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(54) **An improved hinge group for doors of refrigerator cabinets**

(57) A hinge group (50) for closing panels of an access entry of refrigerator cabinets comprising: a first support element (51) fixable to a fixed frame (21) of the access entry; a second support element (54) fixable to the closing panel (30), and hinged to the first support element (51); elastic return means (53) interposed between the first and the second support element (51, 54) for return from the open position to the closed position, which comprise a torsion spring (53) substantially parallel to the

hinge axis (X) and decentred with respect thereto; cam means (511, 545) for transforming means of the rotary motion of the second support element (54) with respect to the first support element (51) into rotary motion of the first end (53a) with respect to the second end (53b) of the torsion spring (53), comprising a pin (545) and an abutting element (511) for the pin (545) in which the abutting element (511) is rotatably associated to the first support element (51).

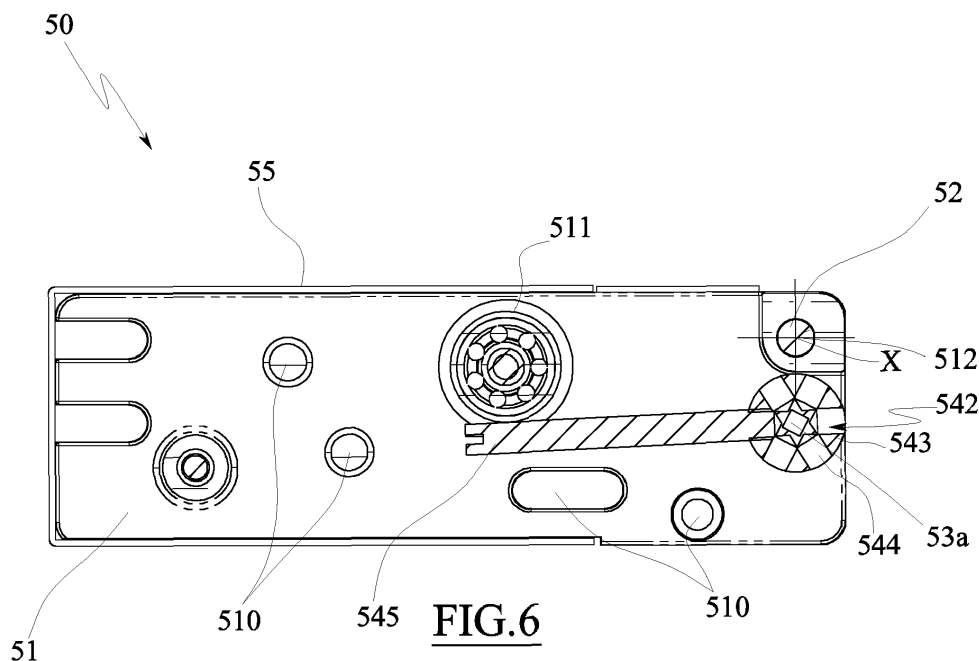


FIG. 6

Description

TECHNICAL FIELD

[0001] The present invention relates to a hinge group for refrigerator or refrigerator cabinet doors.

[0002] In greater detail, the invention relates to a hinge group for doors of refrigerator cabinets or refrigerators destined to be located internally of sales points of food products or the like, for conserving and displaying the products.

PRIOR ART

[0003] As is known, refrigerator cabinets generally comprise an external body having a parallelepiped shape, which delimits internally thereof a refrigerated chamber for receiving products to be conserved.

[0004] The refrigerated chamber is accessible via a frontal access entry fashioned on a lateral flank of the external body, which is closed by a door that can be partially or entirely transparent, so as to enable viewing the products which are contained internally thereof.

[0005] At present, the door of a refrigerator cabinet can be a leaf door or a sliding door.

[0006] In particular, a leaf door comprises a fixed frame delimiting the access entry of the refrigerator cabinet and one or more panels for closing the access entry, which are hinged to the frame so as to open the access entry, functioning as a door.

[0007] A requirement of these refrigerator cabinets is that they should increase the transparent area of the door, so as to improve the visibility of the products contained internally and increase display capability thereof.

[0008] This requirement leads to the use of panels having very slim frames closed by large transparent panes.

[0009] Notwithstanding the use of these panels, it has been found that much non-transparent space of the door is necessarily used for the manoeuvring space required by the hinge group for moving the panel with respect to the fixed frame.

[0010] A further drawback encountered in the doors of known type lies in the fact that the large manoeuvring space required between the fixed frame and the panel, at the hinged side thereof, requires a relatively large gap which varies the width thereof during the rotation of the panel with respect to the frame and wherein a user's finger might be inserted and then inadvertently crushed when the panel is opened.

[0011] Also known are hinge groups, for example of the type described in patent application RE2011A000074 in the name of the same Applicant, which obviate the drawbacks mentioned herein above with a particular arrangement of the hinge axis of the hinge group with respect to the elements it is constituted by, and therefore the rotation axis of the closing panel with respect to the edge of the fixed frame closed to the hinge.

[0012] In practice, the hinge groups comprise:

- a first support element fixable to a fixed frame of the access entry,
- a second support element fixable to the closing panel, the second support element being hinged to the first support element with a hinge axis thereof parallel to the panel so as to enable rotation of the panel between a closed position and an open position of the access entry.

[0013] The hinge axis is arranged at a corner of the second support element.

[0014] Also comprised are elastic return means interposed between the first and the second support element for return from the open position to the closed position, which comprise a torsion spring substantially parallel to the hinge axis and decentred with respect thereto, a first end of which is rotatably associated to the second support element and the second end of which is solidly associated in rotation to the second support element.

[0015] The hinge group further comprises transforming means of the rotary motion of the second support element with respect to the first support element in rotary motion of the first end with respect to the second end of the torsion spring, which transforming means in the example comprise a geared portion fixed to the first support element coaxially to the hinge axis and able to enmesh with a cog wheel associated rotatably to the second support element and comprising a housing seating for the first end of the torsion spring, in which the first end and the housing seating are configured so as to give rise to a sliding coupling.

[0016] In this way the gears are used to load the torsion spring during the rotation of the second support element towards the open position, so that it exerts a thrust action which acts on the panel towards the closed position whenever it is released.

[0017] Another hinge group which comprises transforming means, of the rotary motion of the second support element with respect to the first support element in rotary motion of the first end with respect to the second end of the torsion spring, and wherein said transforming means have geared portions is disclosed in the document D1: DE 196 24 741.

[0018] Although the hinge group is particularly advantageous and enables very significantly to contain the dimensions of the non-transparent parts of the refrigerator cabinet, as well as reducing to a minimum the interspace between the fixed frame and the edge of the panel close to the hinge axis, it is decidedly expensive to produce, mostly due to the use of the above-mentioned gears.

[0019] Further, the use of these gears implies the presence of some production steps in the production cycle of the hinge group, among which the mounting and calibrating of the preload on the torsion spring, which are particularly delicate and crucial; this fact contributes to an increase of production costs of the hinge group.

[0020] Examples of these hinge groups, in which the hinge axis does not coincide with the axis of the torsion

spring, are also described in International Patent Application no. WO 2008/050975, in which the motion transforming means comprise a pair of levers hinged to one another and respectively constrained to the first support element and the first end of the torsion spring.

[0021] This pair of levers, while on the one hand reducing the production costs of the hinge group, does not however enable configuring and varying the resistance of the torsion spring as desired according to the angle of opening of the panel, according to constructional and/or use requirements.

