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(54) CLOSING SYSTEM FOR REFRIGERATORS AND REFRIGERATOR COMPRISING THE CLOSING SYSTEM

(57) The present invention concerns a closing system (1) for refrigerators, comprising: at least one fixed frame (3) suited to be attached to the opening of a refrigerator (F) and defining an opening suited to allow access to the inner volume of said refrigerator (F); at least one door (5) associated with said fixed frame (3), said at least one door (5) being movable with respect to said fixed frame (3) between a closed configuration, in which said door (5) is closed on said fixed frame (3), and an open configuration, in which said door (5) is open on said fixed frame (3), said at least one door (5) comprising a door frame (7) and a panel (9) fixed to said door frame (7) and preferably made of a transparent material. According to the invention, said fixed frame (3) and said door frame (7) are made of high density polyurethane by means of moulding techniques.

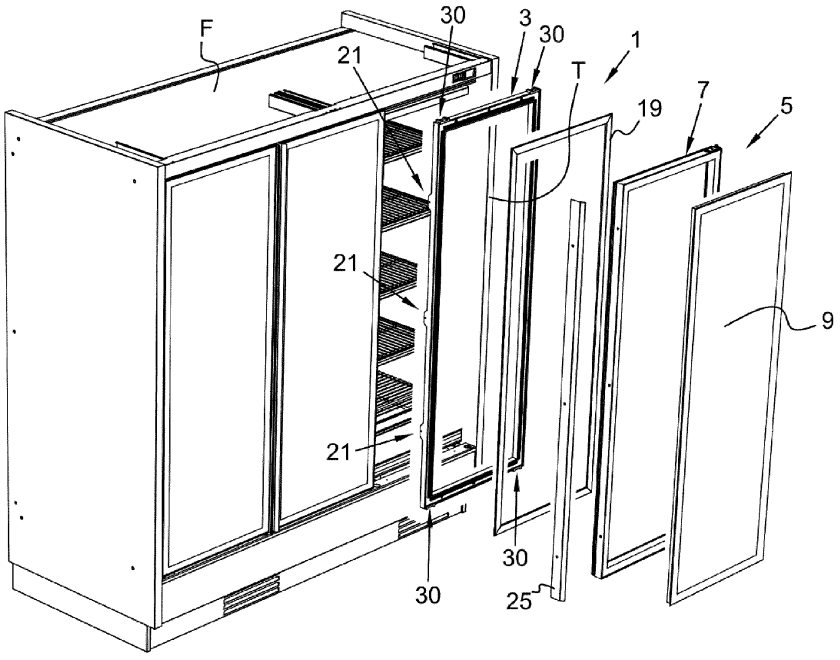

FIG. 1

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Description

Field of application of the invention

[0001] The present invention concerns a closing system for refrigerators, more specifically for supermarket refrigerators. The present invention furthermore concerns a refrigerator comprising such a closing system and a process for making the components of said closing system.

State of the art

[0002] As is known, several types of refrigerators are installed in supermarkets, which however can be grouped into two main categories.

[0003] The first category includes "open" refrigerators, which are characterized by the fact that the products are directly exhibited to the final customer, without the interposition of doors.

[0004] The second category, instead, is that of "closed" refrigerators, which are characterized by the presence of a closing system designed to close the refrigerating compartment, comprising a door for accessing said compartment, interposed between the product and the customer.

[0005] Said closed refrigerators offer the advantage that less energy is required to maintain a low temperature inside them, thanks exactly to the presence of said closing system with door.

[0006] The thermal efficiency of the closing system of the refrigerator thus contributes in a substantial manner to the overall energy efficiency of the refrigerator itself.

[0007] At present the known closing systems for refrigerators comprise a fixed frame associated with a door frame to which a glass pane or another transparent panel is glued. The fixed frame and the door frame are generally made of section bars in aluminium or other metals, or section bars in composite materials such as PVC and aluminium composite materials.

[0008] These closing systems, however, are not without technical drawbacks.

[0009] A first drawback of said closing systems of the known type lies in that for their production many operations are required to process and assemble the section bars themselves and respectively obtain the fixed frame and the door frame, together with a series of successive processing operations on the frames obtained in this way so that they can be fixed to one another and to the refrigerator. Said processing operations comprise, for example, the execution of holes for the screws used to fix the frames to the refrigerator, the creation of suitable seats for fixing the hinges or even the creation of seats for positioning heating means, such as electrical heating cables, around the fixed frame in order to avoid the formation of condensation on the glass. Furthermore, it is often necessary to apply suitable structural reinforcing elements to the section bars, in order to provide them with the necessary resistance characteristics.

[0010] A second drawback of said closing systems of the known type lies in that the materials typically used to make the section bars that constitute the fixed frame and the movable frame are thermally conductive materials, which thus tend to reduce the thermal efficiency of the closing system and consequently the overall energy efficiency of the refrigerator itself.

[0011] More specifically, the main drawback of these solutions is represented by the fact that the materials used at the level of the areas where the closing system is anchored to the frame of the refrigerator have high thermal conductivity.

[0012] To anchor the fixed section of the closing system to the frame of the refrigerator metallic fixing bodies are generally used which, even if they ensure high resistance to stress, provide low thermal insulation between the inside of the refrigerator and the outside (that is, the room where the refrigerator itself is installed).

[0013] Furthermore, the high thermal conductivity of these materials favours the formation of condensation that accumulates in proximity to the fixing bodies and that can be eliminated using electrical heating means which increase the energy consumption associated with the system.

[0014] The patent documents EP2908074, DE202006013838, US5255473, US2012/028027 and the document "Glass door for refrigerator - comprises reaction injection moulded polyurethane frame with spaced sealed glass plates" (Ishida Y et Al, WPI/THOMSON vol. 1990, no. 32) describe closing systems for refrigerators and/or refrigerators with the technical characteristics specified in the preamble of the main claim. However, the systems and/or the refrigerators described in these documents do not make it possible to effectively resolve the above mentioned problems of the known art.

Presentation of the invention

[0015] The main task of the present invention is to provide a closing system for refrigerators which is able to solve the drawbacks and overcome the limitations of the known technique, being simple to carry out, assemble and install on the refrigerator and at the same time extremely efficient from the thermal point of view.

[0016] Within the context of this task, it is one object of the present invention to provide a closing system for refrigerators that can be installed on refrigerators of different sizes.

[0017] It is a further object of the invention to provide a closing system for refrigerators that is capable of providing the amplest guarantees in terms of reliability and safety of use.

[0018] It is another object of the invention to provide a closing system for refrigerators that is economically competitive if compared to the known art.

[0019] The task illustrated above as well as the mentioned objects and other objects that will be explained

more clearly below are fulfilled by the closing system for refrigerators described in claim 1.

[0020] The present invention concerns also a refrigerator comprising such a closing system and a process for making said closing system.

[0021] Other characteristics are specified in the dependent claims.

Brief description of the drawings

[0022] Further characteristics and advantages are illustrated in greater detail in the description of a preferred but not exclusive embodiment of a closing system for refrigerators, which is described by way of non-limiting example with the aid of the attached drawings, in which:

- Figure 1 shows an exploded perspective view of a refrigerator comprising a closing system according to the invention;
- Figure 2 shows a front elevation view of a fixed frame of the closing system for refrigerators according to the invention;
- Figure 3 shows a rear elevation view of the fixed frame of Figure 2;
- Figure 4 shows a side view of the fixed frame of Figure 2;
- Figure 5 shows a plan view from above of the fixed frame of Figure 2;
- Figure 6 shows a sectional view of the fixed frame represented in Figure 2 according to axis VI - VI;
- Figure 7 shows a sectional view of the fixed frame represented in Figure 2 according to axis VII - VII;
- Figure 8 shows an enlarged view of the detail of Figure 7 indicated by VIII;
- Figure 9 shows an enlarged view of the detail of Figure 2 indicated by IX;
- Figure 10 shows an enlarged view of the detail of Figure 6 indicated by X;
- Figure 11 shows an enlarged view of the detail of Figure 10 indicated by XI;
- Figure 12 shows a perspective view of a detail of the fixed frame of Figure 2;
- Figure 13 shows a perspective view of a door frame of the closing system for refrigerators according to the invention;
- Figure 14 shows a front elevation view of the door frame of Figure 13;
- Figure 15 shows a plan view from below of the door frame of Figure 13;
- Figure 16 shows a side view of the door frame of Figure 13;
- Figure 17 shows a sectional view of the door frame represented in Figure 14 according to axis XVII-XVII;
- Figure 18 shows a sectional view of the door frame represented in Figure 14 according to axis XVIII-XVIII;
- Figure 19 shows an enlarged view of the detail of Figure indicated by IXX;
- Figure 20 shows an enlarged view of the detail of Figure 17 indicated by XX;
- Figure 21 shows a perspective view of a detail of the closing system according to the invention installed on a refrigerator.

