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(54) **A cabinet-side door frame for refrigerator cabinets**

(57) A front frame (20) for doors of refrigerator cabinets, comprising a border able to delimit an access entry of the refrigerator cabinet, wherein at least a portion (21,

22, 23) of the border comprises a first part (210, 220, 230) made of a plastic material, in which the plastic material is high-density foam polyurethane.

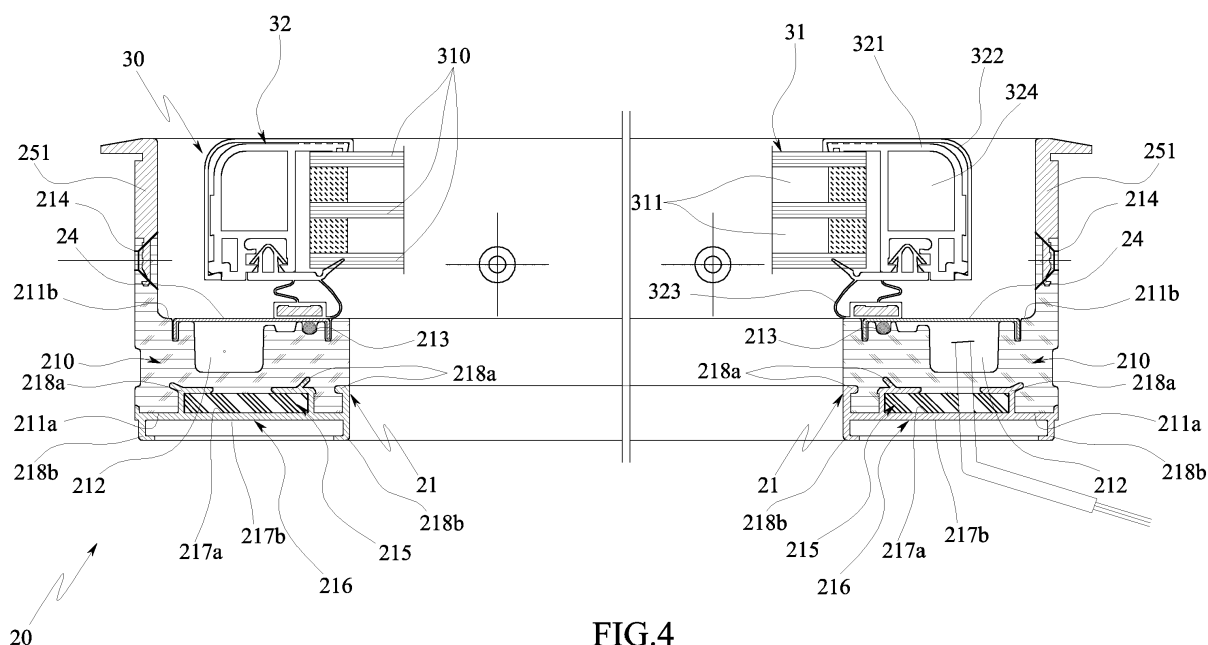


FIG.4

Description

TECHNICAL FIELD

[0001] The present invention relates to doors of refrigerator cabinets, in particular of the refrigerator cabinets used for the display and sale of perishable products, typically food products, and which are intended to be placed in sales points of food products or the like, for conservation and display of those products.

PRIOR ART

[0002] As is known, a refrigerator cabinet generally comprises at least an internal cell for containing products, an access entry for introducing and removing products into/out of the internal containing cell, and an appropriate door applied to the access entry.

[0003] The door comprises a cabinet-side front frame, generally conformed as a border which is fixed to the refrigerator cabinet so as to delimit the access entry, and an openable door associated to the front frame for closing the access entry.

[0004] The door can be hinged to the cabinet front frame, thus realizing a leaf door, or can slide with respect to the front frame, defining a sliding door.

[0005] In both cases, the door normally comprises a frame generally formed as a border, which surrounds and constrains a transparent closing panel.

[0006] The transparent panel can be realised by one or more glass or plastic panes. For realising the cabinet-side front frame and the door frame, it is known to use profiled elements made of a plastic material in general polyvinylchloride (PVC), for example formed by extrusion such as to realise longitudinal profiled elements with an appropriate profiled section.

[0007] Owing to the difference between the external temperature and the internal temperature of the refrigerator cabinet, the plastic profiled elements are however often subject to asymmetrical deformations, which can lead to the opening of gaps between the adjacent profiled elements at the corners of the frame and the cabinet-side front frame, or which can cause loss of rectilinearity, with consequent problems of thermal seal.

[0008] Owing to the low resistance characteristics of the plastic material, these profiled elements are further generally unsuitable for realizing frames and front frames having large dimensions which are destined to bear a heavy load.

[0009] The plastic material is further often subject to ageing phenomena which can cause colour changes, as well as a progressive weakening of the profiled elements over time, with consequent breakages and/or cracks.

[0010] To obviate these drawbacks, it is known to make the frame and cabinet-side front frame of the door using metal profiled elements, typically made of aluminium.

[0011] Unless the metal is a highly heat-conductive material, due to the difference between the external tem-

perature and the internal temperature of the refrigerator cabinet there can be disadvantageous formation of condensation, such as dew or frost, on the external surface of the profiled elements.

[0012] To prevent formation of condensation, the transversal section of the metal profiled elements generally comprises a hollow portion which affords a receiving channel for heating means, typically an electrical resistance, which have the task of heating the frame and/or the cabinet-side front frame.

[0013] The good heat conductivity of the metal, however, implies that the heat supplied by the electrical resistance will spread also towards zones of the profiled elements which are extraneous to the points where the heat is required to prevent formation of condensation.

[0014] It follows that in order to effectively prevent the formation of condensation, a quantity of electrical energy is required that is significantly higher than what is necessary, with consequent repercussions in terms of the energy profile and with an increase in general management costs of the refrigerator cabinet. With the aim of obviating these drawbacks, a solution is known which includes the frame and the cabinet-side front frame of the door being constituted by metal profiled elements completely clad by profiled elements made of a plastic material such as PVC.

[0015] In practice, the metal profiled elements function as support cores and are inserted internally of plastic profiled elements which exhibit a generally tubular conformation that completely covers the metal.

[0016] By exploiting the insulating characteristics of the plastic material it has been found that this solution prevents formation of condensation without any need for predisposing heating means, or in any case with a smaller consumption of electrical energy.

[0017] This solution further enables obviating the problems of mechanical resistance linked to the use of profiled elements made entirely of plastic material. However, since the metal profiled element is completely enveloped by the profiled element made of plastic material, the metal profiled element is subject to both the external temperature and the internal temperature of the refrigerator cabinet, and can therefore in any case present ageing phenomena, shrinkage and/or asymmetrical deformations.

[0018] Further, the heat transmittance of the door, given same thermal characteristics of the transparent panel, depends substantially on the characteristics of the PVC which constitutes the profiled elements of plastic material.

[0019] Lastly, the inserting of the metal profiled element in the plastic element, generally obtained by extrusion, leads to a certain operating difficulty, which is reflected in a longer duration and cost of the assembly process of the frame and cabinet front-frame.