[0022] Further, these hinge groups are particularly laborious from the point of view of assembly and maintenance, requiring operations for lubricating the components in reciprocal motion.

[0023] To obviate these drawbacks, the same Applicant has developed an advantageous solution, described in Italian Patent Application no. RE2012A000063, in which the transforming means comprise cam means comprising a pin associated to the first end of the torsion spring and a profiled abutting appendage branching from the first support element and able to come into dragging contact on the pin during the rotation of the second support element with respect to the first support element, in such a way as to load the torsion spring during the opening rotation of the closing panel.

[0024] With this solution, the loading mechanism of the torsion spring is particularly effective, economical and easy to realise, and the transmission ratio of the transforming means in regard to the angle of opening of the closing panel is also easy.

[0025] However, the dragging contact between the pin with the abutting appendage, with an opening and closing activation that is continuous and frequent, like the one to which a closing panel of refrigerator cabinets destined to be located internally of sales points is subjected, leads to rapid wear on the reciprocally-dragging organs, and also leads to noisier transforming means in some circumstances.

[0026] An aim of the present invention is to provide an advantageous alternative to the above hinge groups of known type and obviate the above-mentioned drawbacks of the prior art, with a solution that is simple, rational and relatively inexpensive.

[0027] 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

[0028] In particular the invention discloses a hinge group for closing panels of an access entry of refrigerator cabinets, comprising:

- a first support element fixable to a fixed frame of the access entry,
- a second support element fixable to the closing pan-

el, the second support element being hinged to the first support element with a hinge axis thereof parallel to the panel so as to enable rotation of the panel between a closed position and an open position of the access entry,

- elastic return means interposed between the first and the second support element for return from the open position to the closed position, which comprise a torsion spring substantially parallel to the hinge axis and decentred with respect thereto, a first end of which is rotatably associated to the second support element and a second end of which is solidly associated in rotation to the second support element,
- cam means for transforming means of the rotary motion of the second support element with respect to the first support element in rotary motion of the first end with respect to the second end of the torsion spring, comprising a pin associated to the first end of the torsion spring and an abutting element associated to the first support element and able to come into contact with the pin during the rotation of the second support element with respect to the first support element.

[0029] According to the invention, the abutting element is rotatably associated to the first support element.

[0030] With this solution, the cam means are free of problems connected to the wear of the organs in reciprocating motion even following intense use (in opening and closing) of the panels.

[0031] Further, with this solution the hinge group is quieter in operation.

[0032] It is further possible to configure and vary the resistance of the torsion spring as desired in accordance with the opening angle of the panel, according to constructional and/or use needs, for example by appropriately configuring the components of the cam means.

[0033] In a further aspect of the hinge group of the invention, the first end of the torsion spring is solidly inserted in rotation in a cylindrical body rotatably associated to the second support element.

[0034] The pin advantageously projects from the cylindrical body, substantially in a radial direction.

[0035] In this way, the mounting and realization of the stop means and the whole hinge group is particularly simple and functional, with undoubted advantages in terms of efficiency and economy of the production cycle thereof.

[0036] The abutting element can advantageously rotate, for example without dragging, on the pin during the rotation of the second support element with respect to the first support element, for activating in rotation the first end of the torsion spring with respect to the second support element and thus load the torsion spring.

[0037] Further, the second end of the torsion spring is solidly rotatably inserted in a bushing deriving from the second support element and solid in rotation therewith.

[0038] The hinge axis of the hinge group is advanta-

geously arranged at a corner of at least the second support element, while the torsion spring is located in an off-centre position.

[0039] In this way, the torsion spring can easily be installed internally of the mobile panel of the door, without interfering with the profiles that realize the frame of the panel and at the same time the interspace between the panel and the frame can be kept to a minimum.

[0040] The pin of the cam means is advantageously substantially cylindrical. Alternatively, the pin of the cam means can have a variable section along the longitudinal axis thereof.

[0041] With this solution, the thrust on or from the torsion spring can be varied according to the displacement (along the pin axis) of the contact point between the pin and the abutting element, for example by varying the transmission ratio of the transforming means according to the angle of opening of the closing panel.

[0042] In particular, an aspect of the invention includes the free end of the pin being broadened with respect to the end of the pin which is constrained in rotation to the first end of the torsion spring.

[0043] With this solution it is possible to increase the loading of the torsion spring (and equally the thrust exerted by the elastic response thereof) at small angles of opening of the closing panel, for example when it is in proximity of the closed position thereof.

[0044] In an aspect of the invention, the abutting element comprises a cylindrical body.

[0045] The cylindrical body, for example a rolling bearing, is rotatably associated, with respect to the axis thereof, to the second support element.

[0046] In this way, the contact surface between the pin and the abutting element moves along a surface of revolution that is particularly simple, easily realisable and subject to limited wear over time.

[0047] It is for example possible for the plan shape of the abutting element to be other than circular, for example elliptical or exhibiting one or more cam portions, so as to give a different thrust to the pin according to the angular position of the eccentricities.

[0048] For the same aims as outlined above, the cylindrical body (though exhibiting a circular plan shape) can be associated with respect to an eccentric axis to the second support element.

[0049] A further aspect of the invention provides a door for refrigerator cabinets which comprises a fixed frame able to delimit an access entry of the refrigerator cabinet and at least a closing panel of the access entry, which comprises a hinge group as described above.

[0050] The use of this hinge group in a door for refrigerator cabinets enables limiting the non-transparent area of the door while at the same time reducing the interspace between the closing panel and the fixed frame of the door, enabling at the same time a large number of openings and closings of the closing panel without wearing the cam means, and a good level of silent operation.

[0051] The panel advantageously comprises a closing

panel (and a frame for perimetally holding the closing panel, while the torsion spring is inserted internally of the frame, and is substantially hidden internally thereof.

[0052] Further, in an aspect of the invention the distance between the edge of the panel parallel to the hinge axis and close to the hinge axis thereof is at a substantially constant distance from the fixed frame during the rotation between the closed position and the open position of the panel.

[0053] With this solution, obtainable with the hinge group illustrated in the preceding, the possibility of crushing internally of the space between the panel and the fixed frame in proximity of the hinge axis is prevented.

[0054] The distance between the edge of the panel parallel to the hinge axis and close to the hinge axis of the fixed frame is further advantageously comprised between 3.5 mm and 6.5, so as to prevent the possibility of insertion of fingers in the space.

[0055] In a further aspect of the door of the invention, the external edge of the fixed frame and the external edge of the panel are substantially coplanar when the panel is in the closed position.

BRIEF DESCRIPTION OF THE DRAWINGS

[0056] 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 schematic front view of a refrigerator cabinet provided with a leaf door provided with hinge groups, according to the present invention.

figure 2 is a front view of a hinge group according to the invention, in a closed position seen from line II of figure 3.

figure 3 is a view from above of figure 2.

figure 4 is a front view of the hinge group of figure 2 in an open position, seen from line IV of figure 5.

figure 5 is a view from above of figure 4.

figure 6 is a view along section line VI-VI of figure 2.

figure 7 is a view along section line VII-VII of figure 4.

figure 8 is a schematic view of the hinge group according to the invention in two operating positions.

BEST WAY OF CARRYING OUT THE INVENTION

[0057] During the course of the following description, the concepts of high and low, upper and lower and left and right are all referred to the view of figure 1.

