

- mindestens einen Längskanal (95, 100) parallel zu einer ersten Seite (25, 50) des Paars von Platten, wobei der Gehäusesitz (S) in dem Längskanal (95, 100) enthalten ist, der sich längs entlang eines axialen Abschnitts des Längskanals (95, 100) erstreckt, der Abstandhalter (60) umfassend mindestens ein oder zwei vertikale Längselemente (80, 85) parallel zu der zweiten Seite (30, 55) des Paars von Platten (5, 35) und gegenüberliegend, wobei jedes vertikale Längselement (80, 85) optisch transparent ist.

2. Tür nach Anspruch 1, wobei das Heizelement (105) Streifen (110, 120) eines elektrischen Widerstands umfasst, die auf einer ersten Innenfläche (10) der Platte (5), an der das Heizelement (105) befestigt ist, aufgebracht sind, wobei die Streifen (110, 120) miteinander auf eine Weise verbunden sind, um einen einzigen elektrischen Widerstand zu definieren.

3. Tür nach Anspruch 2, wobei das Heizelement (105) Folgendes umfasst:

- mindestens zwei erste Streifen (110) parallel zu der ersten Seite (25, 50) und proximal zu dem Längskanal (95), wobei die ersten Streifen (110) zueinander ausgerichtet und durch ein Isoliersegment (115), das in der Nähe der Mittellinie der ersten Innenfläche (10) platziert ist, voneinander getrennt sind;
- einen zweiten Streifen (120) parallel zu der ersten Seite (25, 50) und proximal zu der ersten Seite (25, 50) des Paars von Platten (5, 35) gegenüber dem Längskanal (95) proximal zu den ersten Streifen (110); und
- einen Widerstand (125), der auf der ersten Innenfläche (10) aufgebracht ist, der einen ersten Streifen (110) mit dem zweiten Streifen (120) und den zweiten Streifen (120) mit dem anderen ersten Streifen (110) elektrisch verbindet, wodurch eine elektrische Spur definiert wird.

4. Tür nach Anspruch 1, wobei der Abstandhalter (60) zwei horizontale Längselemente (70, 75) parallel zu der ersten Seite (25, 50) des Paars von Platten (5, 35) und gegenüberliegend umfasst, wobei mindestens eines der horizontalen Längselemente (70, 75) einen Längshohlraum aufweist, der über Öffnungen (F) mit der geschlossenen Kammer (90) in Verbindung ist, wobei mindestens eine Trockenmittelsubstanz (G) in dem Längshohlraum mindestens eines horizontalen Längselements (70, 75) enthalten ist.

5. Tür (1) nach Anspruch 1, wobei jede Platte des Paars von Platten (5, 35) optisch transparent ist.

6. Tür (1) nach Anspruch 1, ferner umfassend ein Halterungselement (215) zum Verbinden der Tür (1) mit einem Rahmen (T) des Kühlschranks (R), wobei das Halterungselement (215) in dem Längskanal (95) parallel in einem Abstand von dem Abstandhalter (60) enthalten ist.

7. Tür (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** das elektrische Verbindungselement (130) an

dem ersten Ende einen Verbinder (150) umfasst, der an dem Abstandhalter (60) befestigt ist, der von dem Längskanal (95) aus zugänglich ist und mittels Verbindungsflügeln (200, 205), die mit mindestens einem Abschnitt des Heizelements (105) in Kontakt sind, in das Innere der geschlossenen Kammer (90) hervorsteht.

8. Kühlschrank (R), umfassend:

- einen Rahmen (T) zum Definieren einer Zugangsöffnung (E) des Kühlschranks (R), und
- mindestens eine Tür (1) nach Anspruch 1, die angepasst ist, um mindestens einen Abschnitt der Zugangsöffnung (E) zu schließen.

