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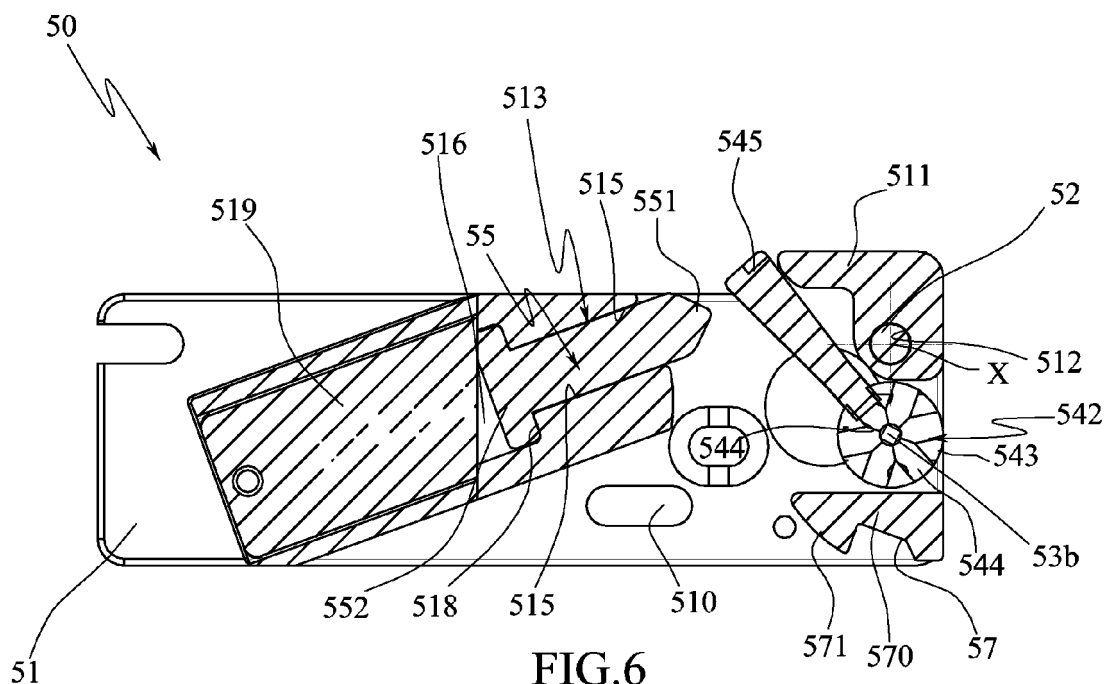
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(54) Hinge group for refrigerator cabinet doors

(57) A hinge group (50) for closing panels of an entry access of refrigerator cabinets, comprising: a first support element (51) fixable to the refrigerator cabinet; a second support element (54), substantially slab-shaped and fixable to an access entry (12) of the refrigerator cabinet (10), with the hinge axis (X) thereof perpendicular to the

lie plane of the first support element (51), in such a way as to rotate the panel with respect to the refrigerator cabinet (10) between a closed position and an open position of the access entry (12), where the hinge axis (X) is arranged at a corner at least of the second support element (54).

**FIG.6****EP 2 717 005 A1**

Description

TECHNICAL FIELD

[0001] The present invention relates to a hinge group for doors of refrigerated cabinets.

[0002] In more detail, the invention relates to a hinge group for refrigerator cabinet doors destined to be located internally of retail outlets of food products or the like, for conserving and displaying the products.

PRIOR ART

[0003] As is known, refrigerated cabinets generally comprise an outer body having a parallelepiped shape and suitable for delimiting an internal refrigerated compartment for accommodating the products to be conserved.

[0004] The refrigerated compartment is accessible through a front access entry afforded on a lateral side of the outer body, which entry is closed by a door that can be partially or entirely transparent, so as to enable viewing of the products contained within.

[0005] Currently, the door of a refrigerator cabinet may be either a swing leaf type or a sliding panel type.