[0020] An aim of the present invention is to obviate the above-mentioned drawbacks of the prior art, with a solution that is simple, rational and relatively inexpensive.

[0021] In particular, an aim of the present invention is

to realise a cabinet-side front frame constituted by profiled elements made of plastic material or metal profiled elements that are completely covered by profiled elements made of plastic material which exhibit a smaller thermal transmittance and at the same time exhibit a high mechanical stability, good resistance to wear, relatively good aesthetic versatility of the finishings applicable, while at the same time permitting a rapid and economical realization.

[0022] The aims are attained by the characteristics of the invention reported in the independent claim. The dependent claims delineate preferred and/or particularly advantageous aspects of the invention.

DESCRIPTION OF THE INVENTION

[0023] The invention discloses a front frame for doors of refrigerator cabinets, comprising a border able to delimit an access entry of the refrigerator cabinet, wherein at least a portion of the border comprises a first part made of a plastic material.

[0024] In the invention, the plastic material is high-density foam polyurethane.

[0025] With this solution, the thermal efficiency of the refrigerator cabinet can be significantly increased while lowering energy consumption and maintaining a good level of mechanical resistance of the front frame.

[0026] For example, the foam polyurethane used is a bi-component polyurethane system, based on polyol and isocyanate, which is initially in liquid form but produces a rigid foam polyurethane.

[0027] In a preferred aspect of the front frame, the density of the foam polyurethane is substantially comprised between 300 and 700 kg/m³, preferably being substantially 300 kg/m³.

[0028] In this way, as well as increasing the heat-insulation performance, the structure of the front frame is particularly rigid and solid.

[0029] In a further preferred aspect of the front frame, at least a portion of the border can comprise at least a second part made of a second plastic material, for example low-density foam polyurethane (substantially comprised between 30 and 50 kg/m³ and preferably 42 kg/m³).

[0030] In this way, given equal thermal and/or mechanical performances, the border can be more economical.

[0031] The front frame of the invention can preferably comprise a portion of the border, for reinforcing the border, comprising at least a third part constituted by a reinforcing profiled element made of a metal material, such as for example aluminium.

[0032] In this way, thanks to the characteristics of the material the first part is made of, the coupling of the third metal part to the first part made of a plastic material is simple and rapid.

[0033] In an embodiment of the front frame, the first part of a portion of the border is able to partially cover the metal profiled element of the portion of the border,

for example by becoming solidly unremovably associated thereto.

[0034] With this solution, the metal profiled elements can be directly associated to the access entry of the refrigerator cabinet, performing a greater bearing function of the whole front frame, while thermal bridges are not present between the inside and outside of the refrigerator cabinet.

[0035] The invention further discloses a forming method of a front frame for refrigerator cabinets which comprises steps of:

- arranging a forming cavity of an injection mould for forming at least a profiled portion of a border;
- inserting, in the forming cavity, a profiled element made of a metal material;
- injecting foam polyurethane into the forming cavity;
- solidifying the foam polyurethane internally of the forming cavity so that once the foam polyurethane has solidified the foam polyurethane solidly adheres to the metal profiled element;
- releasing the profiled portion of border formed by the joining of the metal profiled element and the solidified foam polyurethane from the forming cavity.

[0036] In this way, the manufacturing of the border in a plastic material and the metal border is rather simple, rapid and relatively inexpensive.

[0037] The metal profiled element advantageously comprises undercut zones, and the injecting step into the forming cavity comprises a step of filling the undercut zones with foam polyurethane.

[0038] Also, the injecting step includes a first injection of high-density foam polyurethane.

[0039] Alternatively or additionally the injecting step includes a second injection of low-density foam polyurethane, for example preceding the first injecting step. The method advantageously also includes a step of joining a plurality of profiled portions, thus-formed and solidified, in such a way as to delimit at least a closed perimeter for realising the border.

BRIEF DESCRIPTION OF THE DRAWINGS

[0040] Further characteristics and advantages of the invention will emerge from a reading of the description that follows, provided by way of non-limiting example, with the aid of the figures of the accompanying tables.

Figure 1 is a front view of a door for refrigerator cabinets, provided with a cabinet-side front frame according to the invention.

Figure 2 is section II-II of figure 1.

Figure 3 is section III-III of figure 1.

Figure 4 is detail IV of figure 2, shown in larger scale.

Figure 5 is detail V of figure 3, shown in larger scale.

Figures 6-8 are transversal sections respectively of a vertical profiled longitudinal member and a dividing

cross-member of a further embodiment of the cabinet-side door frame of the invention.

BEST WAY OF CARRYING OUT THE INVENTION

[0041] As is known, a refrigerator cabinet schematically comprises a plurality of walls for delimiting an internal cell for containing the products, and a refrigerating system for maintaining the cell at a temperature of generally lower than the outside temperature.

[0042] A wall of the refrigerator cabinet has an access entry for introduction and removal of the products into/from the containing cell.

[0043] A door is applied to the access entry, generally denoted by 10 and shown in figure 1.

[0044] The door 10 comprises a cabinet-side front frame 20 shaped as a border, which is fixed to the refrigerator cabinet in such a way as to delimit the access entry, and one or more (in the example three) openable doors 30 that are associated with the front frame 20 so as to close the access entry.

[0045] In particular, each door 30 is hinged to the front frame 20 about an axis of rotation A, so as to achieve overall a hinged door.

[0046] The door 30 comprises a transparent panel 31, and a support frame 32, generally conformed as a border, which surrounds and supports the transparent panel 31.

[0047] In the present example, the transparent panel 31 comprises three panes of tempered glass 310, which are arranged parallel to one another and separated by two air chambers 311 advantageously sealedly closed (see figures 4 and 5).

[0048] The support frame 32 has a generally polygonal shape, joined to at least a part of the cabinet-side front frame 20, in this case substantially rectangular.

[0049] The support frame 32 is composed of two or more concentric support frames designed to border the transparent panel 31, of which, for example, a plastic border 321 and a metal frame 322 associated to the plastic border 321, for example so as to clad the visible surface (i.e. facing externally of the refrigerator).

[0050] As illustrated in figure 6, the sides of the plastic border 321 are constituted by four profiled elements, which are connected and joined together by four corner brackets which define the corners of the border.

[0051] The profiled elements and the corner pieces are made of a plastic material, preferably a material having good thermal insulation properties such as PVC. The profiled elements are preferably made by extrusion, while the corner brackets are preferably made by injection moulding.

[0052] The transversal section of the profiled elements is shaped so as to exhibit two full-length external faces, of which a lateral face perpendicular to the plane of the support frame 32 and facing towards the outside thereof, and an upper face parallel to the plane of the support frame 32 and facing externally of the refrigerator cabinet.

[0053] At an internal face, i.e. a face directed towards

the inside of the refrigerator cabinet, the profiled element exhibits a recess over the entire length thereof for accommodating a gasket 323, for example, made of rubber and having a magnetic core.

[0054] The gasket 323 is attached to the profiled element by means of a plurality of anchoring feet, each of which snap-engages in a hole formed in the internal face of the profiled element.