Revendications

1. Porte sans cadre (1) pour réfrigérateurs, comprenant :

- une paire de plaques (5, 35), en matériau thermiquement isolant, se faisant face et reliées par une entretoise (60) qui divise un espace intermédiaire (65) entre les plaques de la paire de plaques (5, 35) dans une chambre fermée (90)
- un élément chauffant (105) fixé à une des plaques (5, 35) à l'intérieur de la chambre fermée (90) ;
- un élément de raccordement électrique (130) doté d'au moins une section allongée contenue dans un logement (S) et d'une première extrémité reliée à l'élément chauffant (105) ;
- ledit logement (S) s'achève par une ouverture de sortie (140) sur un deuxième côté (30, 55) adjacent au premier côté de la paire de plaques (5, 35) ; l'élément de raccordement électrique (130) étant pourvu d'une deuxième extrémité opposée qui fait saillie hors de l'ouverture de sortie (140) du logement (S)

caractérisé en ce qu'elle comprend :

- au moins un canal longitudinal (95, 100) parallèle à un premier côté (25, 50) de la paire de plaques, le logement (S) étant contenu dans le canal longitudinal (95, 100) qui s'étend longitudinalement le long d'une section axiale du canal longitudinal (95, 100), l'entretoise (60) comprenant au moins un ou deux éléments longitudinaux verticaux (80, 85) parallèles au deuxième côté (30, 55) de la paire de plaques (5, 35) et opposés, dans lequel chaque élément longitudinal vertical (80, 85) est optiquement transparent.

2. Porte selon la revendication 1, dans laquelle l'élément chauffant (105) comprend des bandes (110, 120) d'une résistance électrique déposée sur une première surface intérieure (10) de la plaque (5) à laquelle l'élément chauffant (105) est fixé, les bandes (110, 120) étant reliées entre elles de manière à définir une seule résistance électrique.

3. Porte selon la revendication 2, dans laquelle l'élément chauffant (105) comprend :

- au moins deux premières bandes (110) parallèles au premier côté (25, 50) et proches du canal longitudinal (95), dans lesquelles les premières bandes (110) sont alignées les unes avec les autres et séparées les unes des autres par un segment isolant (115) placé à proximité de la ligne centrale de la première surface intérieure (10) ;
- une deuxième bande (120) parallèle au premier côté (25, 50) et proche du premier côté (25, 50) de la paire de plaques (5, 35) opposée au canal longitudinal (95) proche des premières bandes (110) ; et
- une résistance (125) déposée sur la première surface intérieure (10) qui relie électriquement une première bande (110) à la deuxième bande (120) et la deuxième bande (120) à l'autre première bande (110) définissant une piste électrique.

4. Porte selon la revendication 1, dans laquelle l'entretoise (60) comprend deux éléments longitudinaux horizontaux (70, 75) parallèles au premier côté (25, 50) de la paire de plaques (5, 35) et opposés, dans laquelle au moins un des éléments longitudinaux horizontaux (70, 75) a une cavité longitudinale communiquant avec la chambre fermée (90) à travers des ouvertures (F), au moins une substance déshydratante (G) étant contenue dans la cavité longitudinale d'au moins un élément longitudinal horizontal (70, 75).

5. Porte (1) selon la revendication 1, dans laquelle chaque plaque de la paire de plaques (5, 35) est optiquement transparente.

6. Porte (1) selon la revendication 1, comprenant en outre un élément de support (215) permettant de relier la porte (1) à un cadre (T) du réfrigérateur (R), l'élément de support (215) étant contenu dans le canal longitudinal (95) parallèle à une certaine distance de l'entretoise (60).

7. Porte (1) selon la revendication 1, dans laquelle l'élément de raccordement électrique (130) comprend à la première extrémité un connecteur (150) fixé à l'entretoise (60) accessible depuis le canal longitudinal (95) et faisant saillie à l'intérieur de la chambre fer-

mée (90) au moyen d'ailettes de raccordement (200, 205) en contact avec au moins une partie de l'élément chauffant (105).

8. Réfrigérateur (R) comprenant :

- un cadre (T) permettant de définir une ouverture d'accès (E) du réfrigérateur (R), et
- au moins une porte (1) selon la revendication 1, adaptée pour fermer au moins une partie de l'ouverture d'accès (E).