[0006] In particular, a swing door comprises a fixed frame able to delimit the access entry of the refrigerator cabinet and one or more leaf panels able to close the access, which leaves are hinged to the frame so as to open the access entry by rotating, in the usual way of doors.

[0007] There is a need with such refrigerators to increase the transparent area of the door, so as to improve vision of the products contained within and extend the display thereof.

[0008] This necessity involves the use of panels with very thin frames closed by large transparent panes.

[0009] Despite the use of these panels it has been observed that much non-transparent space of the door is necessarily occupied by the manoeuvring space required by the hinge group for the movement of the panel with respect to the fixed frame.

[0010] A further drawback encountered in doors of known type is that a large manoeuvring space is necessary between the fixed frame and the panel, at the hinge side thereof, and this creates a relatively large gap that varies the width thereof during rotation of the panel relative to the frame, in which a user's finger, for example, might be inserted and inadvertently crushed upon opening the panel.

[0011] Hinge groups are also known, for example of the type described in patent application RE2011A000074 in the name of the present Applicant, which obviate the drawbacks mentioned above by means of a particular arrangement of the hinge axis of the group of with respect to the elements it is constituted by, and therefore of the rotation axis of the closure panel with respect to the edge of the fixed frame close 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 the hinge axis parallel to the panel in such a way 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 second end of the torsion spring, which in the example comprise a geared portion fixed to the first support element coaxially to the hinge axis and able to enmesh in a cogwheel, rotatably associated 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 seatings are configured in such a way as to give rise to a sliding coupling.

[0016] In this way, the torsion spring is loaded by means of the gearings during the rotation of the second support element towards the open position, so that a thrust action is exerted on the active panel towards the closed position when the spring is released.

[0017] Although the hinge group is particularly advantageous and enables the non-transparent parts of the refrigerator cabinet to be greatly reduced, 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 has decidedly high production costs attributable in large part to the use of the gearings.

[0018] Furthermore, the use of the gears implies the presence of some production steps in the manufacturing cycle of the hinge assembly, including the mounting and adjustment of the preload of the torsion spring, which are particularly delicate and critical, a fact that contributes to an increase in the production costs of the hinge assembly itself.

[0019] In the international patent application nr. WO 2008/050 975 is described a further example of an hinge group according to the preamble of claim 1, wherein transforming means of the rotary motion comprises a pair of levers hinged to each other and, respectively, bound to the first support element and the second end of the torsion spring.

[0020] Such a pair of levers, if on the one hand de-

creases the production costs of the hinge group, however, does not allow to configure and vary, according to the need, the resistance of the torsion spring in function of the angle of opening of the panel, depending on the constructional and/or use requirements.

[0021] Furthermore, such hinge groups are particularly onerous from the point of view of assembly and maintenance, needing the continuous lubrication of the components in reciprocal motion.

[0022] An aim of the present invention is to offer an advantageous alternative to the hinge groups of known type and obviate the above-mentioned drawbacks in the prior art, with a solution that is simple, rational and relatively inexpensive. These 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] In particular the invention discloses a hinge group for access entry closing panels in refrigerator cabinets, comprising:

- 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 the hinge axis parallel to the panel in such a way 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 the second end of which is solidly associated in rotation to the second support element,
- transforming means of the rotary motion of the second support element with respect to the first element into a rotary motion of the first end with respect to the second end of the torsion spring.

[0024] According to the invention, the transformation means include cam means comprising a pin associated to the first end of the torsion spring and an abutment appendage shaped branching from the first support element and destined to come into contact with the pin during rotation of the second support element relative to the first support element. Thanks to this solution, the loading mechanism of the torsion spring is especially efficient, economical and easily realisable. Further, this solution enables a much quieter operation of the hinge assembly, fewer calibration and mounting problems thereof while keeping the overall dimensions of the non-transparent parts of the refrigerator cabinet very much contained.

[0025] Furthermore, this solution enables to configure and vary, according to the need, the resistance of the torsion spring in function of the angle of opening of the panel, depending on the constructional and/or use requirements, for example by properly configuring the components of the cam means.