[0058] The refrigerator cabinet 10 shown in figure 1 comprises an external body 11 of parallelepiped shape, which delimits an internal refrigerated compartment (not visible) for accommodating the products to be conserved.

[0059] The refrigerated compartment is accessible from the outside through an access entry 12, which is afforded frontally on a vertical side of the external body 11.

[0060] The access entry 12 is closed by a door which is denoted in its entirety by 20. The door 20 comprises a bordering fixed frame 21 delimiting the access entry 12, which exhibits a rectangular shape defined by two parallel pairs of profiles, of which a pair of vertical profiles, respectively left 22 and right 23, and a pair of horizontal profiles, respectively, upper 24 and lower 25.

[0061] The profiles 22-25 can be made of a plastic material, such as PVC, so as to improve the thermal insulation of the refrigerated compartment and prevent condensation, and can be covered externally by a coating of aluminium which improves the aesthetic appeal thereof.

[0062] The door 20 also comprises two panels 30, which are together able to close the access entry 12 delimited by the fixed frame 21.

[0063] In particular, each panel 30 has a rectangular shape having substantially the same height as the access entry 12, and a width equal to a little more than half the width of the access entry 12.

[0064] In this way, each panel 30 is individually able to close a respective half of the access entry 12, though the access entry 12 could also be totally closed by only one panel 30 or more panels according to requirements.

[0065] Each panel 30 comprises a closing panel 31, typically made of transparent material, for example glass, for enabling viewing of the products contained inside the refrigerator 10, and a frame 32 that surrounds the perimeter of the closing panel 31. In particular, the frame 32 is defined by a series of straight profiles fixed along the edges of the closing panel 31.

[0066] The profiles of the frame 32 can also be made of plastic material, for example PVC, and can be externally covered by an aluminum cladding.

[0067] As illustrated in figure 1, each panel 30 is also hinged to the fixed frame 21, so as to be able to rotate with respect thereto about a pivoting axis X, for example, vertical and parallel to the lie plane of the frame 21, between a closed position and at least one open position.

[0068] The external edge (the edge facing externally of the refrigerator cabinet 10) of the fixed frame 21, in particular of the right 23 and left 22 vertical profiles, and the external edge of the frame 32 of the panel 30, are substantially flush i.e. coplanar when the panel 30 is in the closed position.

[0069] This hinge coupling is realized by at least a hinge assembly generally denoted by reference numeral 50 and shown in detail in figures 2 - 8 and which will be described below in detail.

[0070] The hinge groups 50 can be one for each panel 30, for example arranged in a lower area of the panel 30; the other hinge panel can for example be of the traditional type or of the type described in the co-pending Patent Application for Utility Model in the name of the same Applicant, or alternatively can be two for each panel 30.

[0071] As can be seen in figure 1, the hinge group 50 of the left panel 30 is positioned at the left edge of the window panel 30, while the hinge groups 50 of the panel

30 on the right is positioned (symmetrically to the first hinge group) at the right edge of the window panel 30.

[0072] With this solution, the panels 30 are able to rotate in opposite directions relative to the frame 21, behaving as two doors.

[0073] Each panel 30 is able to rotate about the hinge axis X thereof, between the closed position shown in figure 1 and one (or more) open position of the respective portion of the access entry 12.

[0074] For example, when both panels 30 are in the maximum opening position, the access entry 12 is fully open.

[0075] In figures 2 to 7, for the sake of simplicity, only the lower left hinge group 50 is illustrated.

[0076] The hinge group 50 comprises a substantially plate-shaped first support element 51, for example rectangular in shape with rounded edges. Through-holes 510 are afforded for example on the first support element 51 so as to be engageable by screws which serve to fix the support element 51 to the frame 21, for example at the lower profile 25 thereof.

[0077] A cylindrical seating 512 is fashioned in the first support element 51, substantially in a decentralized area towards the right (visible in figures 6 and 7) in which a rotation pin 52 is rotatably inserted substantially snugly, with a vertical axis.

[0078] In particular, the cylindrical seating 512 is fashioned at a front corner of the first support element 51 which will be positioned in proximity of one of the vertical profiles 22 or 23, in this case the left vertical profile 22.

[0079] The front edge of the first support element 51, which houses the cylindrical seating, is substantially rounded, exhibiting a curved profile coaxial to the cylindrical seating.

[0080] The hinge group 50 further comprises a concave cover 55, formed by a base plate and three lateral faces, which is fixable over first support element 51 and is such as to define a protected environment interposed between the first support element 51 and the cover.

[0081] The cover 55 is for example slidably associated to the first support element 51 and is fixable in position by means of threaded members.

[0082] The hinge group 50 includes a second support element 54, also plate-shaped, for example exhibiting a rectangular base with rounded edges.

[0083] The second support element 54 exhibits a plurality of through-holes 540 in which fastening screws are inserted (not shown) which can be screwed to the frame 32 of the panel 30.

[0084] Further, the vertical-axis rotating pin 52 (perpendicular to the lie plane of the second support element 54) is fixed to the second support element 54; the rotating pin 52 being able to insert in the cylindrical seating 512 for the rotation of the second element of support 54 with respect to the first support element 51.

[0085] The rotation pin 52 is fixed (for example made in one piece with it) downward with respect to the second support element 54, projecting with respect thereto, and

at a corner (front left in the illustrated case) so that the second support element 54 can rotate above the first support element 51.

[0086] In practice, the expression "corner" is used to mean the corner of the plate constituting the second support element 54.

[0087] As shown in figure 8, the positioning of the rotation pin 52 at a corner of the second support element 54 enables the second support element 54 to rotate by an angle of 90° without the distance between the frame 32 and the vertical profile 22 (or the vertical profile 23 or a further frame 32 of a further flanked panel 30) changing during the rotation of the panel 30.

[0088] Further, the distance between the frame 32 and the vertical profile 22 can be minimal, enabling a wider transparent surface of the refrigerator cabinet 10 in its entirety.

[0089] The second support element 54 is therefore hinged to the first support element 51, via the rotation pin 52, so as to rotate the panel 30 with respect to the frame 21 between a closed position and an open position of the access entry 12.

[0090] In practice, the second support element 54 is superposed in plan view on the first support element 51 in the closed position (figure 3) and is inclined, for example by 90°, with respect thereto in the open position (figure 5).

[0091] The second support element 54 is provided with a substantially cylindrical cavity 541 and offset (flanked) with respect to the rotation pin 52, in which a torsion spring 53 is inserted - rotatably associated - of a bar type having a square section coaxially inserted in the cylindrical cavity 541.

[0092] A bushing 520 is inserted in the cylindrical cavity 541 and projects upward in relation to the second support element 54 and fixed to the second support element so as to axially prolong the cylindrical cavity 541.

[0093] The bushing 520 comprises an internal cavity only an upper portion whereof has a square section able to give rise to a sliding coupling with the torsion spring 53.

[0094] In practice, the lower end 53a of the torsion spring 53, as well as the central portion of the torsion spring, is rotatably inserted in the bushing 520 (which inferiorly exhibits a circular cross-section so as to enable rotation of the lower end of the torsion spring 53 internally thereof).

[0095] In this way a rotation of the second support element 54 with respect to the first support element 51, as will be described in detail herein below, corresponds to a rotation of the lower end 53a of the torsion spring 53 with respect to the second support element 54.