Detailed description of the invention

[0023] With reference to the figures specified above, the closing system for refrigerators indicated as a whole by the reference number 1 comprises:

- at least one fixed frame 3 suited to be attached to the opening of a refrigerator F and defining an opening suited to allow access to the internal volume of the refrigerator F;
- at least one door 5 associated with said fixed frame 3, wherein said door 5 is movable with respect to the fixed frame 3 between a closed configuration, in which said door 5 is in contact with the fixed frame 3, and an open configuration, in which said door 5 is spaced from the fixed frame 3 in such a way as to leave at least one portion of the access opening free.

[0024] The door 5 comprises a door frame 7 and a panel 9 fixed to the door frame 7, preferably made of a transparent material.

[0025] According to the invention, both the fixed frame 3 and the door frame 7 are made of high density polyurethane through moulding techniques (as described below, the expression "moulding techniques" includes also co-moulding techniques).

[0026] Advantageously, the fixed frame 3 and the door frame 7 are made of a polyurethane whose density is higher than 200 Kg/m^3, preferably higher than 250 Kg/m^3, more preferably equal to approximately 400 Kg/m^3, measured according to standard DIN53420.

[0027] Advantageously, the fixed frame 3 and the door frame 7 are made of a polyurethane whose hardness is included between 40 and 80 Shore D, and is preferably equal to approximately 55 Shore D, measured according to standard DIN53505.

[0028] Advantageously, the fixed frame 3 and the door frame 7 are made of a polyurethane whose flexural modulus of elasticity is included between 400 and 680 MPa, and is preferably equal to approximately 540 MPa, measured according to standard DIN53432.

[0029] Advantageously, the fixed frame 3 and the door frame 7 are made of a polyurethane whose resistance to impacts is included between 7 and 13 KJ/m^2 and is preferably equal to approximately 10 KJ/m^2, measured according to standard DIN53432.

[0030] Advantageously, the fixed frame 3 and the door frame 7 are made through moulding and/or co-moulding techniques for the injection of two-component materials, preferably in a thermostatic mould made from aluminium milled from a solid block.

[0031] Advantageously, the fixed frame 3 and/or the

door frame 7 comprise structural reinforcing elements 11, visible in particular in Figure 8, buried in the high density polyurethane, wherein said fixed frame 3 and/or said door frame 7 are made of high density polyurethane through co-moulding techniques.

[0032] Preferably, the structural reinforcing elements 11 are buried at least in both the uprights 31 of the fixed frame 3, preferably substantially along the entire length of the same.

[0033] Advantageously, the structural reinforcing elements 11 comprise reinforcing bars such as, for example, U-shaped profiles in metallic material like those shown in Figure 8.

[0034] Advantageously, the closing system 1 comprises at least one seat 13, 15 suited to house means for preventing the formation of condensation obtained, directly through the moulding of the high density polyurethane, in the face 18 of the fixed frame 3 which in the configuration of use of the closing system 1 faces the door 5.

[0035] Preferably, said at least one seat 13, 15 extends along the whole perimeter of the fixed frame 3.

[0036] Advantageously, the closing system 1 comprises one pair of said seats 13, 15 suited to house the means for preventing the formation of condensation. A first seat 13 is configured to accommodate a first means for preventing the formation of condensation, constituted by an electrical heating cable, while a second seat 15 is configured to accommodate a second means for preventing the formation of condensation, constituted by a pipe with a hot gas recovered from a compressor of the refrigerator F flowing therethrough.

[0037] In this way, the fixed frame 3 of the closing system 1 is configured in such a way that, according to the needs, it can accommodate either an electrical heating cable or a pipe with a hot gas recovered from a compressor of the refrigerator F flowing therethrough. It can also be decided not to install any means for preventing the formation of condensation. In that case, the seats 13 and 15 remain empty.

[0038] Advantageously, as illustrated in Figures 10 and 11, the at least one seat 13, 15 is situated inside a cavity 33 obtained in the face 18 of the fixed frame 3, wherein said cavity 33 can be closed through the application of a closure profile 19, for example made of PVC.

[0039] Also the cavity 33 is directly created in the high density polyurethane through a moulding process.

[0040] Advantageously, the fixed frame 3 and the door frame 7 are mutually associated by means of one pair of hinges 17, in such a way as to define a hinged door, as shown in Figure 21.

[0041] Each hinge 17 comprises one pair of elements 170 and 172 which are mutually hinged to each other. The fixed frame 3 comprises at least one pair of first fixing seats 30 suited to fix a first element 170 of the pair of elements 170, 172 of the hinge 17, wherein said first seats 30 are obtained in the high density polyurethane through moulding techniques. The door frame 7 comprises one pair of second fixing seats 70 suited to fix a second element 172 of the hinge 17, wherein said second seats 70 are obtained in the high density polyurethane through moulding techniques.

[0042] Advantageously, the fixed frame 3 comprises two pairs of said first fixing seats 30. The door frame 7 can thus be associated with a first pair of said two pairs of first fixing seats 30 to define a first opening direction for the door 5 or with a second pair of said two pairs of first fixing seats 30 to define a second opening direction for the door 5, opposite said first direction.

[0043] In this way, the opening direction of the door 5 can be selected at the moment of installation of the closing system 1 on the refrigerator F, by simply fixing the hinges 17 to the one or the other pair of first fixing seats 30.

[0044] Advantageously, the first fixing seats 30 are obtained in the upper side 20 and in the underside 22 of the crosspieces 32 of the fixed frame 3.

[0045] Advantageously, the second fixing seats 70 are obtained in the upper side 23 and in the underside 24 of the crosspieces 72 of the door frame 7.

[0046] Advantageously, the first seats 30 comprise a hole 34 suited to accommodate a screw for fixing the first element 170 of the hinge 17 which, as shown in Figure 21, may comprise a fixing bracket 173.

[0047] Advantageously, the second seats 70 are defined by a hole 73 suited to house at least one part of the second element 172 of the hinge 17.

[0048] As shown in Figure 21, the second element 172 of the hinge 17 comprises a fixing bracket 174 and a fixing body, not visible in the attached figures. The fixing body can be inserted in the hole 73, while the fixing bracket 174 can be fixed to the door frame 5 through screws inserted in the holes 75.

[0049] Also the first seats 30 and the second seats 70 are directly created in the high density polyurethane through a moulding process.

[0050] In an alternative embodiment of the closing system, not shown in the attached figures, the door frame 7 is slidingly associated with the fixed frame 3.

[0051] Advantageously, the fixed frame 3 comprises a plurality of through holes 36 made in the high density polyurethane for fixing the fixed frame 3 to the frame T of the refrigerator F with fixing screws.

[0052] Said through holes 36 are made at least in the crosspieces 32 of the fixed frame, in a number higher than or equal to two per each crosspiece 32. Said through holes 36 are directly obtained in the high density polyurethane through a moulding process.

[0053] Advantageously, the closing system 1 comprises a plurality of fixed frames 3 associated with one another in a modular manner and suited to be fixed to the opening of the refrigerator F, and a plurality of doors 5, each associated with a respective fixed frame 3.

[0054] In particular, several fixed frames 3 can be fixed to the opening of the refrigerator F in a modular manner, in a position in which they are side by side so as to cover

the entire extension of said opening.

[0055] Each frame 3 can thus be associated with a respective door 5 in such a way that, after the installation, also the doors are positioned side by side in a modular manner.

[0056] In this configuration, the closing system comprises a plurality of modules of the fixed frame 3 to which a plurality of modules of the door 5 is associated.

[0057] Conveniently, each fixed frame 3 may comprise at least one pair of uprights 31.

[0058] Advantageously, each fixed frame 3 comprises a plurality of fixing bodies 21, directly obtained in the high density polyurethane through a moulding process, 25 arranged on the uprights 31 of the fixed frame 3. Said fixing bodies 21 are configured to be fixed to the frame T of the refrigerator F and/or to corresponding fixing bodies 21 of a contiguous fixed frame of the closing system 1.

[0059] Thus, said fixing bodies 21 make it possible not only to attach the fixed frame 3 to the frame T of the refrigerator F but in particular to attach contiguous fixed frames 3 to one another in a modular manner.