[0026] Further, in an aspect of the invention of the hinge group, the first end of the torsion spring is inserted solid in rotation in a cylindrical body rotatably associated with the second support element. The pin thus projects from the cylindrical body, for example substantially in the radial direction.

[0027] In this way, the assembly and manufacture of the stop means and the entire hinge group is particularly simple and functional, with undoubted advantages in terms of efficiency and economy of the production cycle thereof. Advantageously, the pin can drag, for example substantially without rotating on the abutment appendage during rotation of the second support element relative to the first support element such as to rotate the cylindrical body relative to the second support element.

[0028] In addition, the second end of the torsion spring is inserted solid in rotation in a bushing deriving from the second support element.

[0029] The pivoting axis of the hinge group is advantageously arranged at an corner of at least the second support element, while the torsion spring is placed in an offset position.

[0030] In this way, the torsion spring can be easily installed inside the mobile panel of the door, without interfering with the profiled members that realise the frame of the panel itself and at the same time the interspace between the panel and the door frame can be kept to a minimum.

[0031] In an aspect of the invention the hinge group comprises locking means able to lock removably, between them, the first and the second support element in the open position.

[0032] Thanks to this solution, the door can be easily maintained in the open position during the refrigerator cabinet filling operations, by the personnel at the sales point, thus counteracting the action of the torsion spring.

[0033] The blocking means advantageously comprise two snap-fitting elements associated respectively to the first support element and the second support element, including a bolt and a retaining seating suitable for providing an automatic mutual coupling following a mutual rotation between the first and the second support elements.

[0034] Furthermore, an aspect of the invention discloses a refrigerator cabinet door 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 at least a hinge group as described above.

BRIEF DESCRIPTION OF THE DRAWINGS

[0035] Further characteristics and advantages of the invention will emerge from a reading of the following description, provided by way of non-limiting example, with the aid of the figures illustrated in the accompanying tables of drawings.

Figure 1 is a schematic front view of a refrigerator cabinet provided with a hinged swing door exhibiting hinge groups, according to the present invention.

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

Figure 3 is a view from above of figure 2.

Figure 4 is the front view of the hinge of figure 2 in the open position, seen from plane IV of figure 5.

Figure 5 is the top view of figure 4.

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

Figure 7 is the view along section VII-VII of figure 4.

Figure 8 is a schematic view of the hinge group of the invention, in two operating positions.

BEST WAY OF CARRYING OUT THE INVENTION

[0036] It is initially specified that during the course of the following description, the concepts of high and low, of upper and lower, and left and right, all refer to the view of figure 1.

[0037] The refrigerator cabinet 10 shown in figure 1 comprises a parallelepiped outer body 11, destined to delimit an internal refrigerated compartment (not visible) for accommodating the products to be conserved.

[0038] The refrigerated compartment is made accessible from outside through an access entry 12, afforded frontally on a vertical side of the outer body 11. The access entry 12 is closed by a door which is denoted in its entirety by 20. The door 20 comprises a fixed border frame 21 delimiting the access entry 12, exhibiting a rectangular shape defined by two pairs of parallel profiled members, namely a pair of vertical members, respectively left 22 and right 23, and a pair of horizontal members, respectively upper 24 and lower 25. The profiled members 22-25 can be made of plastic material, for example PVC, such as to improve the heat insulation of the refrigerated compartment and to prevent condensation, and can be externally clad by a coating of aluminium, which improves the aesthetic appeal thereof.

[0039] The door 20 further comprises two panels 30, which are together destined to close the access entry 12 delimited by the fixed frame 21.

[0040] In particular, each panel 30 has a rectangular shape having substantially the same height as the access entry 12, and a width of slightly more than half of the width of the access entry 12.

[0041] In this way, each panel 30 is individually able to close a respective half of the access entry 12, although the access entry 12 might instead be entirely closed by only one panel 30 or several panels according to require-

ments. Each panel 30 comprises a pane 31, typically made of a transparent material, for example glass, to allow viewing of the products contained inside the refrigerator 10, and a frame 32 surrounding the perimeter of the pane 31.