[0096] The torsion spring 53 extends superiorly in a longitudinal direction with respect to the second support element 54 along the entire length of the bushing 520, and the upper end 53b of the torsion spring 53 can be blocked in rotation by the upper portion of the bushing 520, preventing mutual rotation between the upper end 53b of the torsion spring 53 and the panel 30 (the bushing

520 being solidly constrained with the second support element 54 and the panel 30 fixed thereto).

[0097] A cylindrical element 542 is also rotatably inserted in the cylindrical cavity 541, internally of which cylindrical element the lower end 53a of the torsion spring 53 is inserted, solidly constrained in rotation for example by means of a sliding coupling.

[0098] The cylindrical element 542 is supported within the cylindrical cavity 541 by suitable bearings or similar devices, so that it is fixed axially relative to the second support element 54 and is rotatably associated thereto with respect to a perpendicular axis to the lie plane of the second supporting element.

[0099] The cylindrical member 542 comprises a broadening 543 arranged below the second support element 54 (i.e. interposed between the first and the second support element 51,54), on which one or more threaded holes 544 are formed, for example blind holes, radial (horizontal axis) and for example mutually equidistant, in which an end of a pin 545 is screwed, which end protrudes externally, e.g. radially, with respect to the cylindrical body.

[0100] In the example the pin 545 is substantially cylindrical.

[0101] It is possible, however, for the pin 545 to exhibit a variable-section geometry along the longitudinal axis thereof.

[0102] For example, the free end of the pin 545 can be broadened with respect to the end constrained to the broadening 543 (which engages one of the threaded holes 544).

[0103] In this case, the pin 545 would exhibit, for example, a substantially truncoconical shape.

[0104] In any case, the end of the pin 545 constrained to the broadening 543 has for example an external thread such that it can be screwed into one of the threaded holes 544.

[0105] The pin 545 enables activating the cylindrical element 542 in rotation with respect to the second support element 54 (internally of the cylindrical cavity 541) in contrast with the action of the torsion spring 53.

[0106] An abutting element 511 rises vertically from the first support element 51 and is rotatably attached to the first support element 51 with respect to an axis parallel to the hinge axis X (and perpendicular to the lie plane of the first support element).

[0107] The abutting element 511 in the embodiment shown comprises a cylindrical body, for example having a circular cross-section a lateral surface of which defines a rotatable rounded abutting surface for the pin 545 and is able to come into contact with the pin 545 during the rotation of the second support element 54 with respect to the first support element 51.

[0108] It is further possible for the abutting element 511 to have a different shape to the cylindrical circular section, for example an elongate cross section (for example elliptical) or with one or cam features.

[0109] In the example, the cylindrical body is constitut-

ed by a rolling bearing, for example of a ball bearing type, the internal ring of which is keyed on a pin rising from the first support element 51 and the external ring is rotatably coupled, by means of the rolling ball bearings, to the internal ring with a low-level rolling friction.

[0110] The rotating rounded surface of the abutting element 511 in any case defines a substantially vertical wall located in an offset position with respect to the cylindrical seating 512.

[0111] The rounded surface of the abutting element 511 is able to define an abutting position for the pin 545 against the elastic action of the torsion spring 53, so as to limit or otherwise guide the rotation of the lower end of the torsion spring 53 with respect to the first support element 51.

[0112] The abutting element 511, in practice, substantially block, or at least severely limits, the rotation of the lower end 53a of the torsion spring 53 with respect to the longitudinal axis thereof during rotation of the second support element 54 with respect to the first support element 51.

[0113] In other words, the pin 545 and the abutting element 511 act as cam means during rotation of the second support element 54 with respect to the first support element 51, so as to guide the rotation (with respect to the longitudinal axis of the torsion spring) of the cylindrical element 542, and therefore the lower end 53a of the torsion spring 53, with respect to the second support element 54.

[0114] Thus, when the second support element 54 is guided in opening rotation by a user, the lower end 53a of the torsion spring 53 (which is solid in rotation with the pin 545) rotates with respect to the second support element 54 (thanks to the limiting rotation action exerted by the abutting element 511 on the pin and therefore on the cylindrical element 542) in contrast with the action of the torsion spring 53, so as to elastically load the torsion spring 53.

[0115] Further, during the rotation of the second support element 54 with respect to the first support element 51, the abutting element 511 is able to roll, substantially without dragging, on the pin 545, while the cylindrical element 542 describes an imaginary arc of circumference centred on the hinge axis X.

[0116] The surface (line/point) contact between the pin 545 and the abutting element 511 is movable, on the pin 545, between a zone proximal to the free end of the pin 545, when the second support element 54 is in the closed position (figure 6), and a proximal zone to the end of the pin 545 engaged in the cylindrical member 542, when the second support element 54 is in the open position (figure 7).

[0117] The contact surface (line/point) between the pin 545 and the abutting element 511 is movable on the abutting element 511, along an arc (of circumference).

[0118] As can be seen from the figures, following a 90° rotation between the second support element 54 and the first support element 51, the upper end 53b of the torsion

spring 53 also rotates by a right-angle, as it is solid in rotation with the second support element 54 via the upper end of the bushing 520, while the lower end 53a of the torsion spring 53 performs a counter-rotation by an acute angle, for example substantially 10-30°, due to the limiting action exerted by the abutting element 511 on the pin 545 and, possibly, due to the conical shape of the pin.

[0119] In this way, the torsion spring 53 is subjected to torsion due to a mutual rotation between the ends 53a and 53b by an angle of between 100° and 120°.

[0120] The torsion spring 53 (possibly preloaded) also keeps the panel 30 in the closed position thereof and also enables the automatic return of the panel 30 to the closed position once it has been opened.

[0121] Further, the abutting element 511 is located in a central area of the first support element 51, for example, such as to be covered by the cover 55. The cover 55 exhibits an open wall in which the free end of the pin 545 can be inserted, so that the free end of the pin 545, like the abutting element 511, can be protected from the external environment below the cover 55.

[0122] The hinge group 50 and/or the panel 30 and/or the fixed frame 21 and/or the further hinge that constrains the panel 30 to the fixed frame 21 comprises blocking means (known to an expert in the sector) that can removably block the panel 30 in an open position, in contrast to the action of the torsion spring 53.

[0123] In light of the above, the operation of the hinge assembly 50 functions as follows.

[0124] When the panel 30 is closed the second support element 54 is superimposed in plan view (in the closed position thereof) on the first support element 51 pushed into this position by the preload imparted on the torsion spring 53.

[0125] In this configuration (figures 2,3 and 6), the pin 545 (in particular the broadened free end thereof) is pressed against the rounded flank of the abutting element 511 due to the preload of the torsion spring 53.

[0126] By actuating the panel 30 in rotation towards the opening position of the panel, with a consequent greater pressure between the pin 545 and the abutting element 511, the area of contact (point/line) between the pin 545 and the abutting element 511 begins moving towards the tapered end of the pin 545 while the abutting element 511 limits/halts the rotation of the pin with respect to the first support element 51 by rotating the cylindrical element 542 with respect to the second support element 54.

[0127] In practice, the halting action/limitation of rotation exerted by the abutting element 511 on the pin 545 enables loading the torsion spring 53 during the opening step of the panel 30.

[0128] The idle rotation of the abutting element 511 facilitates the reciprocal motion between the pin 545 and the abutting element 511, without causing noise or wear on the organs in reciprocal motion.

[0129] Moreover, the possible conicity of the pin 545 (and/or the shaped profile/cam of the abutting element

511) facilitates a differentiated action of loading of the torsion spring 53 during the opening of the panel 30, and consequently the unloading of the torsion spring 53 during the closing of the panel, as a function of the opening angle of the panel 30.