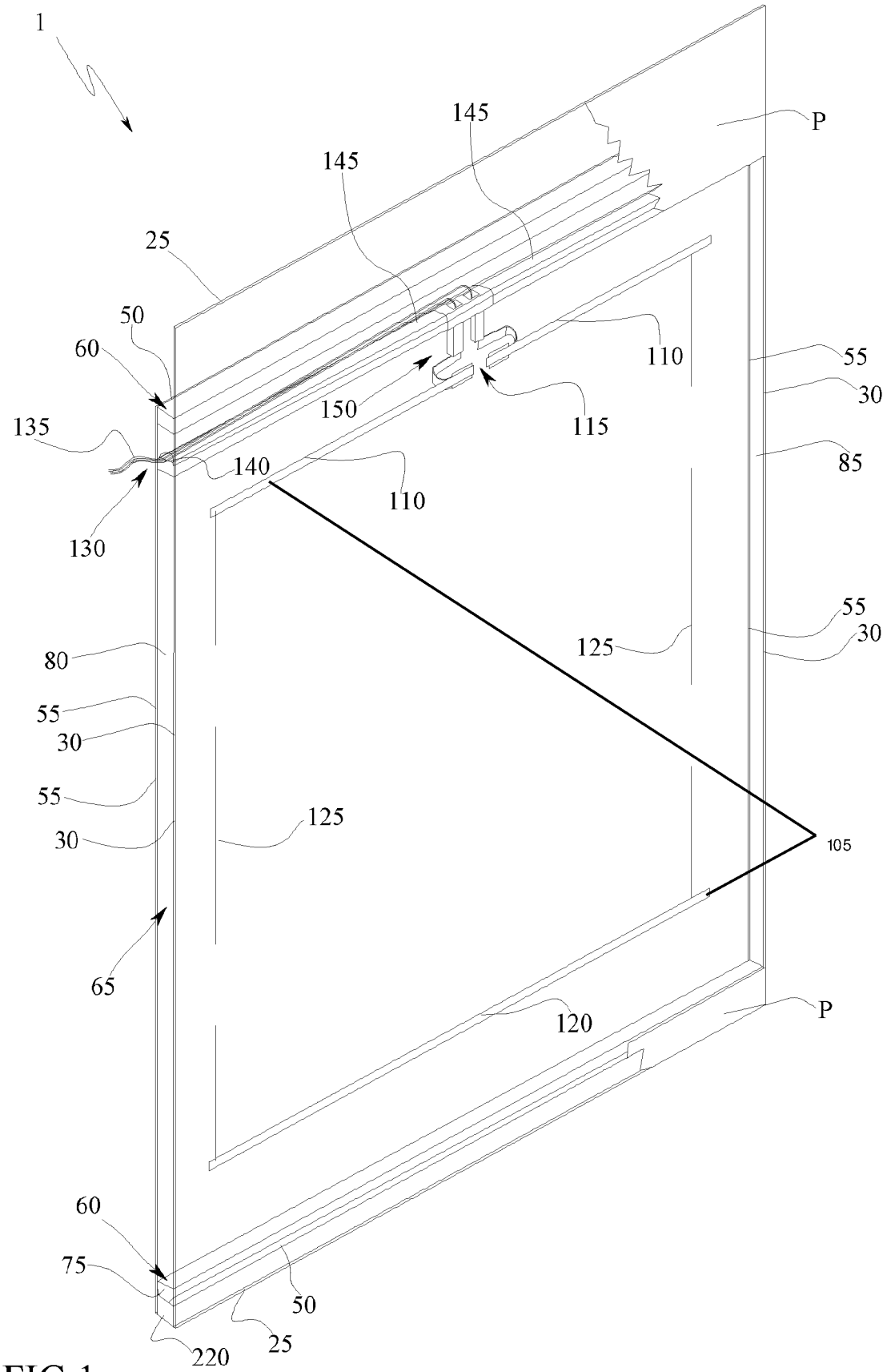

1
145
145
P
25
50
60
110
55
30
150
115
135
140
110
85
130
55
80
125
30