[0042] In particular, the frame 32 is defined by a series of rectilinear profiled members fixed along the edges of the pane 31.

[0043] The profiled members of the frame 32 can also be made of plastic material, for example PVC, and can be externally clad by an aluminium coating.

[0044] As illustrated in figure 1, each panel 30 is also hinged to the fixed frame 21, so that it can rotate with respect thereto around a vertical hinge axis X parallel to the lie plane of the frame 21, between a closed position and at least an open position.

[0045] The outer edge (i.e. facing the outside of the refrigerator cabinet 10) of the fixed frame 21, in particular the right 23 and left 22 vertical profiled members and the external edge of the frame 32 of the panel 30 are substantially flush or coplanar when the panel 30 is in the closed position.

[0046] The hinge coupling is realized by means of at least a hinge assembly denoted by reference numeral 50 and shown in detail in figures 2 - 8, which will be described in detail herein below.

[0047] The hinge groups 50 can be two for each panel 30, respectively arranged in an upper and lower zone of the panel 30, or alternatively one for each panel 30.

[0048] As can be seen in figure 1, the hinge groups 50 of the left panel 30 are placed at the left edge of the left panel 30, while the hinge groups 50 of the right panel 30 are located at the right edge of the right panel 30.

[0049] Thanks to this solution, the panels 30 can rotate in opposite directions relative to the frame 21, behaving as two doors, each around its own pivoting axis X, between the closed position shown in figure 1 towards a further open position of the respective portion of the access entry 12, such that when both panels 30 are in the further open position, the access entry 12 is fully open. For reasons of simplicity, figures 2 to 7 illustrate only the hinge group 50 of the lower left corner.

[0050] The hinge group 50 comprises a substantially plate-shaped first support element 51, for example rectangular in plane view with rounded edges, in which through-holes 510 are afforded, engageable by screws which fasten the support element to the frame 21, for example to the lower profiled member 25 thereof.

[0051] In the first support element 51, substantially in a decentred area to the right, a cylindrical seating 512 is fashioned (visible in figures 6 and 7) in which a rotation pin 52 having a vertical axis is substantially snugly rotatably inserted. In particular, the cylindrical seating 512 is formed at a front edge of the first support element 51 destined to be placed in proximity of one of the vertical profiled members 22 or 23, in the present example the left vertical profile member 22.

[0052] The hinge group 50 includes a second support

element 54, which is also plate-shaped, for example with a rectangular base with rounded edges.

[0053] The second support element 54 exhibits a plurality of through-holes 540 in which screws (not shown) are inserted, which will be screwed to the frame 32 of the panel 30.

[0054] Further, the vertical-axis rotation pin 52 is fixed to the second support element 54, destined to insert in the cylindrical seating 512 such as to rotate the second support element 54 with respect to the first support element 51.

[0055] The rotation pin 52 is inferiorly fixed with respect to the second support element 54 (for example it is made in a single piece therewith), projectingly with respect thereto, and at a corner (front left in the illustrated case) in such a way that the second support element 54 can rotate above the first support element 51.

[0056] In practice, by corner edge is meant the corner of the plate which constitutes the second supporting element.

[0057] As shown in figure 8, the positioning of the rotation pin 52 at an 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 23) changing during the rotation of the panel 30.

[0058] Further, the distance between the frame 32 and the vertical profiled member 22 can be minimal, thus producing a wider transparent surface of the refrigerator cabinet 10.

[0059] The second support element 54 is thus 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.

[0060] 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 to it in the open position (figure 5).

[0061] The second support element 54 is provided with a cavity 541 substantially cylindrical and eccentric/flanked to the rotation pin 52, in which a torsion spring 53 is inserted and rotatably associated, the torsion spring 53 being a bar with a square section coaxially inserted into the cylindrical cavity 541.

[0062] A bushing 520 is inserted in the cylindrical cavity 541, projects upwards relative to the second support element 54 and is fixed to the second support element so as to axially extend the cylindrical cavity 541.

[0063] The bushing 520 comprises an internal cavity the top portion alone of which exhibits a square section able to give rise to a sliding coupling with the torsion spring 53.