[0060] Advantageously, as shown in Figure 12, each fixing body 21 comprises a through hole 210 suited to be aligned with a corresponding through hole 210 of a contiguous fixing body 21, so that fixing screws can be inserted in said holes between contiguous fixed frames 3.

[0061] The choice to use polyurethane for making the fixing bodies 21 (generally of the same type used to make the fixed frame 3 and the movable frame 7) offers the advantage of obtaining high thermal insulation at the level of the areas where the fixed frame is anchored to the frame T of the refrigerator F.

[0062] The fixing bodies 21 made with this material, in fact, make it possible to promote effective insulation also between the inside of the refrigerator F (which can even reach -23° C) and the external environment where said refrigerator F is installed (where the temperature is typically included between 20°- 25°C).

[0063] Polyurethane thus represents a suitable material for making the fixing bodies 21, since its mechanical characteristics are suited to make the entire closing system 1 highly durable and resistant, and at the same time it makes it possible to obtain a thermally efficient system without areas or points with reduced thermal insulation.

[0064] Therefore, making the fixing bodies 21 in polyurethane means obtaining a closing system that is suited to reduce the overall energy consumption of the refrigerator F during its operation.

[0065] Moreover, a further advantage of such high insulation is represented by the fact that it minimizes (if not completely eliminates) the formation of condensation on the fixing bodies 21.

[0066] Advantageously, therefore, the fixed frame 3 and/or the door frame 5, including the various elements that make them up, are completely made of high density polyurethane by means of a moulding and/or co-moulding technique.

[0067] The panel 9 of the door 5 can be constituted by a glass panel glued to the door frame 7. As shown in Figure 20, the glass panel can be glued to the perimeter of the face 77 of the door frame 7 that faces towards the outside of the refrigerator F, in its configuration of use. Advantageously, the door frame 7 may comprise a perimeter edge 78 designed to contain the glass panel 9, directly obtained in the high density polyurethane through a moulding process.

[0068] Advantageously, the door frame 7 comprises a seat 76 for fixing a gasket, created in the inner face 79 of the door frame 7. Said seat 76 is directly obtained in the high density polyurethane through a moulding process and comprises an access hole 760 whose cross section is slightly smaller than the inner cross section 762 of the seat 76 itself, suited to guarantee the correct fastening of the gasket.

[0069] Advantageously, the door frame 7 can be associated with a handle 25 for opening the door 5 with respect to the fixed frame 3.

[0070] The present invention concerns also a refrigerator F comprising a closing system 1 as described above.

[0071] The present invention concerns also a process for making a closing system 1 as described above, comprising at least the following steps:

- moulding the fixed frame 3 from high density polyurethane;
- moulding the door frame 7 from high density polyurethane;
- gluing the panel 9, preferably made of a transparent material, onto the door frame 7 to define a door 5.

[0072] Advantageously, the closing system 1 is installed on the refrigerator F by assembling first the fixed frame 3 on the frame T of the refrigerator F and then the door 5 on the fixed frame 3, through the installation of the hinges 17.

[0073] It has thus been shown that the closing system for refrigerators according to the present invention fulfils its task and achieves the set objects, being simple and economic to produce, to assemble and to install on the refrigerator and at the same time extremely efficient from the thermal point of view.

[0074] An advantage of the closing system for refrigerators according to the invention lies in that the fixed frame and the door frame, including their various components, can be substantially produced through a single moulding or co-moulding operation, with no need for special additional processing steps such as the application of inserts or reinforcements or the execution of holes or seats.

[0075] In fact, the moulding of the fixed frame and the door frame directly in polyurethane makes it possible to directly produce all the technical parts which are necessary for the assembly of the closing system itself and its installation on the refrigerator.

[0076] Another advantage offered by the closing system according to the invention lies in that the high density

polyurethane used for moulding the fixed frame and the door frame has thermal insulating properties and therefore the closing system improves the thermal efficiency and thus the overall energy efficiency of the refrigerator.

[0077] Furthermore, the use of high density polyurethane for making the fixed frame and the door frame offers the advantage of preventing the formation of condensation on the glass, which is generally due to the difference in temperature between the inside of the refrigerator and the external environment, to the point that it is possible to eliminate the use of heating means for preventing the formation of said condensation.

[0078] In any case, the thermal power that said heating means for preventing the formation of condensation must generate is considerably lower if compared to the refrigerators provided with closing systems of the known type.

[0079] Another advantage offered by the closing system according to the invention lies in that it is possible to choose whether to apply said heating means for preventing the formation of condensation or not, and also to choose the type of means to be adopted, with no need to modify the design, in particular the design of the fixed frame. In fact, the fixed frame is configured in such a way that it can be equipped with different types of anti-condensation heating means.

[0080] Another advantage of the closing system according to the invention is represented by its modularity and thus by the possibility to place a plurality of fixed frames with the respective doors side by side in a modular manner, according to the size of the refrigerator.

[0081] Another advantage is represented by the reversibility of the door opening direction, reversibility that can be selected even upon installation on the refrigerator, or upon retrofitting of the refrigerator itself.

[0082] The closing system for refrigerators conceived as described above can be subjected to several changes and modifications, all of which fall within the scope of the inventive concept.

[0083] Furthermore, all the details can be replaced by other technically equivalent elements.

[0084] In practice, any materials, provided that they are compatible with the intended use, as well as any size and specific shapes can be used, according to the needs.

Claims

1. Closing system (1) for refrigerators, comprising:

- at least one fixed frame (3) suited to be attached to the opening of a refrigerator (F) and defining an opening designed to give access to the internal volume of said refrigerator (F);
- at least one door (5) associated with said fixed frame (3), said at least one door (5) being movable with respect to said fixed frame (3) between a closed configuration, in which said door (5) is closed on said fixed frame (3), and an open configuration, in which said door (5) is open on said fixed frame (3), said at least one door (5) comprising a door frame (7) and a panel (9) fixed to said door frame (7), preferably made of a transparent material,

wherein said fixed frame (3) and said door frame (7) are made of high density polyurethane by means of moulding techniques;

characterized in that said at least one fixed frame (3) comprises a plurality of fixing bodies (21) arranged on the uprights (31) of said at least one fixed frame (3), said fixing bodies (21) being configured to be attached to the frame (T) of said refrigerator (F) and/or to corresponding fixing bodies (21) of a contiguous fixed frame of said closing system (1), said fixing bodies (21) being made of said high density polyurethane by means of moulding techniques to promote high thermal insulation between the frame (T) of the refrigerator (F) and the environment outside the closing system (1).

2. Closing system (1) according to claim 1, **characterized in that** said fixed frame (3) and said door frame (7) are made of a polyurethane whose density is higher than 200 kg/m^3, preferably higher than 250 kg/m^3, more preferably equal to about 400 kg/m^3.

3. Closing system (1) according to claim 1 or 2, **characterized in that** said at least one fixed frame (3) and/or said at least one door frame (7) comprise/s structural reinforcing elements (11) buried in said high density polyurethane, said at least one fixed frame (3) and/or said at least one door frame (7) being made of high density polyurethane through co-moulding techniques.

4. Closing system (1) according to one or more of the preceding claims, **characterized in that** it comprises at least one seat (13, 15) suited to house means for preventing the formation of condensation and formed on the face (18) of said fixed frame (3) which in the configuration of use of said closing system (1) faces said door (5).

5. Closing system (1) according to claim 4, **characterized in that** it comprises one pair of said seats (13, 15) suited to house said means for preventing the formation of condensation, a first seat (13) being configured to accommodate a first means for preventing the formation of condensation, consisting of a heating electrical cable, a second seat (15) being configured to accommodate a second means for preventing the formation of condensation, consisting of a pipe through which a hot gas recovered from a compressor of said refrigerator (F) flows.

6. Closing system (1) according to claim 4 or 5, **char-**

acterized in that said at least one seat (13, 15) extends along the whole perimeter of said fixed frame (3).

7. Closing system (1) according to one or more of the preceding claims, **characterized in that** said at least one fixed frame (3) and said at least one door frame (7) are mutually associated through one pair of hinges (17) to define a hinged door, each hinge (17) comprising one pair of elements (170, 172) mutually hinged to each other, said fixed frame (3) comprising at least one pair of first fixing seats (30) for fixing a first element (170) of said pair of elements (170, 172) of said hinge (17), where said first seats (30) are formed in said high density polyurethane by means of moulding techniques, said door frame (7) comprising one pair of second fixing seats (70) for fixing a second element (172) of said pair of elements (170, 172) of said hinge (17), where said second seats (70) are formed in said high density polyurethane by means of moulding techniques.