[0055] The gasket 323 comprises a portion extending over the entire length thereof which projects internally of the support frame 32 and is such as to embrace a portion of the transparent panel 31.

[0056] The profiled element, for example, can exhibit at least a hollow compartment 324 extending over the whole length thereof.

[0057] The sides of the metal border 322 are constituted by four respective profiled elements (see figure 1), which exhibit opposite ends cut at an angle, typically 45°, and are joined together at heads thereof so as to realise a closed border frame.

[0058] The profiled elements that make up the metal border 322 are thin-walled with a generally L-shaped cross-section.

[0059] The margins of the profiled elements which make up the metal border 322 each comprise a respective tooth extending over the entire length thereof, which extends internally of the dihedral angle defined by the L-shaped profile, with a slight undercut.

[0060] The teeth are conformed such as to couple respectively with the profiled elements and the corner brackets of the plastic border 321. This coupling realises a joint which reciprocally constrains each metal profiled element to a plastic profile element and to two opposite plastic corner brackets which thus make up the support frame 32.

[0061] In this way, the metal profiled elements cover the external faces of the profiled elements and the plastic corner brackets, so that the metal frame 322 hides the plastic frame 321 with respect to the outside of the refrigerator cabinet.

[0062] The cabinet-side front frame 20 comprises a border able to delimit the access entry of the refrigerator cabinet.

[0063] The perimeter sides of the border are constituted by longitudinal portions joined together, in practice profiled longitudinal members 21,22, which have ends thereof cut typically at 45°, and are joined together at the heads thereof, so as to realise a closed border.

[0064] The profiled longitudinal members 21,22 comprise a pair of vertical profiled longitudinal members 21 (see figures 3 and 5), symmetrically arranged with respect to a median vertical plane perpendicular to the lie plane of the front frame 20, and a pair of horizontal profiled longitudinal members 22 (see figures 2, 4 and 8), symmetrically arranged with respect to a horizontal median plane perpendicular to the lie plane of the front frame 20.

[0065] The border for example might also comprise

one or more intermediate portions i.e. one or more divider cross-members 23 (in the example two) able to subdivide the access entry of the refrigerator cabinet into a plurality of compartments.

[0066] For example, the divider cross-members 23 have ends thereof cut into a point, with opposite cuts typically inclined by 45°, and are joined in corresponding vertically-aligned slits/cuts realized in two opposite longitudinal profiled members 21,22 (in the example longitudinal horizontal profiled members 21), so as each to realize a closed sub-border with the profiled longitudinal members.

[0067] At least one (in the example each) of the profiled longitudinal members 21,22, such as for example the divider cross-members 23, comprises at least a first part 210,220,230, for example extending over a whole length thereof, made of plastic material, preferably with excellent thermal insulation properties, such as foam polyurethane.

[0068] In particular, the first part 210,220,230 is made of high density foam polyurethane, i.e. having a density of between 300 and 700 kg/m³, preferably 300 kg/m³.

[0069] As illustrated in figures 4 and 5, the first part 210, 220 of the profiled longitudinal members 21,22 exhibits two faces parallel to the plane of the front frame 20, of which an internal face 211 a, 221 a facing towards the inside of the refrigerator cabinet, and an external face 211 b, 212b facing opposite. The profiled longitudinal members 21,22 also exhibit a full-length gully 212, 222, which is open on the external face 211 b, 221 b.

[0070] A full-length channel 213, 223 is fashioned along a free margin of the gully 212, 222a, a longitudinal mouth whereof is open on the external surface 211b, 221b.

[0071] The channel 213, 223 acts as a seating for receiving and retaining an electrical resistance, if present, which can heat the front frame 20 so as to prevent condensation.

[0072] The gully 212, 222, as well as for example the channel 213, 223, is closed by a C-shaped metal plate 24 extending over the whole length of the gully 212, 222, ends of which are anchored in the external face 211b, 221 b of the profiled longitudinal member 21,22, and for example sunken for a portion thereof in the longitudinal member 21,22 itself.

[0073] The gasket 323 of the door 20 rests against the metal plate 24, which is held in place by the magnet 323 incorporated in the gasket.

[0074] Each profiled longitudinal member 21,22 can comprise an appendage 214, 224 developing over a whole length thereof and rising from an end of the external face 211 b, 221 b, for example on the opposite side of the channel 213, 223 with respect to the gully 212, 222.

[0075] In practice, the appendage 214, 224 is able to laterally border the leaves 30 of the door 10.

[0076] Further, the appendage 214, 224 comprises a series of through-holes that can be engaged by fastening screws which anchor the front frame 20 to the access

entry of the refrigerator cabinet.

[0077] In practice, the appendage 214, 224 gives the first part 21,22 of the longitudinal profiled members 21,22 a substantially L-shaped transversal section.

[0078] A finishing profiled member 251, 252, for example made of a metal material such as aluminium, is fixed to each appendage 214, 224 of the profiled longitudinal member 21, 22, for example by means of anchoring teeth.

[0079] The finishing profiled member 251, 252, of the appendage 214, 224 prolongs the appendage, so that the end of the finishing profiled member 251, 252, that is distal from the external face 211 b, 221 b is substantially flush with the external surface of the doors 30.

[0080] In the example the finishing profiled member 251 of the appendage 214 of the profiled horizontal longitudinal member 21 exhibits a substantially upturned-L shaped transversal section. The finishing profiled member 252 of the appendage 224 of the profiled vertical longitudinal member 22 has a substantially I-shaped or over-turned L-shaped transversal section.

[0081] As illustrated in figure 5, the first part 230 of each divider cross-member 23 exhibits two faces parallel to the plane of the front frame 20, of which an internal face 231 a, 231 a facing the interior of the refrigerator cabinet, and an external face 231 b facing the opposite side.

[0082] Each divider cross-member 23 also exhibits a further gully 232, extending over the whole length of the cross-member 23 and open on the external face 231 b.

[0083] A respective groove 233 is fashioned along a whole length of each free edge of the gully 232, a longitudinal mouth of which is open on the external face 231 b.

[0084] Each groove 233 serves as a seating for receiving and retaining a possible electrical resistance for heating the front frame 20, for preventing condensation.

[0085] The gully 232, as well as for example the grooves 233 (individually or both) are closed by a C-shaped metal foil 24 extending over the whole extension thereof, ends of which are anchored in the external face 231 b of the divider cross member 23, for example sunken for a portion thereof in the divider cross member 23.

[0086] An electric power cable can be inserted in one of more of the gullies 212, 222, 232, for example for electrical supply to the electrical resistances or other accessories.

[0087] The gaskets 323 of two adjacent doors 30 rest against the metal foil 24 and are fixed to the divider cross member 23, so as to be held still by means of the magnet incorporated in the gaskets 323.

[0088] At least one (in the example each) of the profiled longitudinal members 21,22, like the divider cross members 23, can comprise at least a second part 214,224,234, for example extending over a whole length, and also made of a plastic material, preferably with excellent thermal insulation properties. For example, the second part 215,225,235 is made of low-density foam polyurethane, i.e. having a density comprised between 30 and 50 kg/m³, preferably 42 kg/m³.