[0130] In practice, with small opening angles of the panel 30 (with respect to the closed position), as the area of contact between the pin 545 and the abutting element 511 is located in proximity of the free end of the pin 545, the lower end 53a of the torsion spring 53 rotates by an increased angle with respect to the rotation angle that the lower end 53a travels at large angles of opening of the panel 30, given a same angle described by the panel 30.

[0131] Owing to the arrangement of the hinge axis X in the vicinity of an edge of the second support element 54, the gap between the vertical profile 23 and the edge of the second support element 54 (and therefore also of the frame 32) is decidedly limited compared to the known art (see figure 8 in comparison to the prior art illustrated above); also, during opening and closing rotation of the of the panel 30 the size of this gap does not substantially vary, preventing any eventual problem of finger-crushing.

[0132] In practice, thanks to the arrangement of the hinge axis X of the hinge group 50 and the configuration of the hinge group the gap existing between the vertical profile 23 and the edge of the second support element 54 (and therefore also the frame 32) can be between 3.5 mm and 6.5 mm (with a usual tolerance in the industry, substantially +/- 0.5 mm).

[0133] Following a rotation of the panel 30 by 90° with respect to the hinge axis X (figures 4, 5 and 7), the blocking means if present block the panel 30 in the open position (e.g. the maximum opening) and the panel 30 is forced, against the action of the torsion spring 53, to remain in this open position.

[0134] To unblock the panel 30 it is sufficient to rotate the panel 30 with a minimum force (enough to overcome the action of the blocking means), so that the panel 30 is free to rotate towards the closed position by means of the return action exerted by the torsion spring 53.

[0135] The release action of the torsion spring 53 is then unloaded from the lower end 53a of the torsion spring 53 to the pin 545 which by pressing against the abutting element 511 pushes the panel 30 towards the closed position thereof.

[0136] The invention as it is conceived is susceptible to numerous modifications and variants, all falling within the scope of the inventive concept.

[0137] Further, all the details can be replaced by other technically-equivalent elements.

[0138] In practice, the materials used, as well as the contingent shapes and dimensions, can be any according to requirements, without forsaking the scope of protection of the following claims.

Claims

1. A hinge group (50) for closing panels of an access entry of refrigerator cabinets comprising:

- a first support element (51) fixable to a fixed frame (21) of the access entry,
- a second support element (54) fixable to the closing panel (30), the second support element (54) being hinged to the first support element (51) with a hinge axis (X) thereof parallel to the panel (30) so as to enable rotation of the panel (30) between a closed position and an open position of the access entry,
- elastic return means (53) interposed between the first and the second support element (51, 54) for return from the open position to the closed position, which comprise a torsion spring (53) substantially parallel to the hinge axis (X) and decentred with respect thereto, a first end (53a) of which is rotatably associated to the second support element (54) and a second end (53b) of which is solidly associated in rotation to the second support element (54),
- cam means (511, 545) for transforming means of the rotary motion of the second support element (54) with respect to the first support element (51) in rotary motion of the first end (53a) with respect to the second end (53b) of the torsion spring (53), comprising a pin (545) associated to the first end (53a) of the torsion spring (53) and an abutting element (511) associated to the first support element (51) and able to come into contact with the pin (545) during the rotation of the second support element (54) with respect to the first support element (51),

characterised in that the abutting element (511) is rotatably associated to the first support element (51).

2. The group (50) of claim 1, **characterised in that** the first end (53a) of the torsion spring (53) is solidly inserted in rotation in a cylindrical element (542) rotatably associated to the second support element (54), the pin (545) projecting from the cylindrical element (542).
3. The group (50) of claim 1 or 2, wherein the abutting element (511) can rotate on the pin (545) during the rotation of the second support element (54) with respect to the first support element (51), for activating in rotation the first end (53a) of the torque spring (53) with respect to the second support element (54).
4. The group (50) of any one of the preceding claims, wherein the second end (53b) of the torsion spring (53) is solidly rotatingly inserted in a bushing (520) deriving from the second support element (54) and

solid in rotation therewith

5. The group (50) of any one of the preceding claims,
wherein the torsion spring (53) comprises a bar hav-
ing a straight longitudinal axis and a substantially 5
quadrangular section.
6. The group (50) of any one of the preceding claims,
wherein the hinge axis (X) is arranged at a corner of
at least the second support element (54). 10
7. The group (50) of any one of the preceding claims,
wherein the pin (545) is substantially cylindrical.
8. The group (50) of any one of the preceding claims, 15
wherein the abutting element comprises a cylindrical
body (511) rotatably associated, with respect to the
central axis thereof, to the second support element
(54). 20
9. The group (50) of claim 8, wherein the cylindrical
body (511) comprises a rolling bearing.
10. A door (20) for refrigerator cabinets which comprises
a fixed frame (21) able to delimit an access entry 25
(12) of the refrigerator cabinet and at least a closing
panel (30) of the access entry (12) **characterised**
in that it comprises at least a hinge group (50) ac-
cording to any one of the preceding claims. 30

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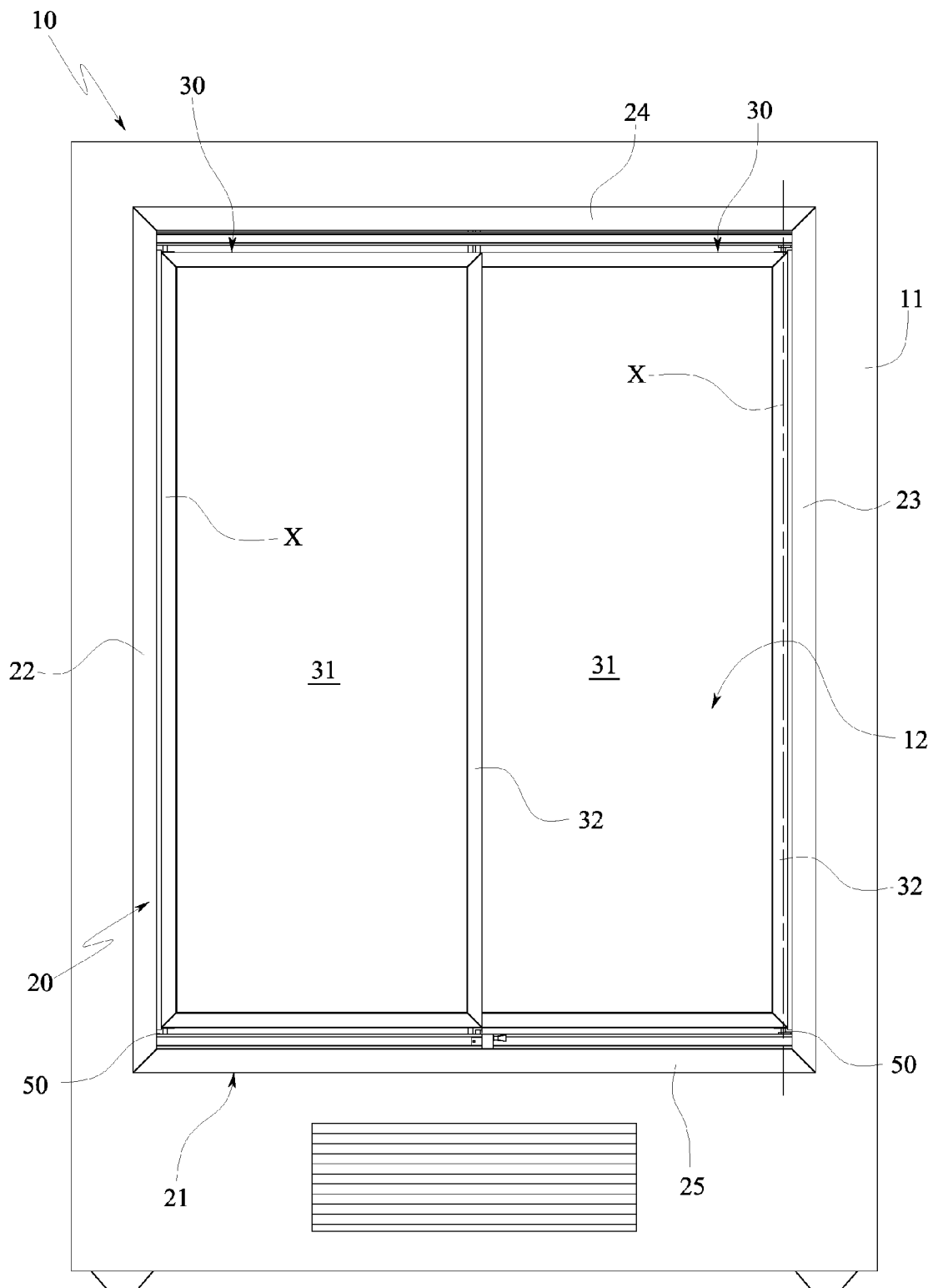