8. Closing system (1) according to claim 7, **characterized in that** said fixed frame (3) comprises two pairs of said first fixing seats (30), said door frame (7) being suited to be associated with a first pair of said two pairs of first fixing seats (30) to define a first opening direction for said door (5) or with a second pair of said two pairs of first fixing seats (30) to define a second opening direction for said door (5), opposite said first direction.

9. Closing system (1) according to one or more of the preceding claims, **characterized in that** it comprises a plurality of said fixed frames (3) associated with one another in a modular way and suited to be attached to the opening of a refrigerator (F), and a plurality of said doors (5), each door (5) of said plurality of doors (5) being associated with a respective fixed frame (3).

10. Closing system (1) according to one or more of the preceding claims, **characterized in that** said at least one fixed frame (3) and said at least one door frame (7) are entirely made of said high density polyurethane by means of a moulding and/or co-moulding technique.

11. Refrigerator (F) **characterized in that** it comprises a closing system (1) according to one or more of the claims from 1 to 10.

12. Process for making a closing system (1) according to one or more of the claims from 1 to 10, **characterized in that** it comprises:

- the moulding of said fixed frame (3) from said high density polyurethane;
- the moulding of said door frame (7) from said high-density polyurethane;
- the gluing of said panel (9) onto said door frame (7) to define said door (5).

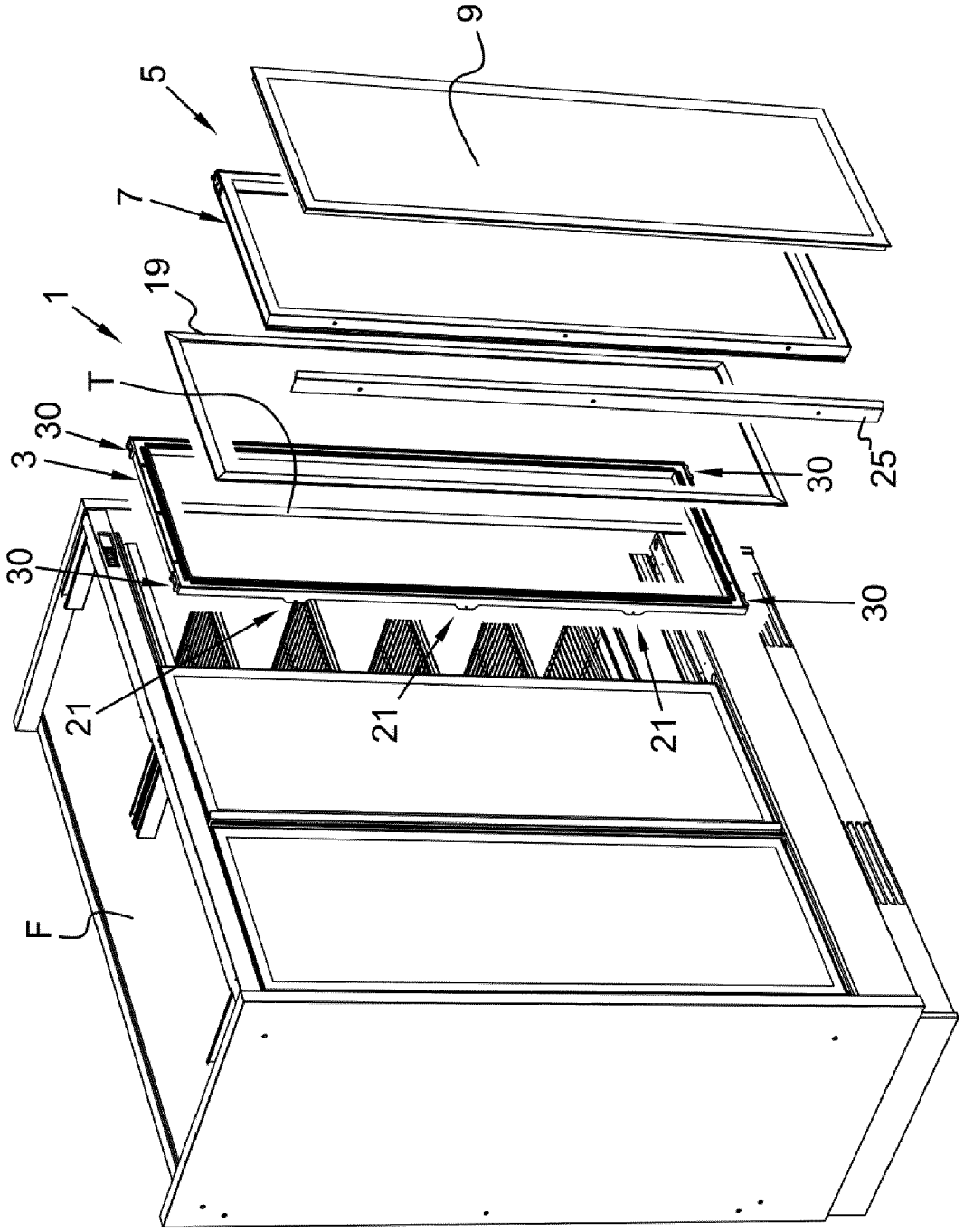


FIG. 1

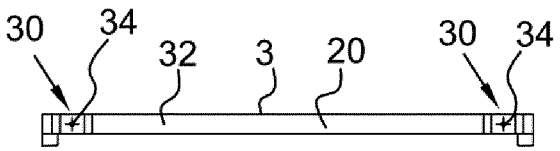
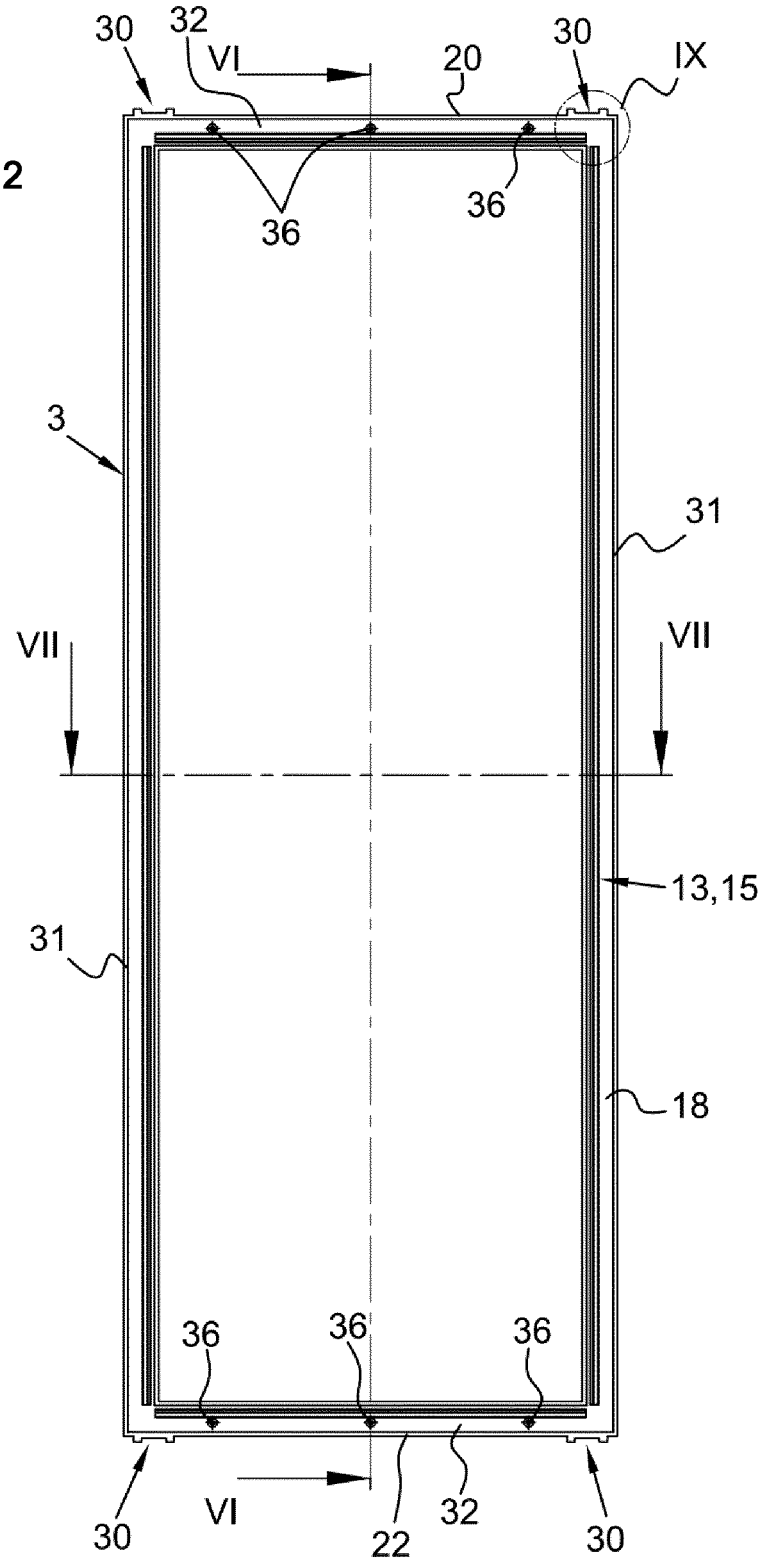