[0089] The second part 215,225,235 is for example at least partially (completely in the example) incorporated internally of the first part 210,220,230.

[0090] The second part 215,225,235 is for example conformed with a narrow slim plate, extending over a whole length, which substantially centrally crosses the whole first part 210,220,230 of the profiled longitudinal members 21,22 and the divider cross-member 23.

[0091] The second part 215,225,235 is completely optional in constructing the structure of the profiled longitudinal members 21,22 as well as the divider cross-members 23, as they can be formed by only the first part 210,220,230 described above.

[0092] At least one (in the example each) of the profiled longitudinal members 21,22, such as for example the divider cross-members 23, comprise at least a third part 216, 226, 236, for example extending over a whole length, made of at least a metal material, preferably aluminium.

[0093] The third part 216,226,236 is essentially constituted by a variously-shaped metal profiled member, solidly and unremovably fixed to the first part 210,220,230 and/or to the second part 215,225,235.

[0094] In practice, the metal profiled member constituting the third part 216,226,236 is substantially plate-shaped and is provided with an internal face 217a, 227a, 237a, facing and in contact with the internal face 211 a, 221 a, 231 a of the first part 210,220,230 (and/or a face of the second part 215,225,235), and an opposite external face 217b, 227b, 237b.

[0095] The metal profiled member constituting the third part 216,226,236, also comprises first ribbings 218a, 228a, 238a rising from the internal face 217a, 227a, 237a and, for example, extending along the whole third part.

[0096] In the example the metal profile which constitutes the third part 216,226,236 comprises at least a first ribbing 218a, 228a, 238a having a substantially L-shaped transversal section, or a variant thereof, and defining an undercut region internally of the third part 216,226,236.

[0097] In the example the metal profile comprises a pair of first ribbings 218a, 228a, 238a symmetrically arranged and with the concavities thereof facing one another.

[0098] In practice, as will be more fully explained in the following, the second part 215, 225, 235 and/or the first part 210, 220, 230 are destined to be inserted, for example by injection or (if it is preformed) by sliding longitudinally, in a part of the undercut zone lateral enclosed by the first ribbings 218a,228a,238a.

[0099] For example, the metal profile, which constitutes the third part 216,226,236, can comprise further first ribbings 218a, 228a, 238a rising from the internal face 217a, 227a, 237a and/or can comprise ramifications protruding from the first ribbings 218a, 228a, 238a, which improve the stable adhesion of the first part 210,220,230 to the third part 216,226,236.

[0100] The metal profile which constitutes the third part 216,226,236, further comprises second ribs 218b, 228b,

238B rising from and, for example, extending over a full length of the external face 217b, 227b, 237b.

[0101] In the example the metal profile which constitutes the third part 216,226,236 comprises a pair of second ribbings 218b, 228b, 238b substantially exhibiting an L-shaped transversal section, arranged symmetrically with concavities thereof facing.

[0102] In practice, right-angled brackets can be inserted in proximity of the join zones between the profiled longitudinal members 21, 22 and/or the divider cross-members 23, which brackets are for reciprocal fixing of the various longitudinal members 21, 22 and possibly divider cross-members 23, such as to form and stabilise the border of the front frame 20 formed thereby.

[0103] The front frame 20, once assembled, is installed internally of the access entry of the refrigerator cabinet and is fastened thereto, so that the third part 216,226,23 is facing internally of the refrigerator cabinet and the first part 210,220,230 is facing externally thereof.

[0104] The in-view walls of the first part 210,220,230 can be painted according to needs.

[0105] In a preferred embodiment shown in figures from 6 to 8, the front frame 20 (apart from having the technical characteristics described above, which are not repeated here) comprises a cladding profiled element 261, 262, which can be engaged, for example by jointing and/or friction, to at least one (in the example each) of the portions 21, 22, 23 of the border.

[0106] In practice, each cladding profiled element 261, 262 is associated to each of the profiled longitudinal members 21, 22 and the dividing cross-members 23, as will be more fully described in the following.

[0107] Each cladding profiled longitudinal member 261, 262 is defined by a profiled longitudinal element, developing over a whole extension thereof, and clads at least an external surface of the profiled longitudinal members 21, 22 and/or of the dividing cross-members 23, the at least an external surface 211b, 221 b, 231 b, of the first part 210, 220, 230 thereof.

[0108] For example, the profiled cladding member 261, 262 incorporates and retains one or more of the metal plates 24 (the functions of which are described in the foregoing), which extends over a whole length of the profiled cladding member 261, 262, which in the present case is substantially plate-shaped and flat (not bent in a C-shape).

[0109] The profiled cladding element 261, 262 is overall made of a further plastic material, preferably polyvinylchloride (PVC).

[0110] The profiled cladding element 261 associated to the profiled longitudinal members 21, 22 exhibits an L-shaped transversal section, so as to clad, with a first transversal portion, the external face 211b, 221 b of the longitudinal profiled members, and with a second transversal portion (at right-angles to the first), a lateral face 211 c, 221 c (adjacent to the external face 211 b, 221 c, and to the internal face 211 a, 221 b) of the profiled longitudinal elements 21, 22.

[0111] Further, the finishing profiled member 251, 252 comprises a metal root extending up to in proximity of the external face 211 b, 221 b, and defining an open seating (extending along the full length and substantially in undercut) located in the proximal zone to the appendage 214, 224 of the profiled longitudinal members 21, 22 of the external face 211 b, 221 b thereof.

[0112] The transversal section of the cladding profiled member 261 exhibits substantially C-shaped ends, in which a first end can snap-hook and/or by interference to one of the second ribbings 218b, 228b (emerging from the external face 217b, 227b of the third portion 216, 226) and a second end can snap-hook and/or can engage by interference to the open seating.

[0113] The cladding profiled member 262 associated to the divider cross-member 23 has a first C-shaped section (with the concavity facing towards the dividing cross member) so as to clad, with a first central transversal portion thereof, the external face 231 b of the dividing wall, substantially adhering thereto, and with the second end transversal portions (at right-angles to the first portion) the opposite lateral faces 231 c (each adjacent to the external face 231 b and to the internal face 231 a) of the dividing wall 23.

[0114] The transversal section of the profiled cladding member 262 has substantially curved C-shaped ends, wherein a first end is able to snap-hook and/or by interference to one of the second ribbings 238b (arranged in the external face 237b of the third portion 236) and a second end can snap-hook and/or engage by interference to the other second ribbing 238b.

[0115] The profiled cladding members 261, 262 in practice snap-hook to the external face 217b, 227b, 237b of the third metal portion 216, 226, 236 and also possibly to the open seating of the metal root of the finishing profiled member 251, 252 where included.

[0116] In practice, the whole in-view surface of the first part 210, 220, 230 is thus clad by a cladding profiled member 261, 262.

[0117] The forming method of the front frame 20 described above is the following. To form each type of profiled longitudinal member 21, 22 and/or divider cross-member 23, an injection mould is prepared, equipped with a forming cavity which is longitudinal and exhibits a suitable shape.

[0118] With the forming cavity open a metal section is inserted therein of a type suitable for constituting the third part 216, 226, 236 of the longitudinal member 21, 22 or divider cross-member 23.