FIG.1

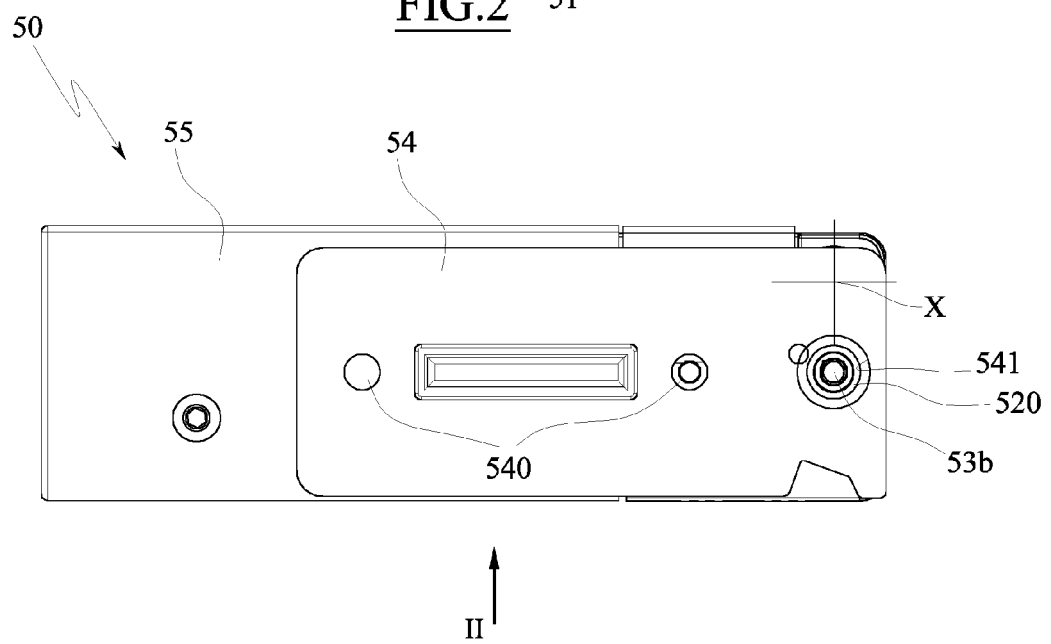
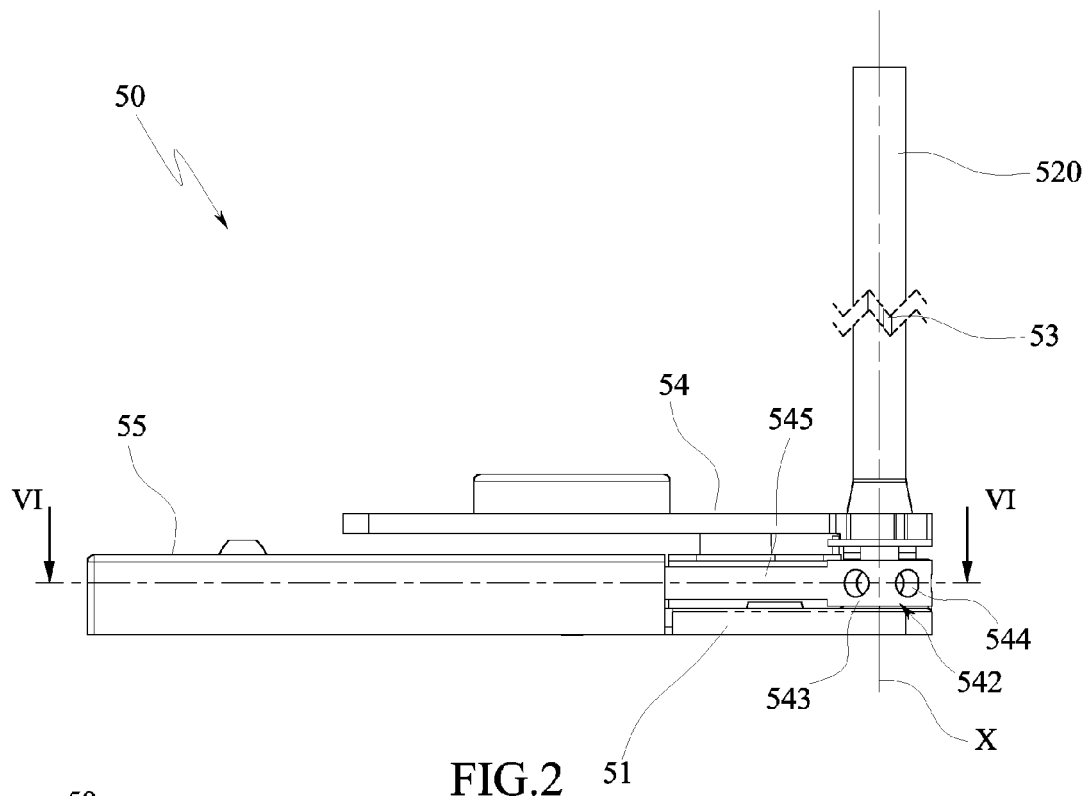
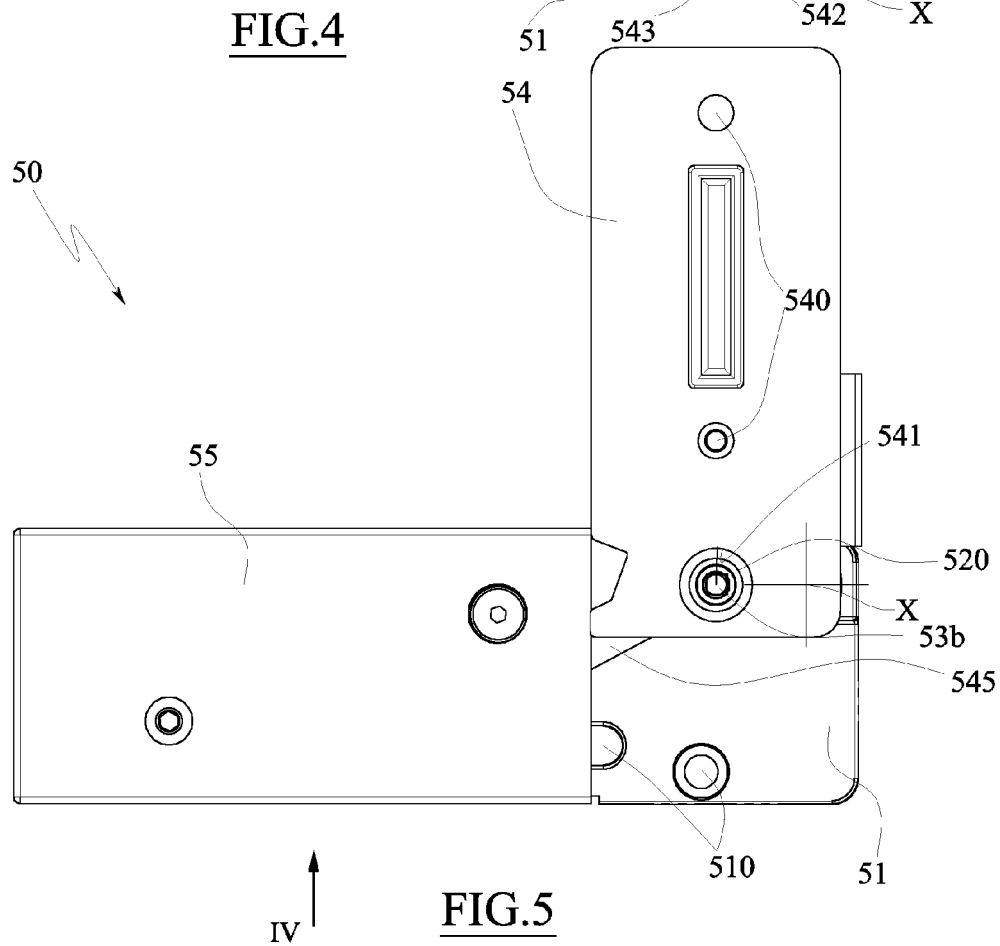