FIG. 5

FIG. 2



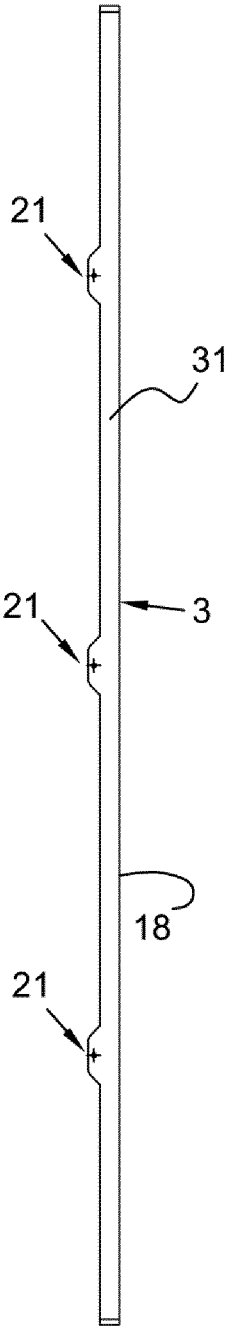


FIG. 4

FIG. 6

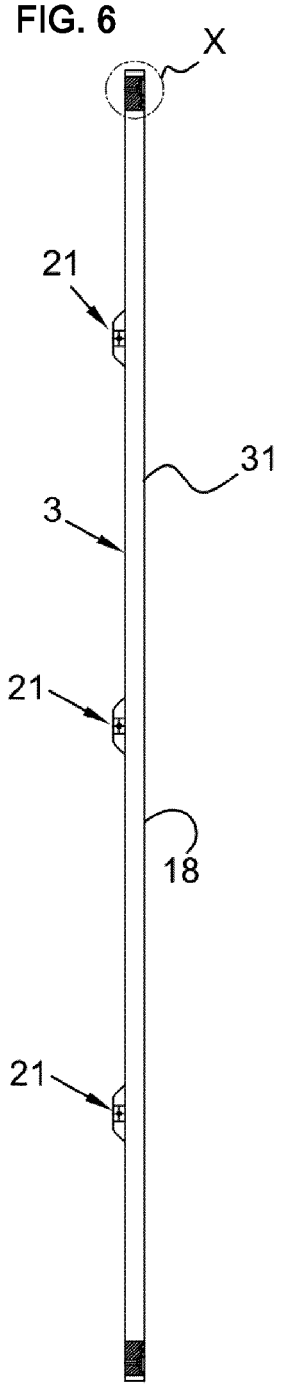


FIG. 3

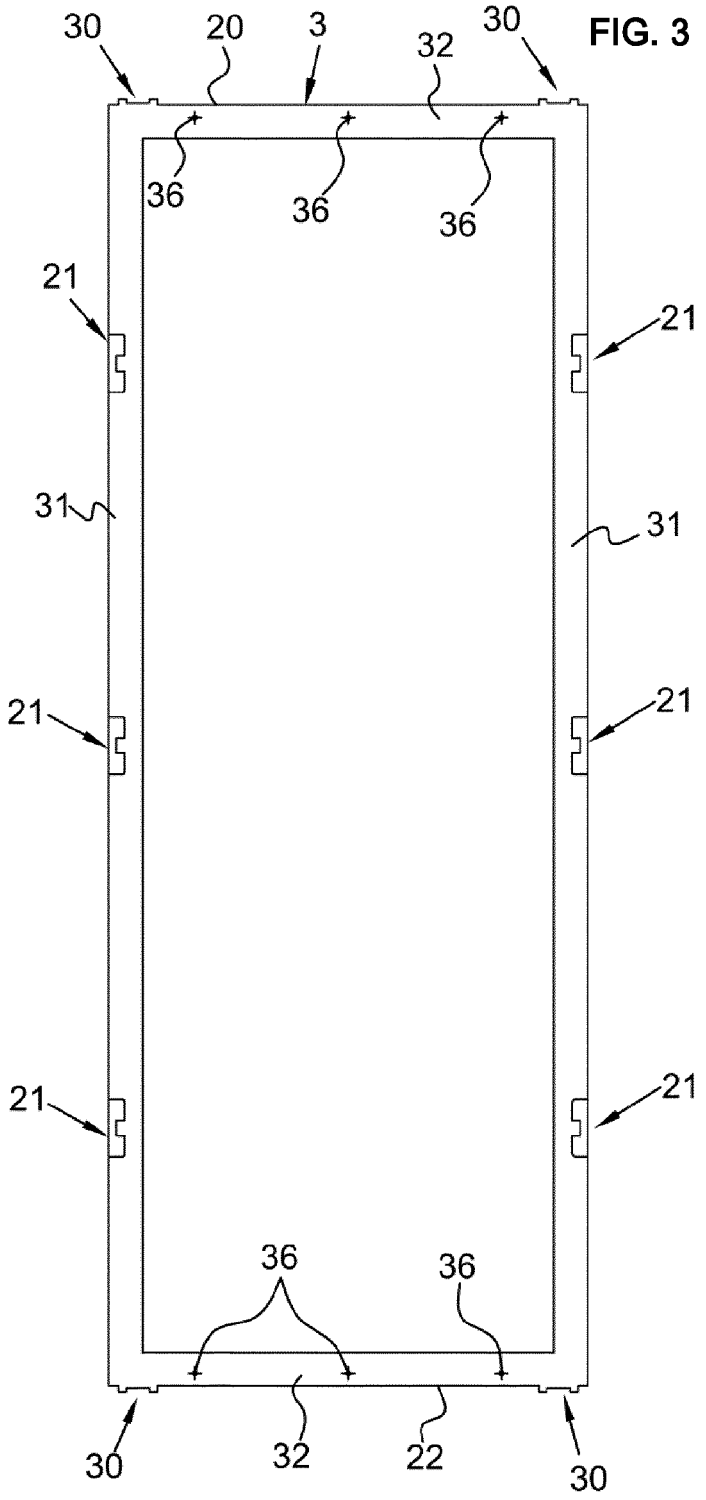


FIG. 7

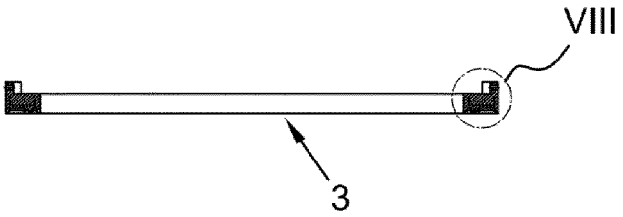


FIG. 8

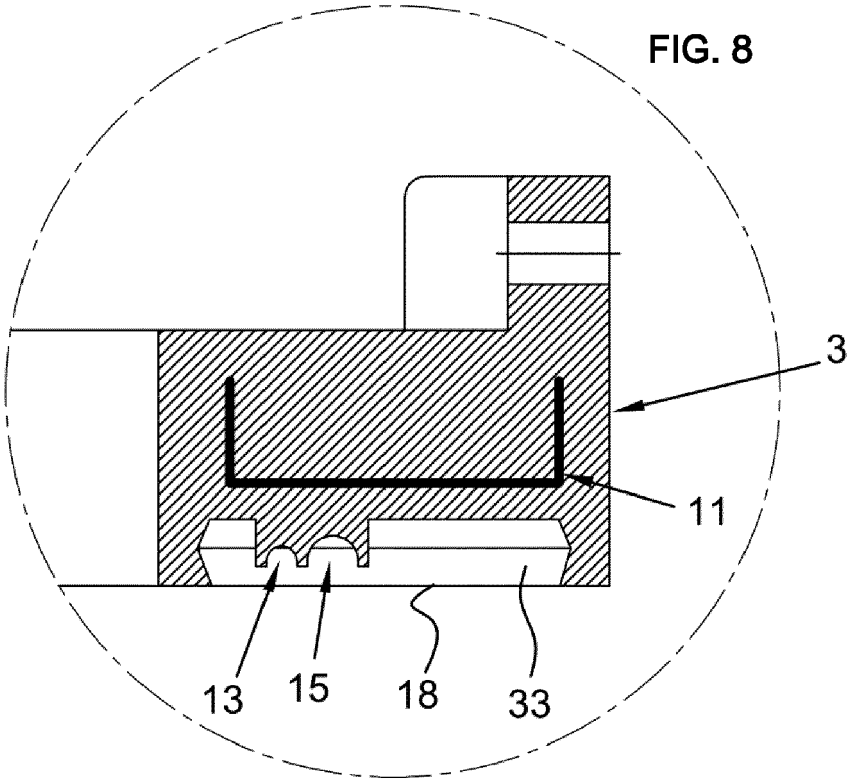