[0064] In practice, the lower end 53a of the torsion spring 53, as well as the central portion of the torsion spring, is rotatably inserted into the bushing 520 (which inferiorly exhibits a lower circular cross-section, so as to enable rotation of the lower end of the torsion spring 53

internally thereof) so that a rotation of the second support element 54 with respect to the first support element 51, as will be more fully described in the following, corresponds to a rotation of the lower end 53a of the torsion spring 53 with respect to the second element support 54.

[0065] The torsion spring 53 extends in the longitudinal direction superiorly 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 is blocked in rotation by the upper portion of the bushing 520 preventing relative rotation between the upper end 53b of the torsion spring 53 and the panel 30 (the bushing 520 being solidly constrained to the second support element 54 and the panel 30 fastened thereto).

[0066] A cylindrical body 542 is also rotatably inserted in the cylindrical cavity 541, internally of which the first end 53a of the torsion spring 53 is internally solidly in rotation, for example by means of a sliding coupling.

[0067] The cylindrical body 542 is supported inside the cylindrical cavity 541 by means of suitable bearings or the like, so that the body 542 is axially fixed with respect to the second support element 54 and rotatable with respect thereto about a perpendicular axis to the lie plane of the second support element.

[0068] The cylindrical body 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 a plurality of threaded blind holes 544 are afforded, radial (with a horizontal axis) and equidistant, for example, in which an end of a pin 545 is screwed and projects radially with respect to the cylindrical body.

[0069] The pin 545 has, for example, substantially a truncoconical shape, in which the tapered end exhibits an external thread so that it can be screwed into the threaded holes 544.

[0070] The pin 545 enables the cylindrical body 542 to be rotated with respect to the second support element 54 (internally of the cylindrical cavity 541) in contrast with the action of the torsion spring 53.

[0071] An abutment appendage 511 rises vertically from the first support element 51, which abutment appendage 511 is profile in plan view such as to define at least a rounded lateral flank, destined to face and come into contact with the pin 545 during the rotation of the second support element 54 with respect to the first support element 51.

[0072] The rounded flank of the abutment appendage 511 defines a substantially vertical wall located in an eccentric position with respect to the cylindrical seating 512.

[0073] In practice, the cylindrical seating 512 and the rounded side are fashioned in the abutment appendage 511.

[0074] The rounded side of the abutment appendage 511 is suitable for defining an abutment position of the pin 545 against the elastic action of the torsion spring 53, such as to limit or in any case guide the rotation of the lower end of the torsion spring 53 with respect to the first

support element 51.

[0075] The abutment appendage 511 substantially blocks, or at least strongly limits, the rotation of the first 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.

[0076] In other words, the pin 545 and the abutment appendage 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 spring torsion) of the cylindrical body 542, and thus the first end 53a of the torsion spring 53, with respect to the second support element 54.

[0077] Note, then, as the lower end 53a of the torsion spring 53 (which is solid in rotation with the pin 545), when the second support element 54 is driven in opening rotation by a user, rotates with respect to the second element of holder 54 itself (thanks to the rotation-limiting action exerted by the abutment appendage 511 on the pin and therefore on the cylindrical body 542) in contrast with the action of the torsion spring 53, such as to elastically load the spring 53.

[0078] Furthermore, during the rotation of the second support element 54 with respect to the first support element 51, the pin 545 drags, substantially without rotating, on the rounded side of the abutment appendage 511, while the cylindrical body 542 moves along an imaginary arc of circle centred on the hinge axis X.

[0079] The contact area between the pin 545 and the rounded side of the abutment appendage 511 is mobile between a zone proximal to the free end (broadened) of the pin 545, when the second support element 54 is in the closed position (figure 6), and a proximal end (tapered) of the pin 545 engaged in the cylindrical body 542, when the second support element 54 is in the open position (figure 7).