[0119] For example, if required, a second part 215, 216, 217, possibly pre-formed and solidified or in the form of foam that is destined to be solidified can be arranged in the undercut region of the third part 216, 217, 218.

[0120] Once the forming cavity of the injection mould has been closed a high density foam polyurethane is injected into the forming cavity, so as to fill all the space interposed between the walls thereof and the third part

216, 226, 236, and incorporating any second part 215, 225, 235 present.

[0121] Injection continues until the desired density value (e.g. comprised between 300 and 700 kg/m³, preferably 300 kg/m³) of foam polyurethane within the forming cavity is reached. Then the foam polyurethane is left to solidify internally of the forming cavity, so that once solidified it constitutes the first part 210, 220, 230 and solidly adheres to the metal profiled member which constitutes the third part 216, 226, 236 (incorporating the second part 215, 225, 235 if present).

[0122] The high-density foam polyurethane, once solidified, solidly adheres to the internal face 211 a, 221 a, 231 a of the third portion 216, 226, 236 (i.e. the metal profiled element), leaving at least the external face 217b, 227b, 237b thereof free.

[0123] In practice, the first ribbings 218a, 228a, 238a of the third part 216, 226, 236 are incorporated into the solidified third part 210, 220, 230, so that the first part and the third part thereof in practice are inseparable.

[0124] At this point it is sufficient to open the forming cavity of the injection mould to release the profiled longitudinal member 21, 22 or the profiled cross-member 23 thus formed.

[0125] For example, once the various profiled longitudinal members 21, 22 and any divider cross-members 23 have been cut, they are joined (at the heads) so as to obtain the closed conformation of the border (possibly subdivided) that constitutes the front frame 20.

[0126] Further, a cladding member 261, 262 can be hooked to each portion 21, 22, 23 formed by the (unremovable) joining of the metal profiled member 216, 226, 236 and the foam polystyrene, so as to clad the external face 211 b, 221 b, 231 b of the first part 210, 220, 230.

[0127] The door 30 could be realized using a plastic material having excellent thermal insulation properties, i.e. the PVC zones as described above can be replaced with zones made of high-density foam polyurethane, which can ensure both a high degree of thermal insulation and a good mechanical resistance.

[0128] Obviously an expert in the sector might make numerous modifications of a technical-applicational nature to the door frame and cabinet-side front frame described above, without forsaking the scope of the invention as claimed in the following.

Claims

1. A front frame (20) for doors of refrigerator cabinets, comprising a border constituted by portions (21, 22, 23) joined to one another at heads thereof, so as to realise a perimetally-closed border able to delimit an access entry of the refrigerator cabinet, wherein at least a portion (21, 22, 23) of the frame comprises a first part (210, 220, 230) made of high-density foam polyurethane, wherein a density of the foam polystyrene is substantially comprised between 300 and

- 700 kg/m³ and a reinforcing third portion (216, 226, 236) realised by a profiled member made of metal material, **characterised in that** the first part (210, 220, 230) of a portion (21, 22, 23) of the border is able only partly to clad the metal third portion (216, 226, 236) of the portion (21, 22, 23) of the border, leaving free at least an external face (217b, 227b, 237c) thereof.
2. The front frame (20) of claim 1, wherein the metal material is aluminium. 10
 3. The front frame (20) of claim 1, wherein the density of the foam polyurethane is substantially 300 kg/m³. 15
 4. The front frame (20) of any one of the preceding claims, wherein at least a portion (21, 22, 23) of the frame comprises at least a second part (215, 225, 235) made of a second plastic material. 20
 5. The front frame (20) of claim 4, wherein the second plastic material is low-density foam polyurethane. 25
 6. The front frame (20) of claim 5, wherein the density of the low-density foam polyurethane is substantially comprised between 30 and 50 kg/m³, preferably 42 kg/m³.
 7. The front frame (20) of any one of the preceding claims, **characterised in that** it comprises a profiled cladding member (261, 262) able to be hooked to at least one of the portions (21, 22, 23) of the border. 30
 8. The front frame (20) of claim 7, wherein each profiled cladding member (261, 262) is defined by a longitudinal profiled plate developing over a whole extension thereof and clads at least an external surface of the first part (210, 220, 230) of the portions (21, 22, 23). 35
 9. The front frame (20) of any one of the preceding claims from 7 to 8, **characterised in that** each cladding member (261, 262) is made of a further plastic material, preferably made of polyvinyl chloride (PVC). 40
 10. The front frame (20) of any one of the preceding claims from 7 to 9, **characterised in that** each profiled cladding member (261, 262) snap-hooks to the external face (217b, 227b, 237b) of the third portion (216, 226, 236), preferably at the second ribbings (218b, 228b, 237b) rising from the external face (217b, 227b, 237b). 45
 11. The front frame (20) of any one of the preceding claims, wherein the first part (210, 220, 230) of a portion (21, 22, 23) of the border and at least the third metal part (216, 226, 236) of the portion (21, 22, 23) of the border are solidly unremovably associated to one another. 50
 12. A forming method of a front frame (20) for refrigerator cabinets which comprises steps of: 55
 - arranging a forming cavity of an injection mould for forming at least a profiled portion (21, 22, 23) of a border;
 - inserting, in the forming cavity, a profiled element made of a metal material (216, 226, 236);
 - injecting foam polyurethane into the forming cavity, such that the density of the foam polyurethane injected is comprised between 300 and 700 kg/m³;
 - solidifying the foam polyurethane internally of the forming cavity so that once the foam polyurethane has solidified the foam polyurethane solidly adheres to an internal face (211 a, 221 a, 231 a) of the metal profiled element (216, 226, 236), leaving at least an external face (217b, 227b, 237b) thereof;
 - releasing the profiled portion (21, 22, 23) of border formed by the joining of the metal profiled element (216, 226, 236) and the solidified foam polyurethane from the forming cavity.
 13. The method of claim 11, **characterised in that** the metal profiled element (216, 226, 236) comprises undercut zones, and the injecting step into the forming cavity comprises a step of filling the undercut zones with foam polyurethane.
 14. The method of any one of claims from 12 to 13, wherein a cladding profiled member (261, 262) is hooked to each part (21, 22, 23) formed by the joining of the metal profiled member (216, 226, 236) and the solidified foam polyurethane formed by the forming cavity, so as to clad at least an external face 211 b, 221 b, 231 b of the first part 210, 220, 230.
 15. The method of any one of claims from 12 to 13, **characterised in that** it comprises a step of joining a plurality of profiled portions (21, 22, 23) such as to delimit at least a closed perimeter for realising the border.