55
30
55
125
30
105
65
120
P
60
75
50
25
220

FIG.1

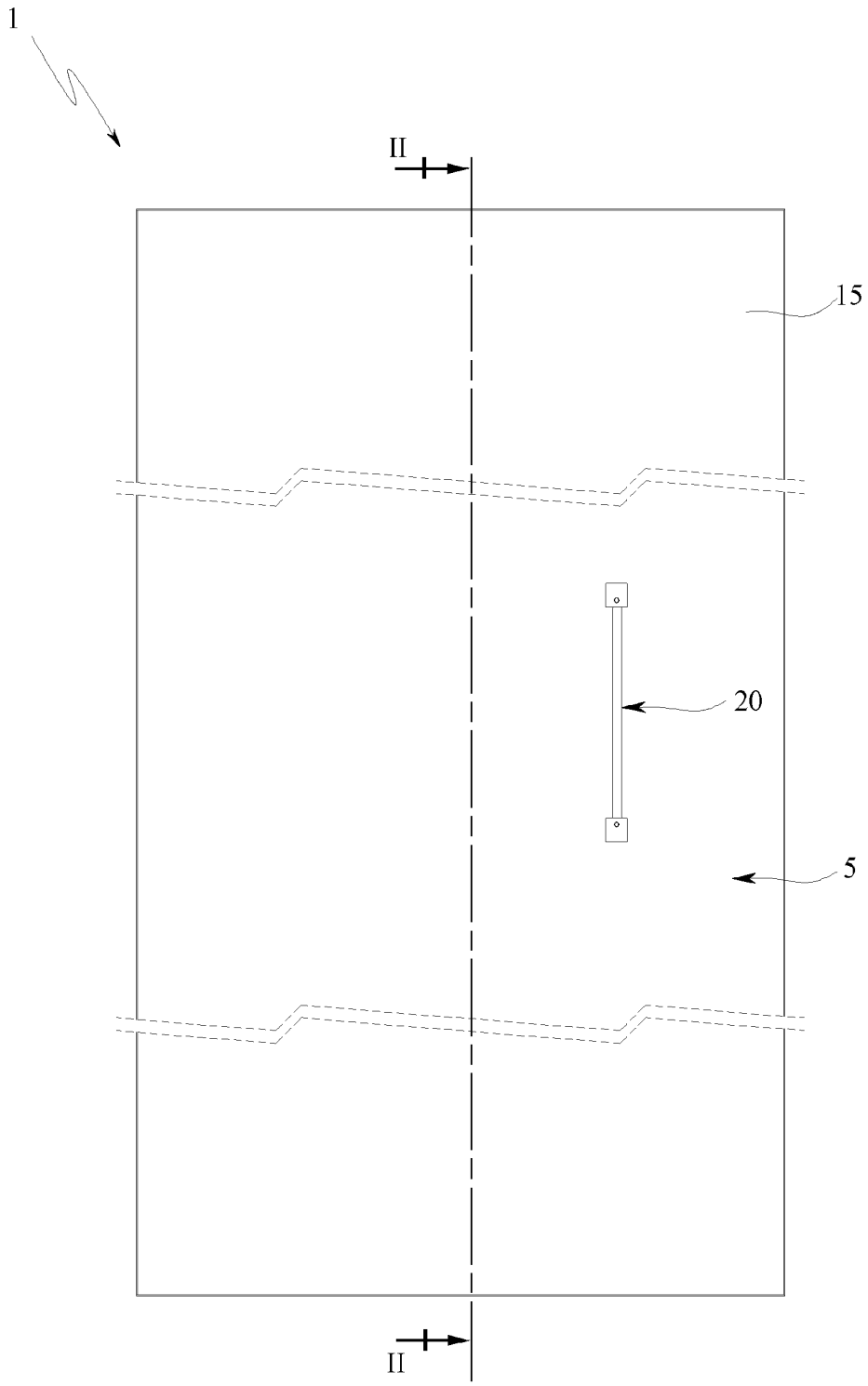


FIG.2