[0080] As can be seen from the figures, following a rotation of 90° between the second support element 54 and the first support element 51, the second end 53b of the torsion spring 53 performs a rotation by an equal angle, as it is solidly constrained the second support element 54 via the upper end of the bushing 520, while the first end 53a of the torsion spring performs a rotation by an acute angle, for example substantially by 10-30°, due to the restricting action exerted by the abutment appendage 511 on the pin 545 and the actual conicity of the pin.

[0081] In this way, the torsion spring 53 undergoes a torsion caused by a mutual rotation between the ends 53a and 53b by an angle of between 60° and 70°. The torsion spring 53 (possibly preloaded) keeps the panel 30 closed also in the closed position thereof and further enables the automatic return of the panel 30 to the closed position once it has been opened.

[0082] The hinge group 50 includes blocking means able to removably lock the first support element 51 and the second support element 54 between them in the open position, in contrast with the action of the torsion spring

53.

[0083] In the example shown, the locking means comprise an automatically activated bolt 55 which is slidably associated to the first support element 51.

5 **[0084]** The first support element 51 comprises a straight guide 513 flanked to the cylindrical seating 512 and arranged with the longitudinal axis thereof lying on a perpendicular plane to the hinge axis X and inclined, in the example by 20°, with respect to the longitudinal axis of the first element support 51 (with a rectangular base).

10 **[0085]** The bolt 55 can slide along the straight guide 513 between an advanced position, in which it is close to the rotation pin 52, and a retracted position, in which it is distanced therefrom.

15 **[0086]** In practice, the straight guide 513 is realised at the raised area to the left of the first support element 51 and is defined by a longitudinally-developing recess realized in the first support element 51.

20 **[0087]** In plan view, the recess has the shape of a channel open at both ends and delimited by a pair of flanks 515, parallel to one another, between which the bolt 55 slides.

25 **[0088]** The recess opens, with one of the open ends, on the lowered decentred area to the left of the first support element 51 and, with the other open end, on a broadened cavity 516.

30 **[0089]** In practice, the enlarged cavity 516 is located upstream of the sides 515, in the sliding direction of the bolt 55 from the retracted position to the advanced position.

35 **[0090]** In plan view, the enlarged cavity 516 is perimetrically closed on all sides except at the front portion of the recess.

40 **[0091]** A pair of compression springs 56 (visible in figure 7) is housed in the enlarged cavity 516 which springs 56 are compressed between the closed rear bottom of the broadened cavity 516 (distal from the recess) and the rear wall of the bolt 55, so as to push the bolt itself towards the advanced position thereof.

45 **[0092]** In the illustrated preferred embodiment, the compression springs 56 are of a helical type and have respective longitudinal axes that are parallel to one another.

[0093] Correspondingly, the broadened cavity 516 exhibits, in plan view, a substantially rectangular shape.

[0094] The straight guide 513 is provided with an abutment element 518, for example, defined by the connecting abutment between the sides 515 and the broadened cavity 516, which is destined to halt the run of the bolt 55 into the forward position thereof.

[0095] The recess and the broadened cavity 516 are superiorly closed by a cover 519 able to superiorly retain the bolt 55 and the compression springs 56.

55 **[0096]** The bolt 55 comprises an elongate substantially parallelepiped body able to slidably engage the rectilinear guide, the front end 551 of which guide (in the sliding direction from the retracted position to the advanced po-

sition thereof) is substantially pointed and the rear end 552 of which defines a broadened wall that can interfere frontally with the abutment element 518 and posteriorly define a support zone for the compression springs 56.

[0097] The front end 551 of the bolt 55 projects frontally from the left raised area of the first support element 51 positioned at least partially above the lowered region to the right thereof.

[0098] In practice, the first support element 51 defines a box body in which the bolt 55 is internally inserted, the front end 551 of which exits from the open end of the recess facing towards the rotation pin 52.

[0099] The blocking means further comprise a retaining seating 57 formed in the second support element 52 and solid in rotation therewith, which is able to receive the front end 551 of the bolt 55 when the second support element 54 is in the open position.