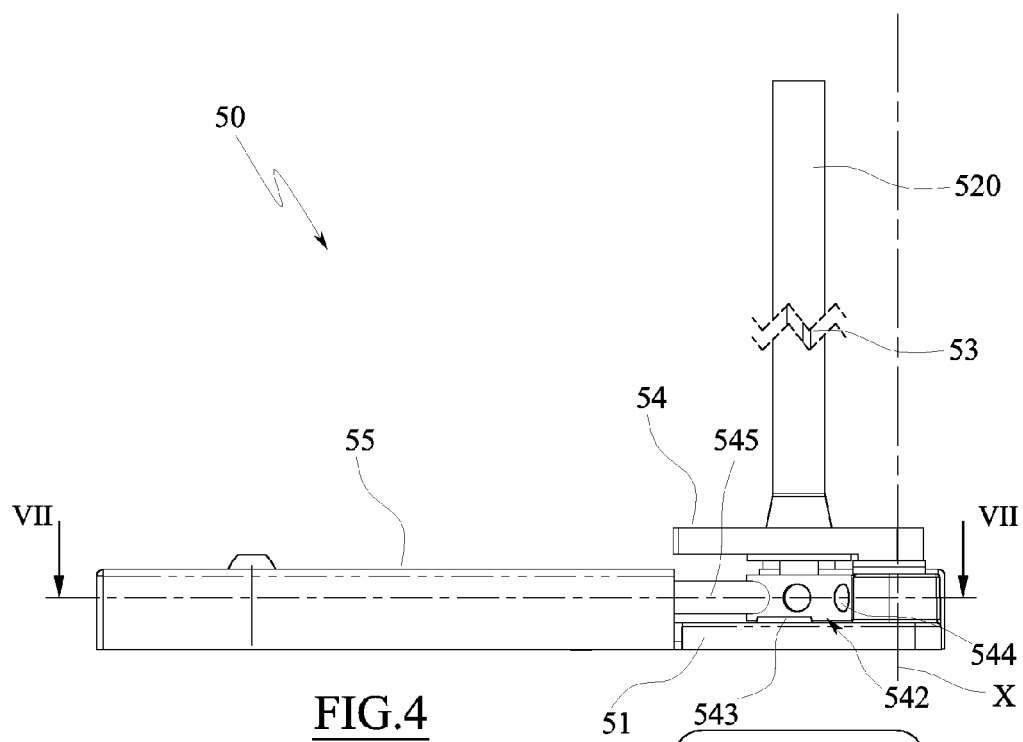
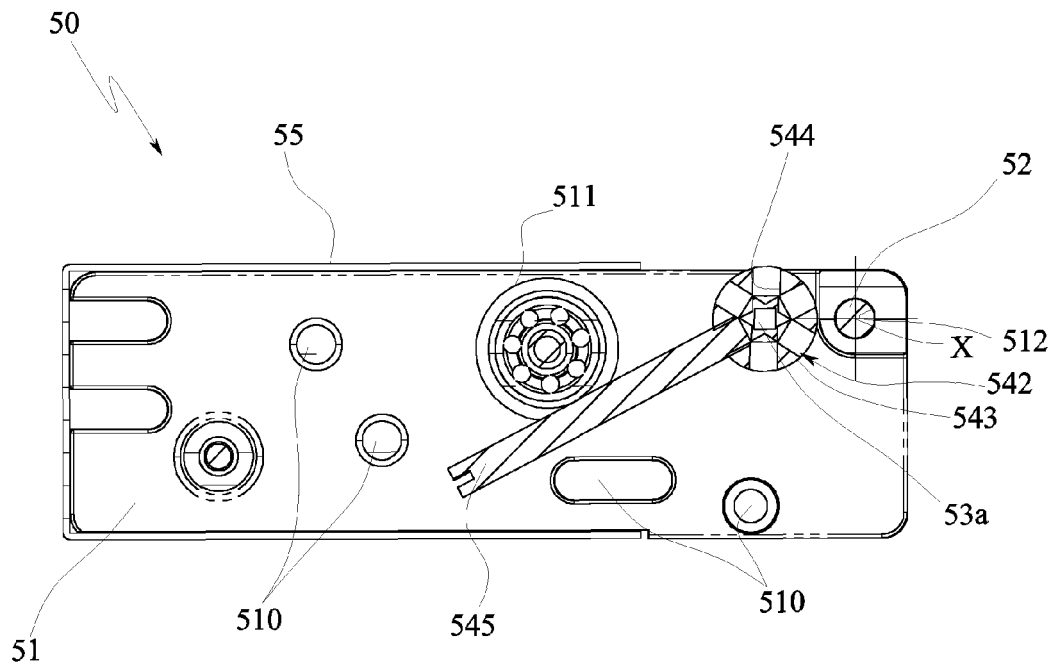
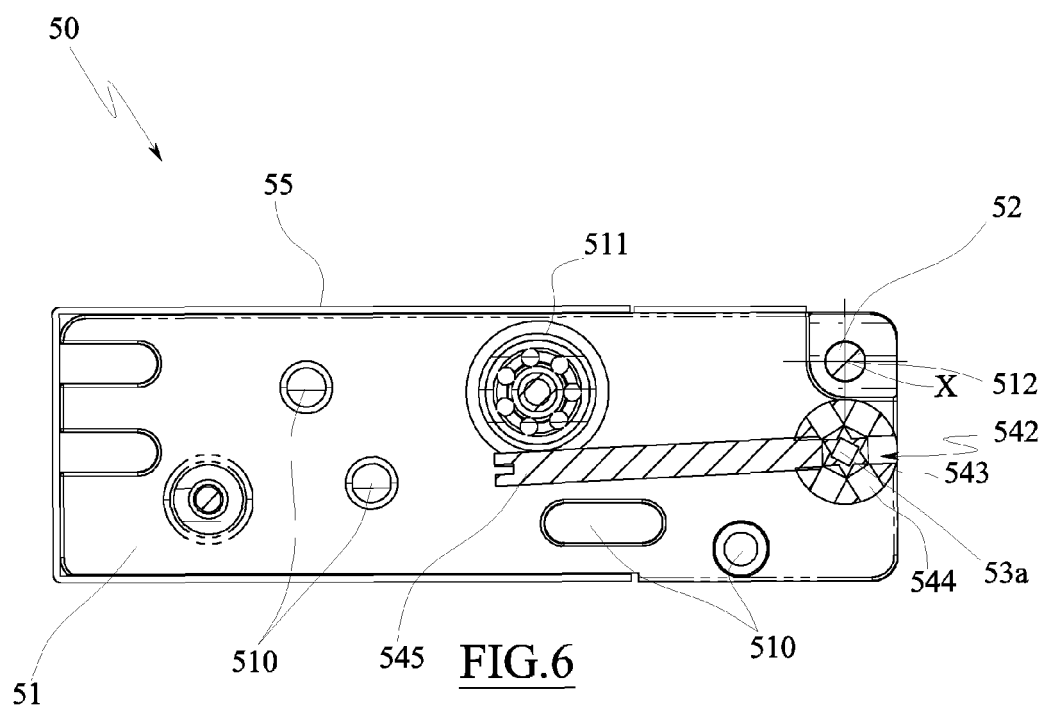
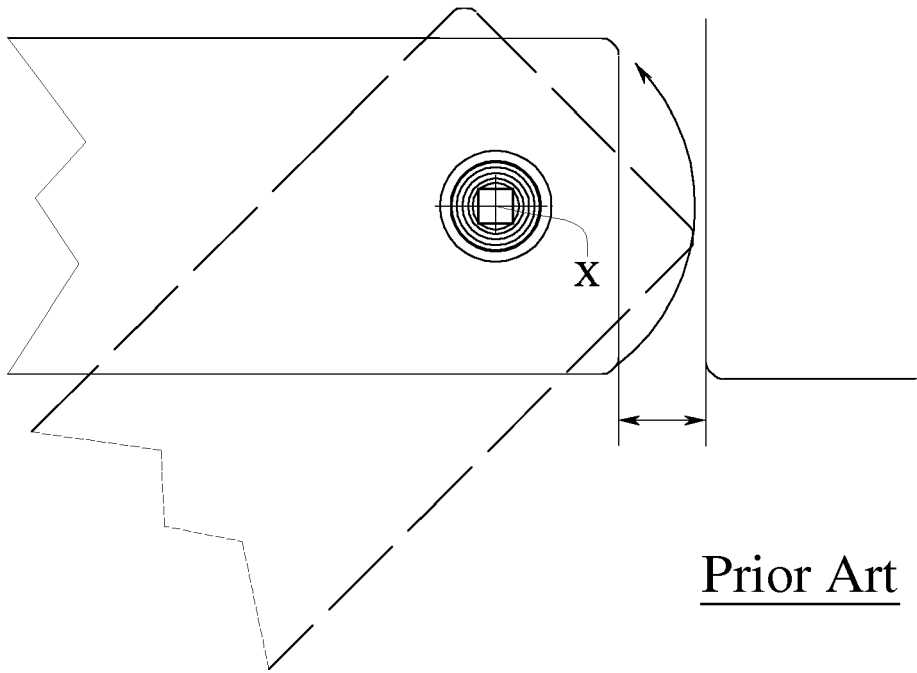