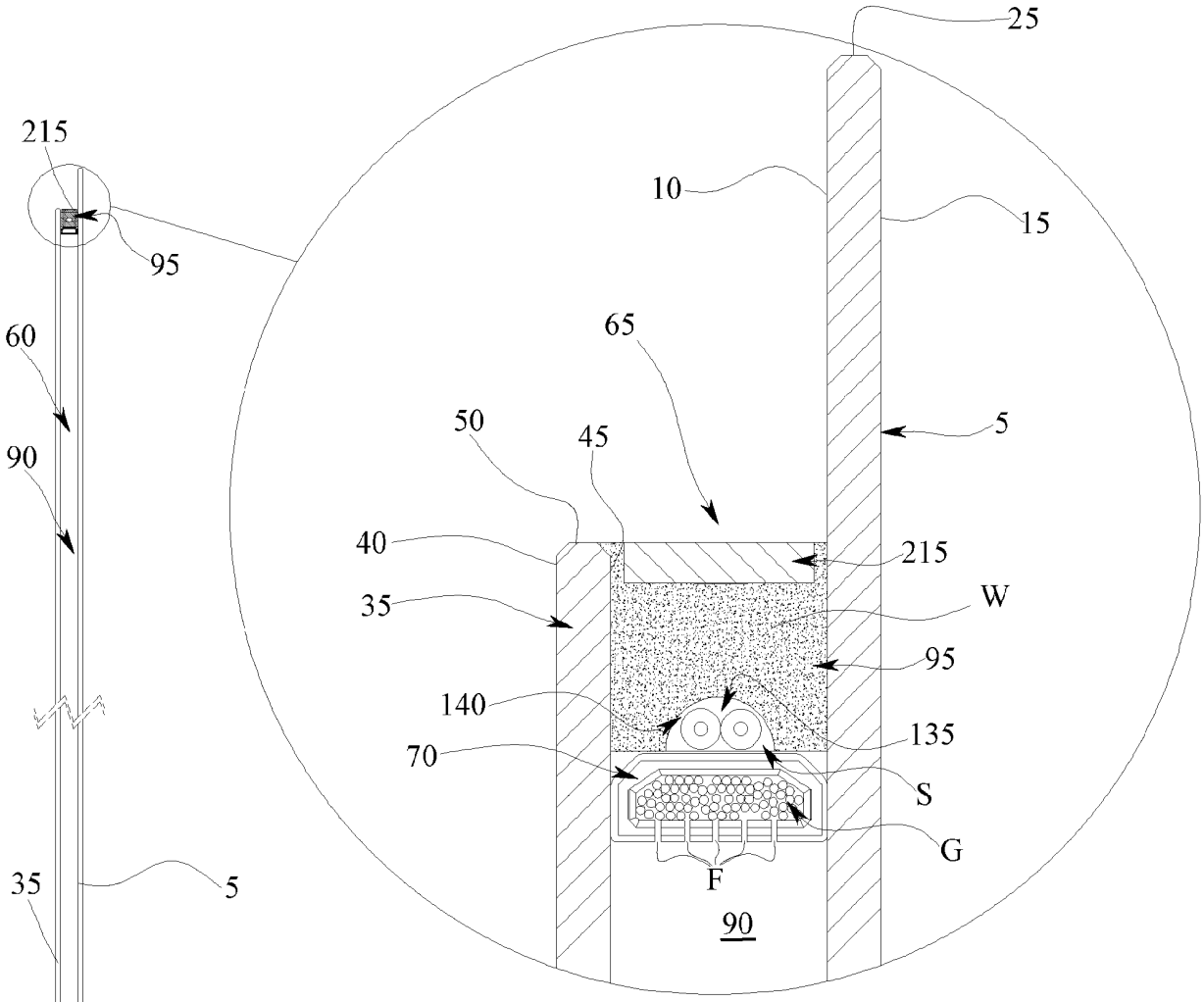


FIG.4

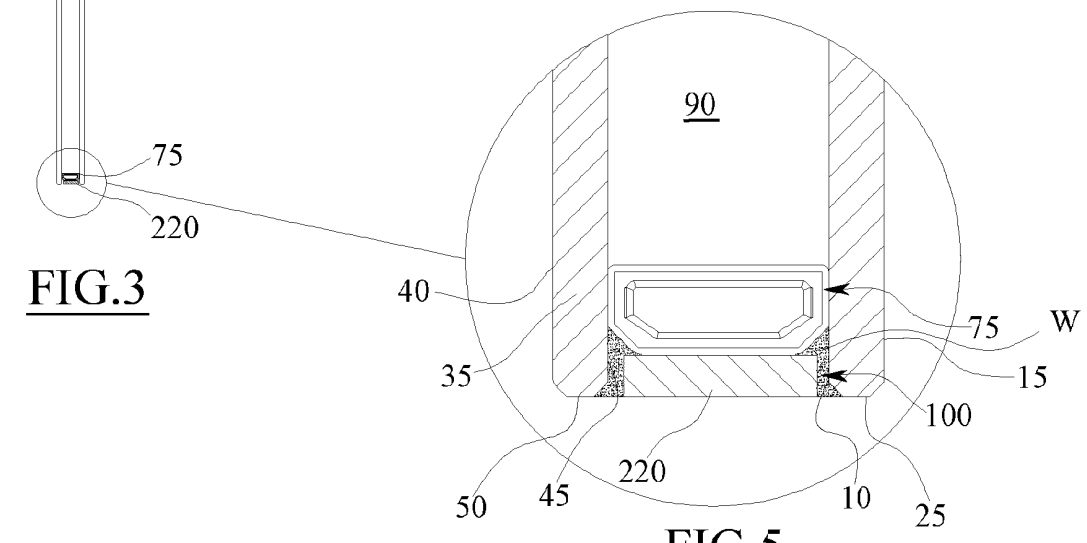


FIG.3

FIG.5