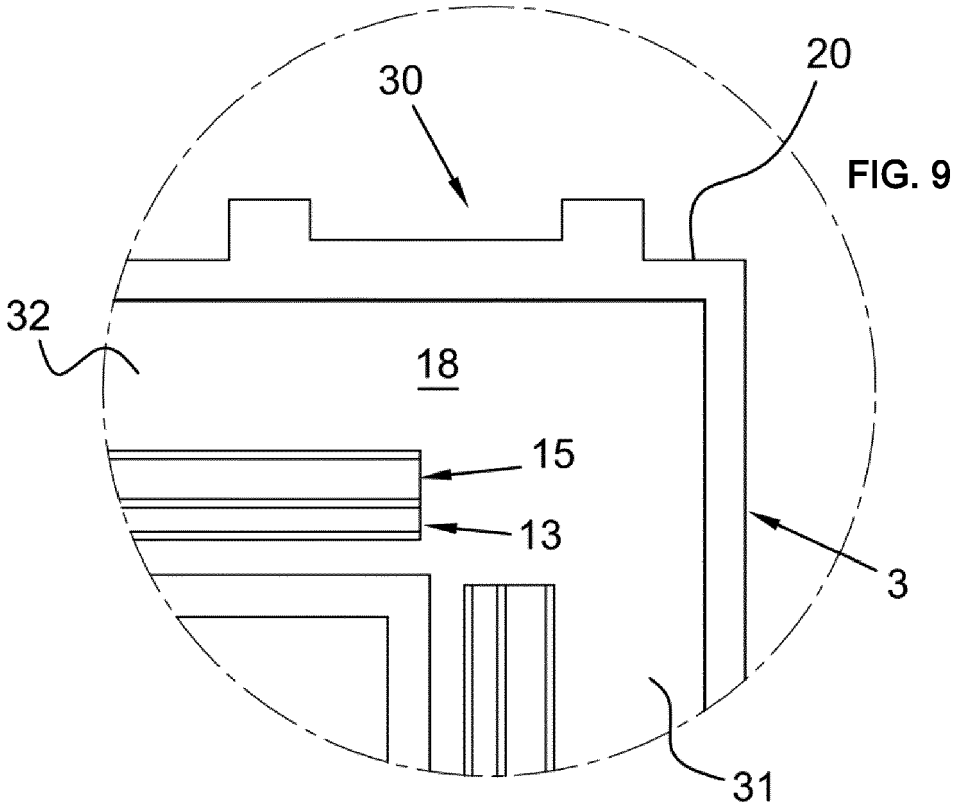


FIG. 9



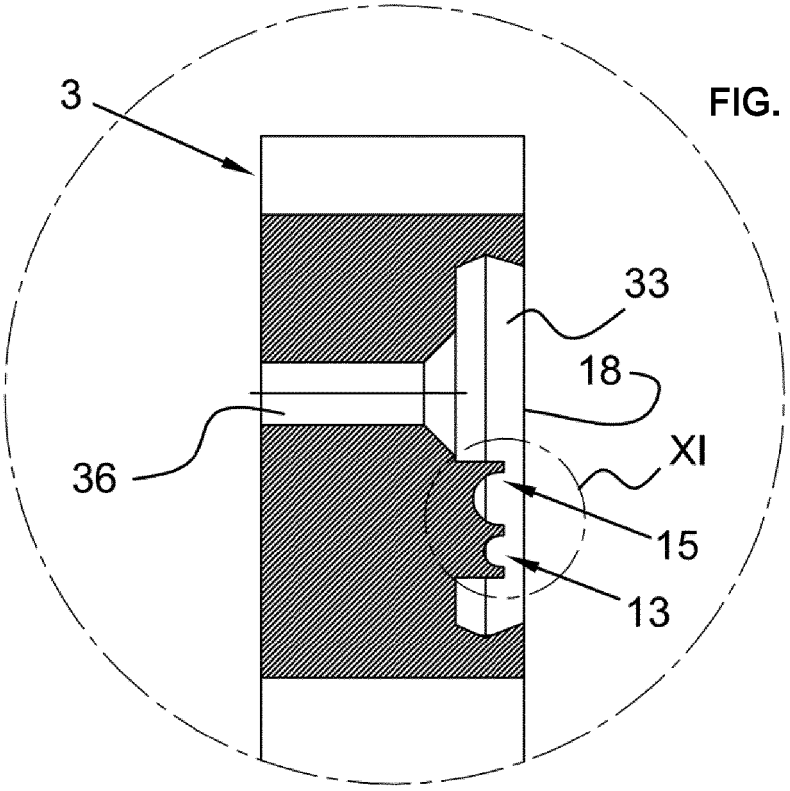
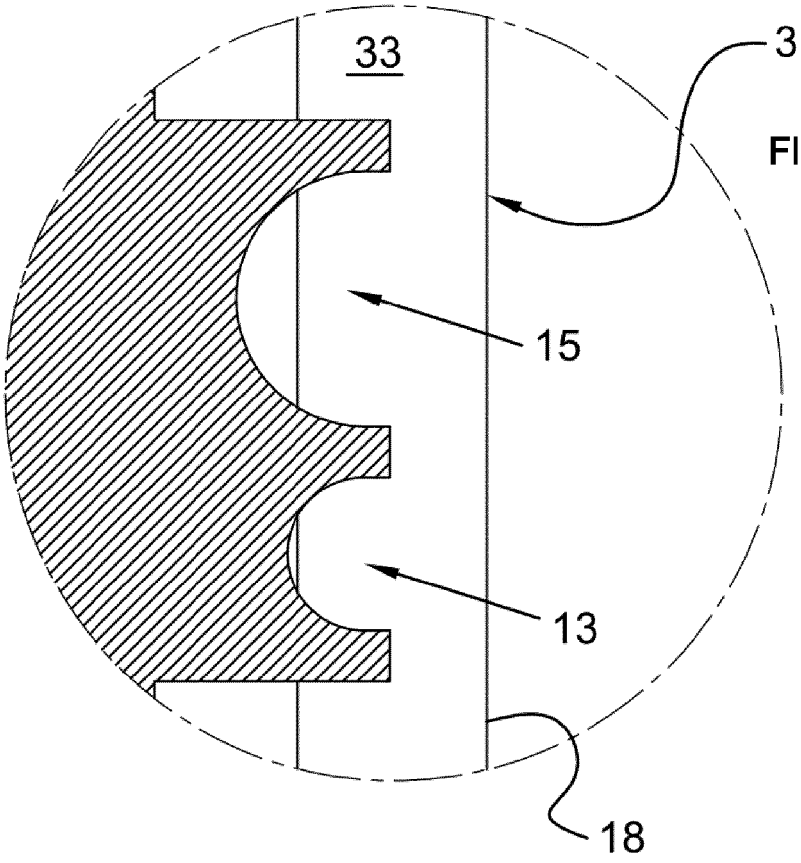


FIG. 10



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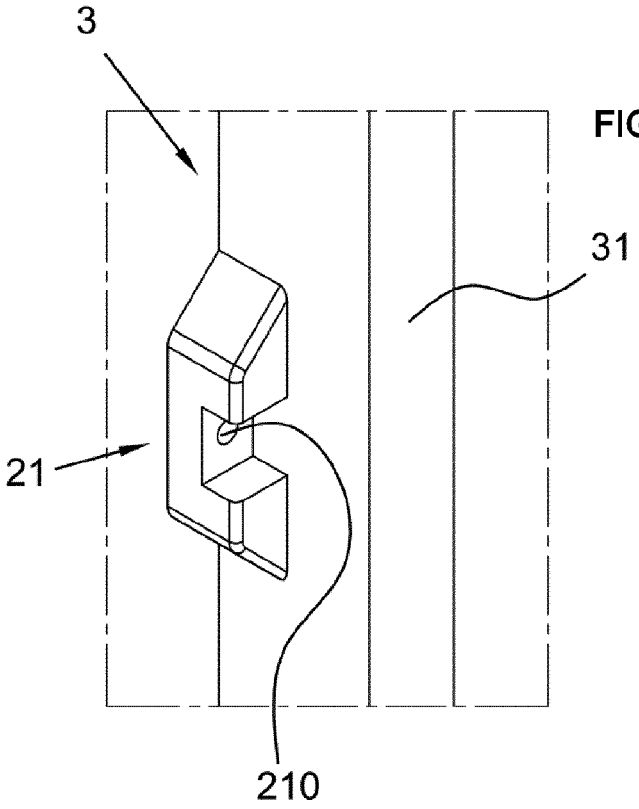