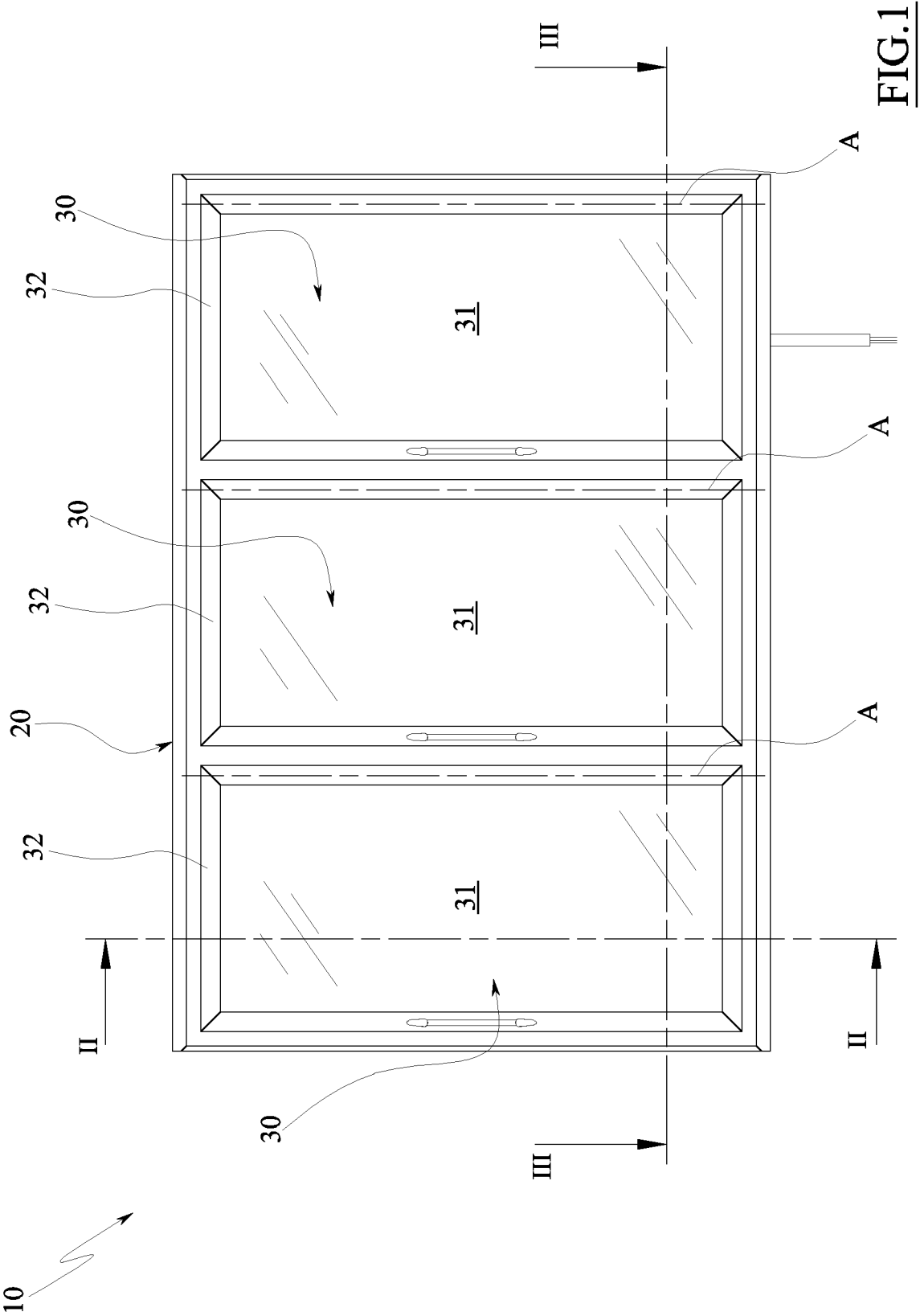
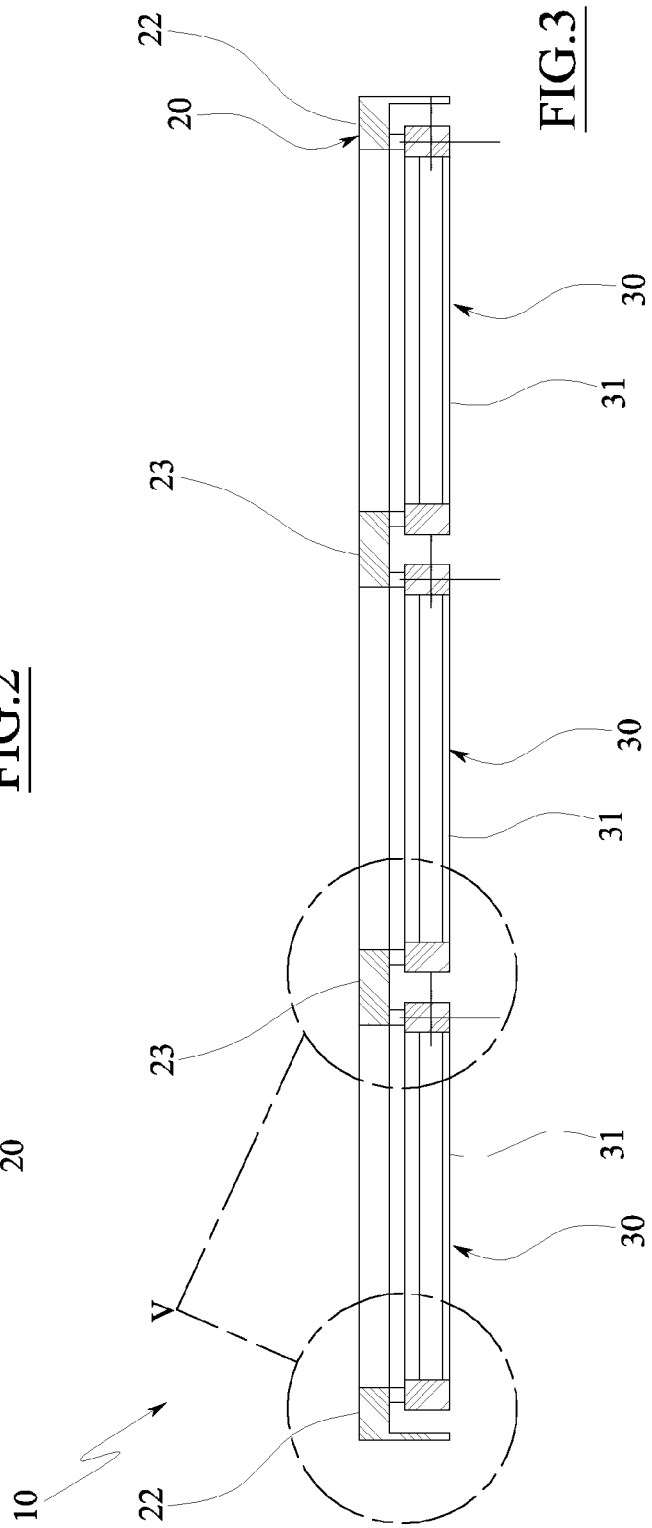
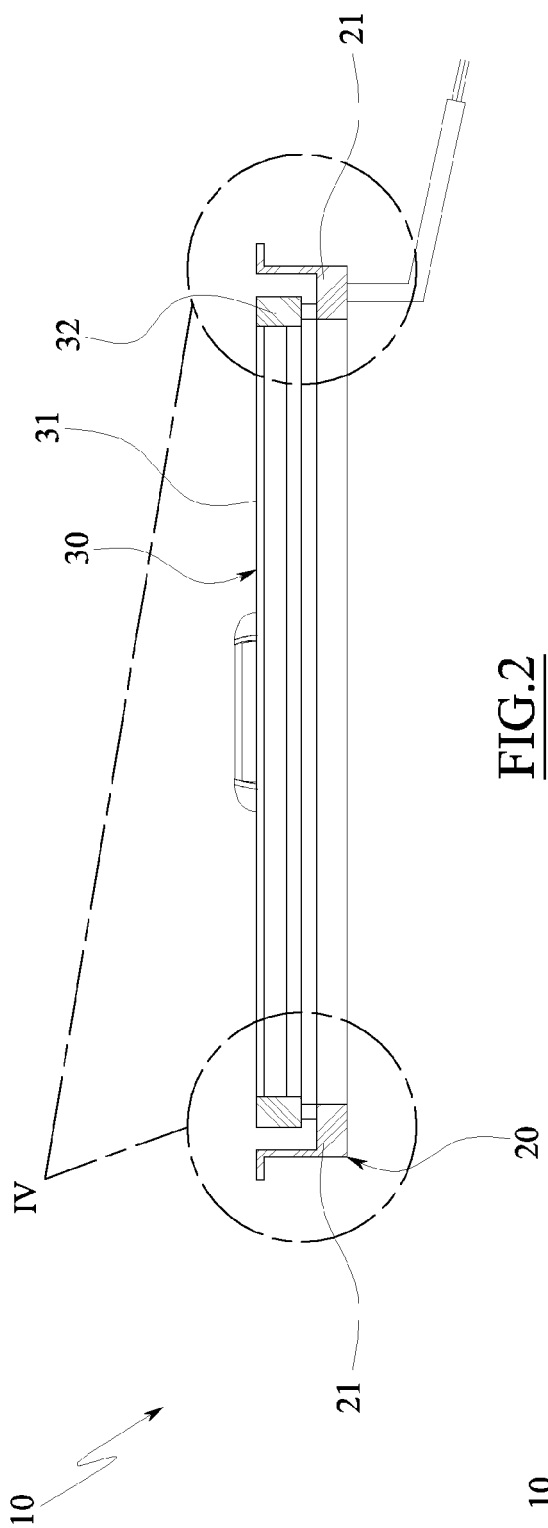