FIG. 3







Prior Art

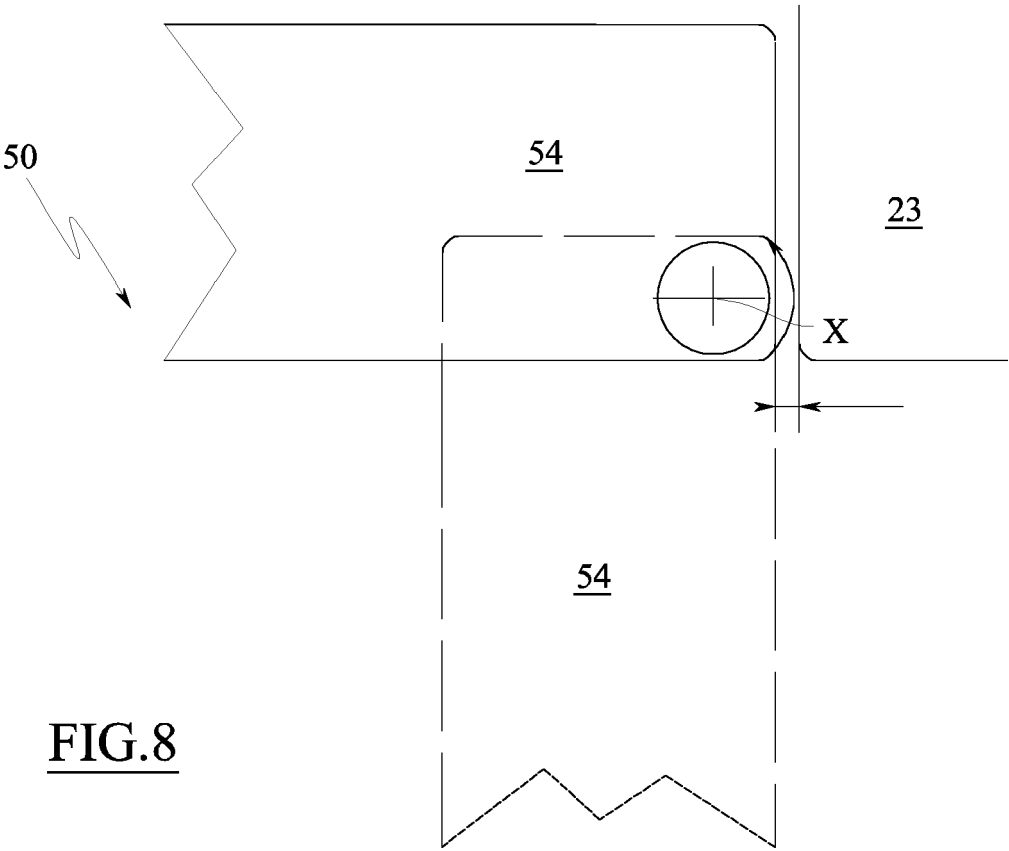


FIG. 8



EUROPEAN SEARCH REPORT

 Application Number
EP 15 15 4314

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	US 3 115 685 A (WHEELER JAMES D ET AL) 31 December 1963 (1963-12-31) * the whole document *	1	TECHNICAL FIELDS SEARCHED (IPC)
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Place of search The Hague		Date of completion of the search 16 April 2015	Examiner Léandre, Arnaud
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16-04-2015

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