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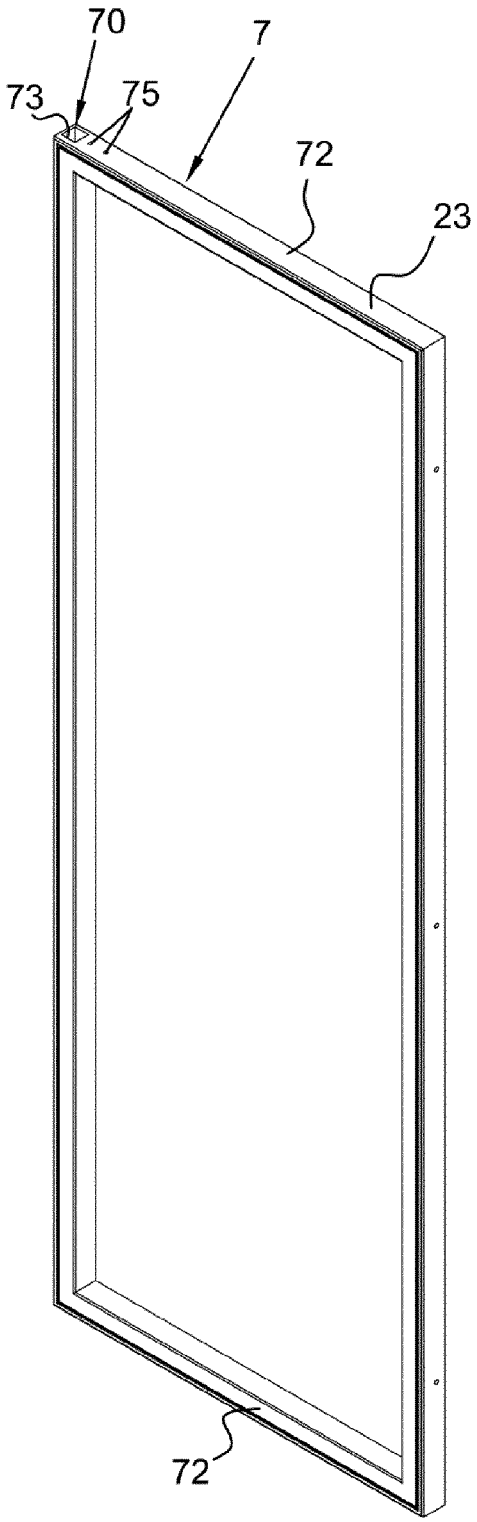
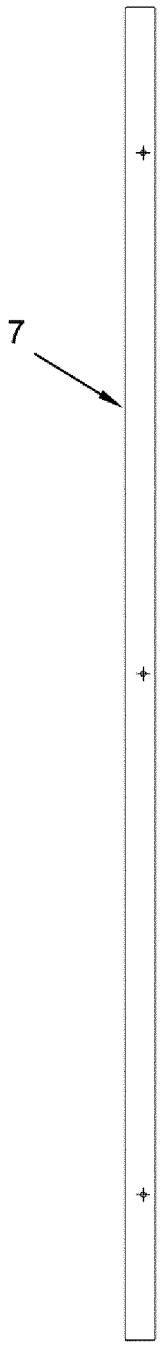