FIG. 1



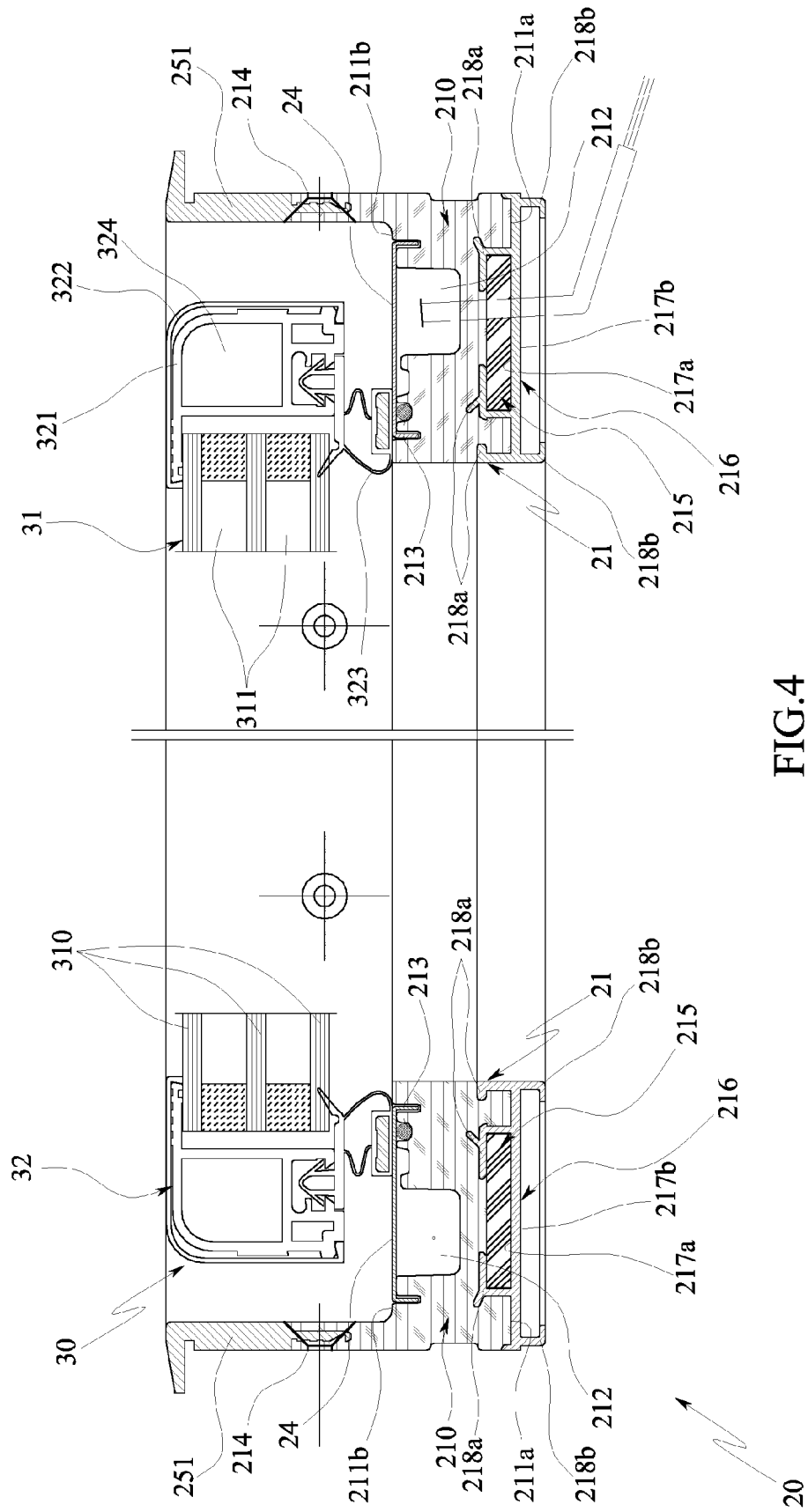


FIG. 4

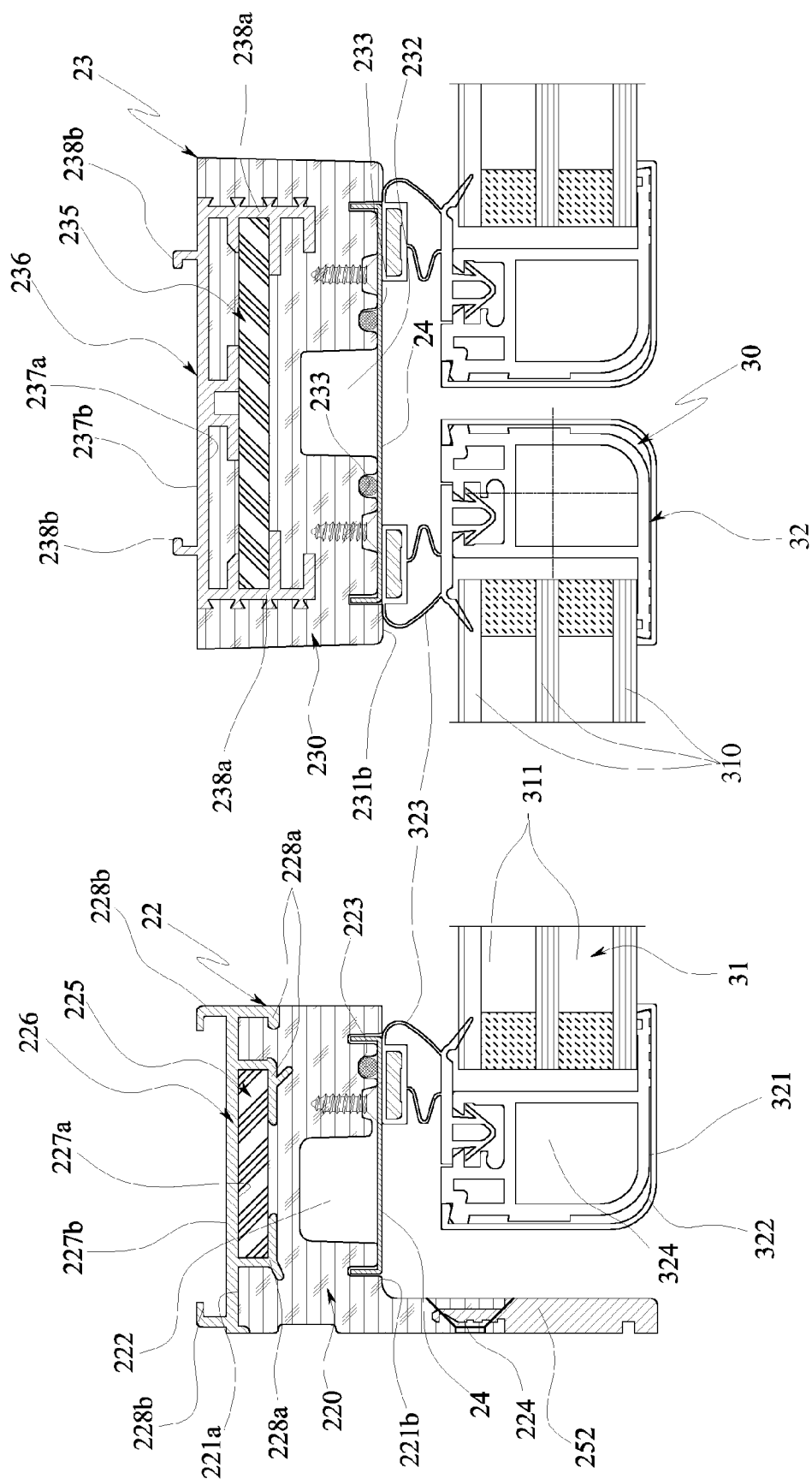
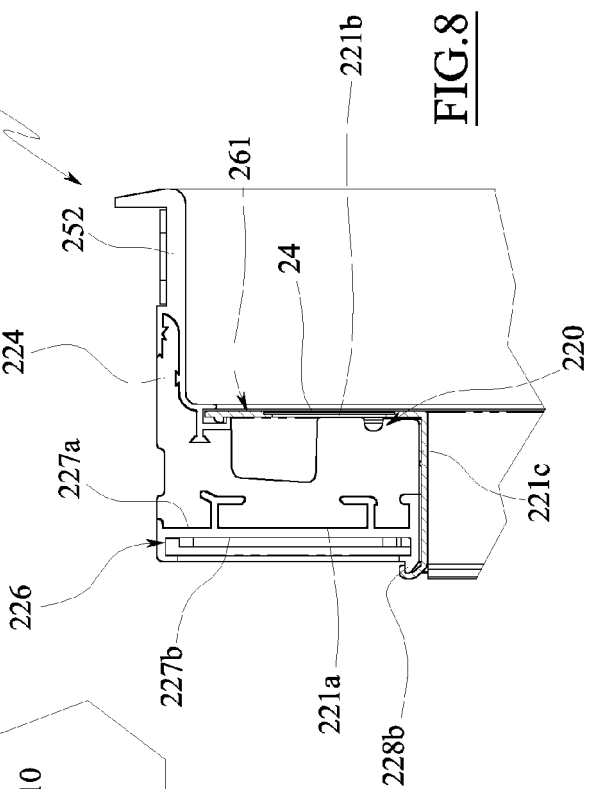
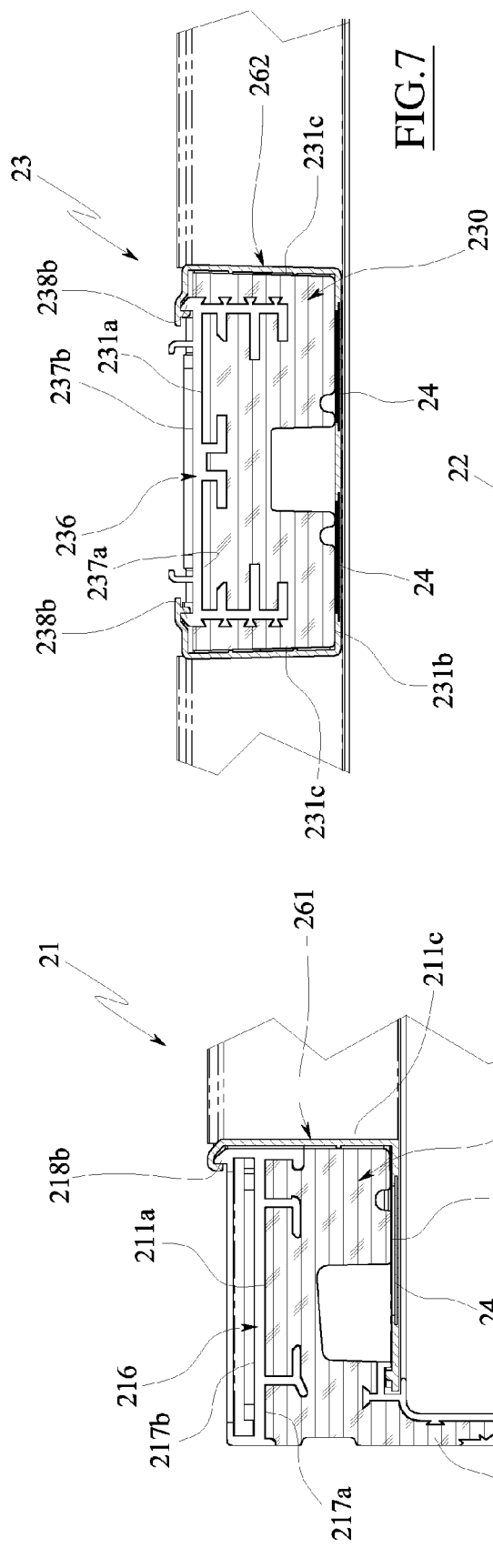


FIG. 5





EUROPEAN SEARCH REPORT

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Place of search The Hague		Date of completion of the search 13 May 2015	Examiner Léandre, Arnaud
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