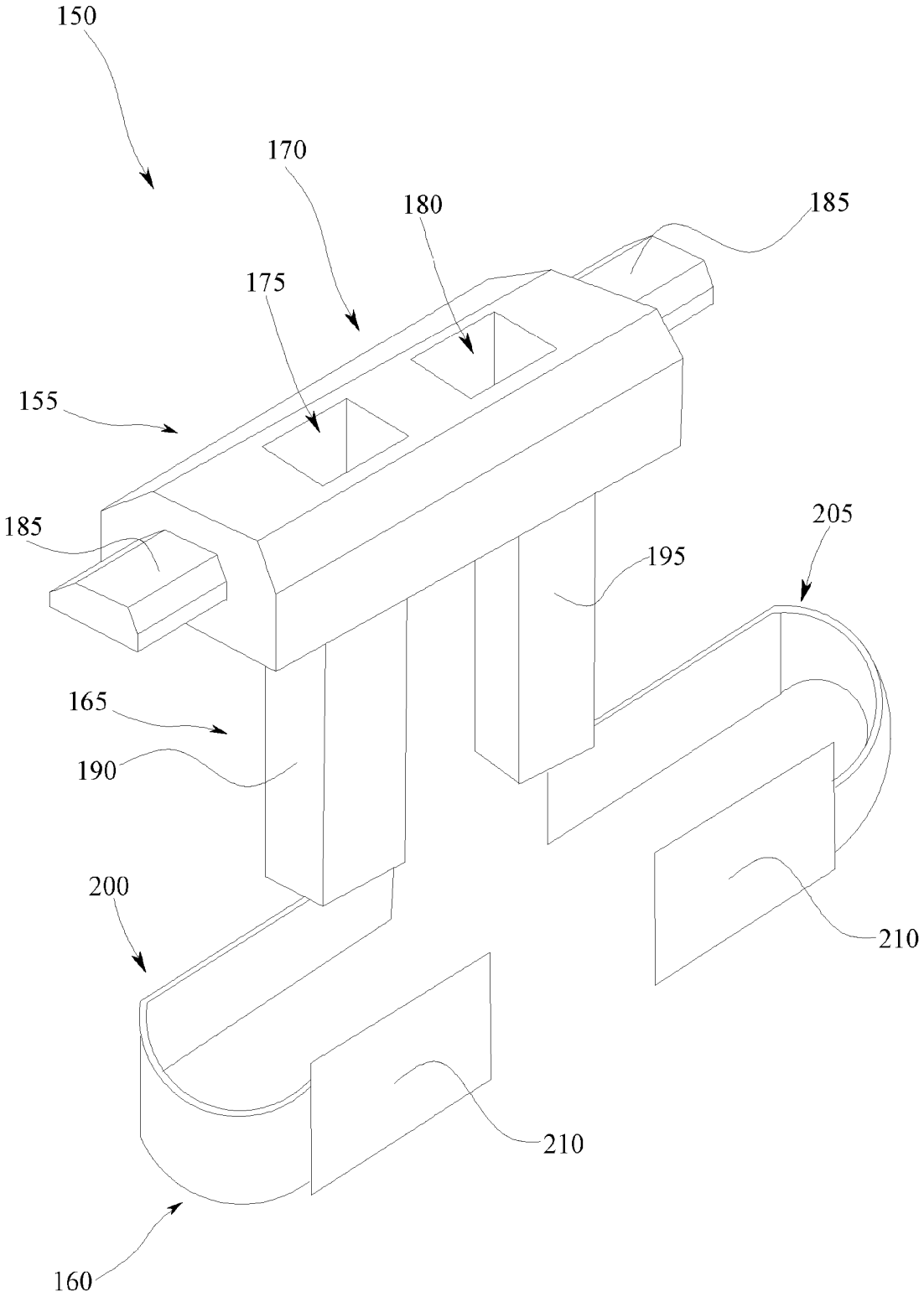


FIG.6

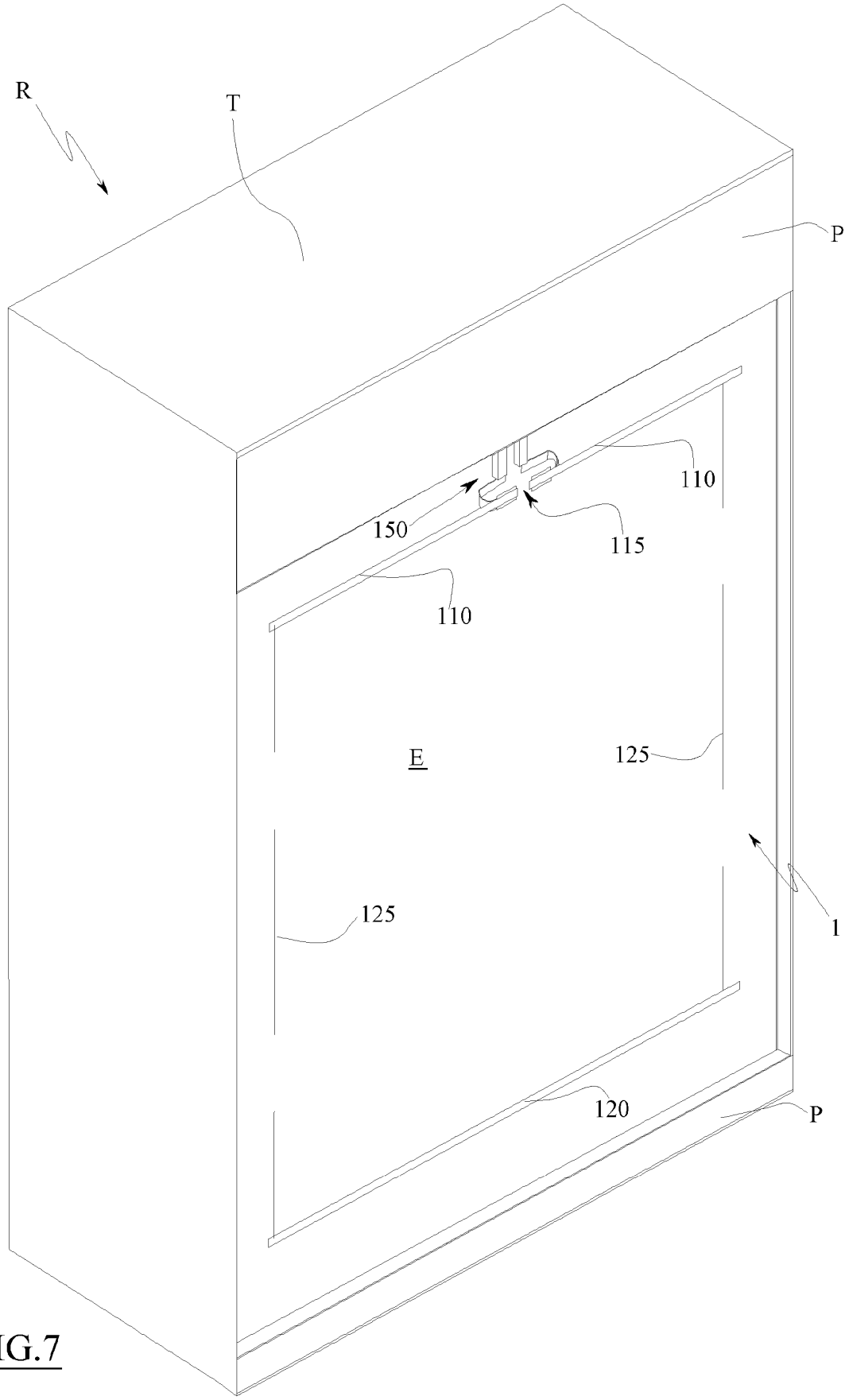


FIG.7

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- GB 2292581 A **[0005]**
- WO 9830409 A1 **[0006]**
- US 2007204531 A1 **[0006]**