FIG. 13

FIG. 16



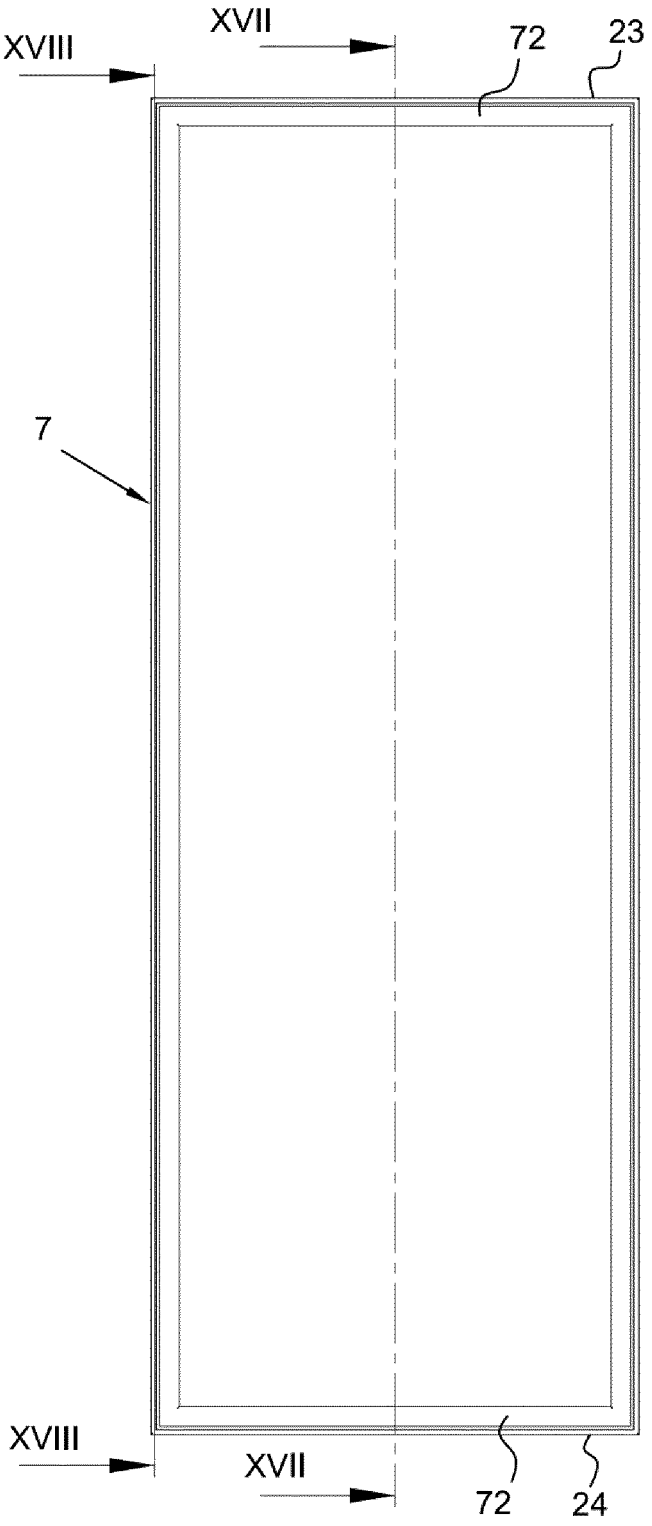


FIG. 14

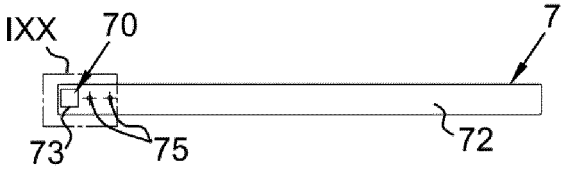


FIG. 15

FIG. 17

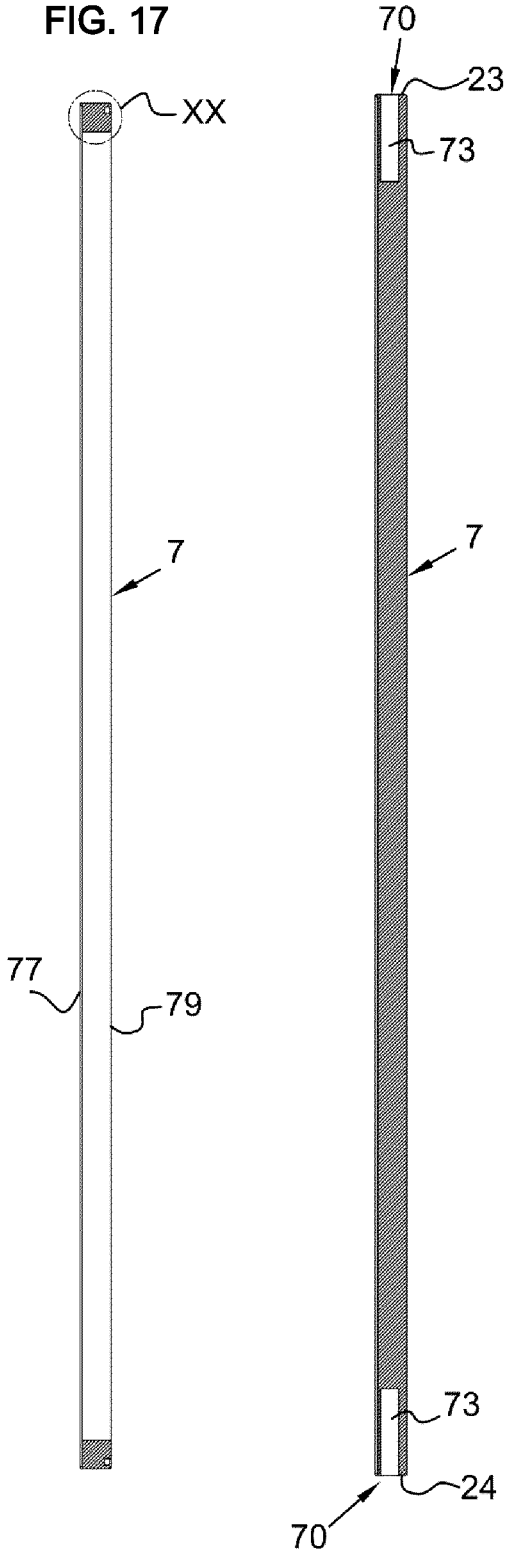


FIG. 18

FIG. 19

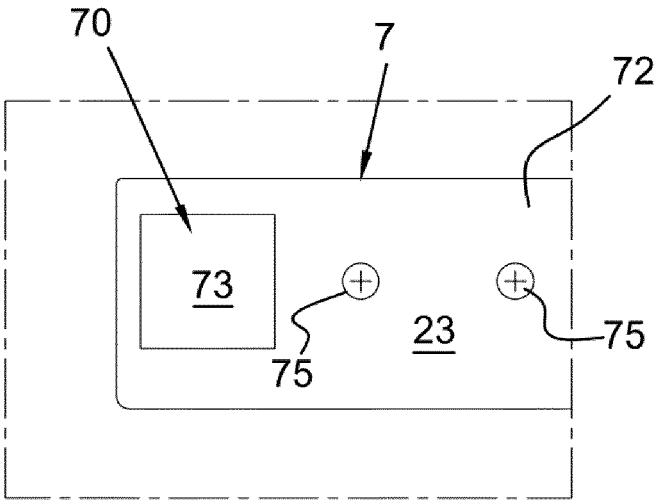


FIG. 20

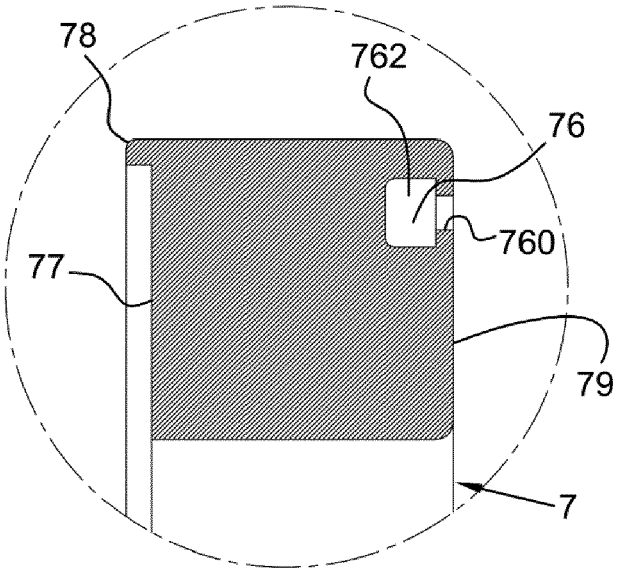
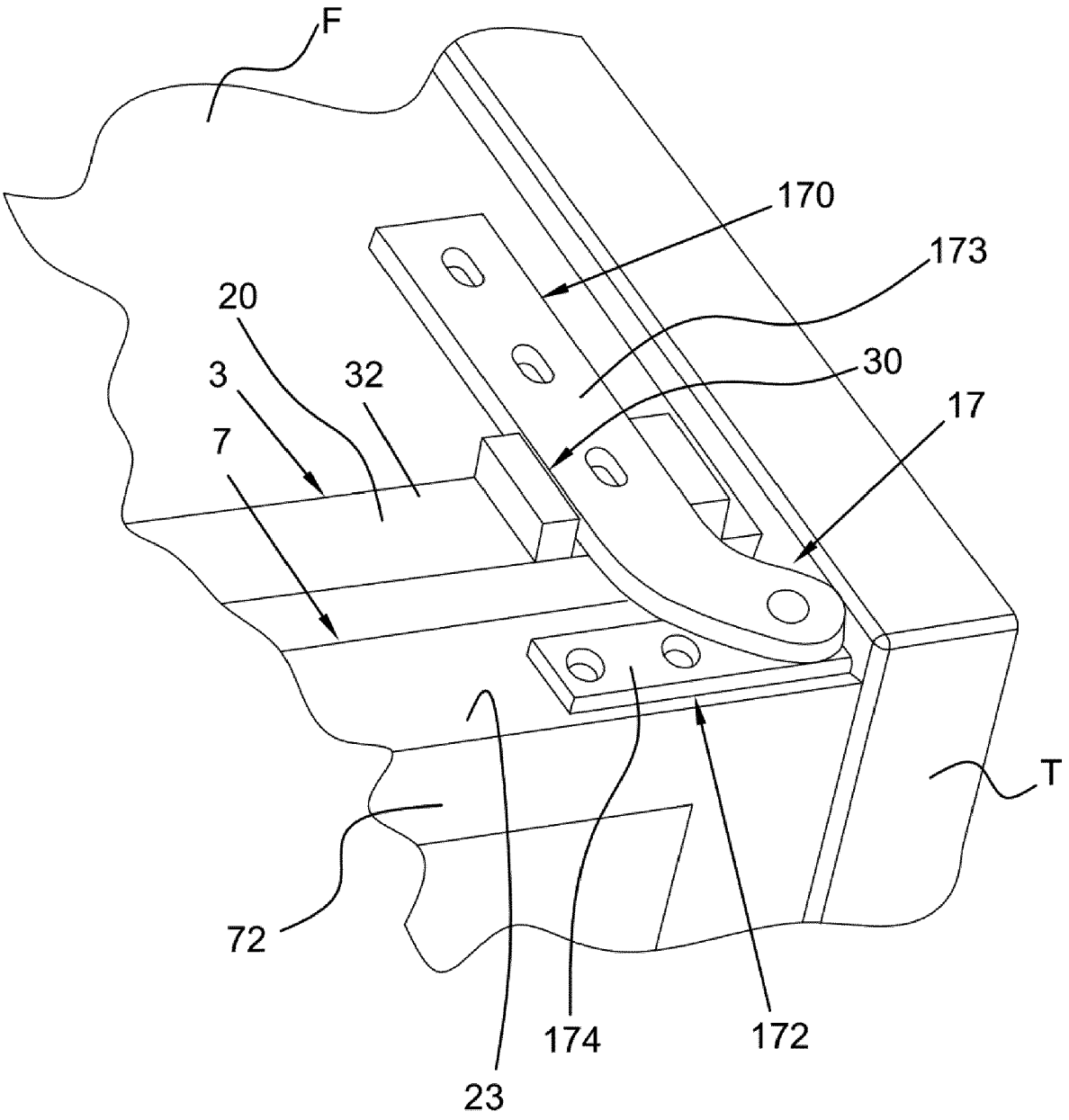


FIG. 21



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A	US 5 255 473 A (KASPAR MELVIN [US] ET AL) 26 October 1993 (1993-10-26) * column 7, line 40 - column 8, line 18; figures *	1	
A	ISHIDA Y ET AL: "Glass door for refrigerator - comprises reaction injection moulded polyurethane frame with spaced sealed glass plates", WPI / THOMSON,, vol. 1990, no. 32, 27 June 1990 (1990-06-27), XP002730856, * the whole document *	1	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	9 February 2021	Vigilante, Marco

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