[0100] In practice, the retaining seating 57 is formed at a side (rear, i.e. facing towards the inside of the refrigerator cabinet) of the second support element 54 and is formed on a profiled tooth 570 projecting below the second support element, so that, by rotating the second support element 54 by 90° from the closed position to the open position, the retaining seating 57 passes, above the right lowered area of the first support element 51, from a position in which it is not aligned with the bolt 55 (along the sliding direction of the bolt itself) to a position in which it is aligned with it and accessible from it.

[0101] Further, the retaining seating 57 has a substantially V-shaped profile in plan view so as to substantially snugly accommodate the pointed advanced end 551 of the bolt 55 when it is in the advanced position, and ensure the centring thereof.

[0102] The tooth 570 includes at least a rounded flank 571 located in a lateral position with respect to the retaining seating 57 and arranged to come into contact with the front end 551 of the bolt 55, during the rotation motion of the second support element 54 with respect to the first element support 51 between the open position and the closed position.

[0103] The rounded flank 571 acts as a cam for the bolt 55 and brings it, in contrast to the compression springs 56, from the advanced position to the retracted position, during the rotary motion imparted to the panel 30 by the user.

[0104] In practice, the compression of the compression springs 56 by the rounded flank 571 enables snap-fitting the bolt 55 in the retaining seating 57, during the opening of the panel 30, and at the same time facilitates the exit thereof so it can be blocked when closing the panel 30.

[0105] The compression springs 56 are configured so that the rigidity thereof is greater than the rigidity of the torsion spring 53, so that when the bolt 55 is inserted into the retaining seating 57 the torsion spring 53 is unable, by itself, to remove the constraint to the rotation of the second support element 54 with respect to the first support element 51 provided by the bolt 55.

[0106] It is however possible for the bolt to be manually-

activated, and therefore of a type known to the skilled person.

[0107] In the light of the foregoing description, the operation of the hinge assembly 50 is as follows.

[0108] The panel 30 is normally closed and therefore with the second support element 54 superposed (in the closed position thereof) on the first support element 51, pushed by the preload imparted on the torsion spring 53.

[0109] In this configuration (figures 2, 3 and 6), the pin 545 (in particular the broadened free end) is pressed against the rounded flank of the abutment appendage 511 due to the preloading of the torsion spring 53.

[0110] Also in this configuration (figures 2, 3 and 6), the bolt 55 and the retaining seating 57 are mutually misaligned and the panel 30 can be rotated such as to open the door 20.

[0111] By actuating the panel 30 in rotation towards the open position thereof, the point of contact between the pin 545 and the abutment appendage 511 starts to move towards the tapered end of the pin 545 while the abutment appendage 511 stops the rotation of the pin with respect to the first support element 51, causing the cylindrical body 542 to rotate in relation to the second support element 54.

[0112] In practice, the action of stopping the rotation exerted by the abutment appendage 511 on the pin 545 leads to loading the torsion spring 53 during the opening phase of the panel 30.

[0113] Following a rotation of the panel 30 by 90° with respect to the pivoting axis X (figures 4, 5 and 7), the retaining seating 57 rotates with the second support element 54, reaching to in front of the bolt 55, which, previously pushed by the rounded flank 571 of the tooth 570 into the retracted position thereof contrastingly to the thrust action of the compression springs 56, instantly and automatically moves into the advanced position (by the action of the compression springs 56) to snap-fit with the retaining seating.

[0114] Thanks to the arranging of the hinge axis X in proximity of a corner of the second supporting element, the gap between the vertical profiled member 23 and the edge of the second support element 54 (and therefore also of the frame 32) is significantly limited in comparison to the prior art (see figure 8 in comparison to the prior art illustrated above); furthermore, during the opening and closing rotation of the panel 30, this slit does not vary substantially in size, preventing any eventual problem of crushing.

[0115] 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 of the frame 32) can be between 3.5 mm and 6.5 mm (with a usual tolerance acceptable in the sector of basically +/- 0.5 mm).

[0116] With the bolt 55 engaged in the retaining seating 57, the panel 30 is forced, against the action of the torsion spring 53, to remain in the open position.

[0117] To unblock the panel 30 it is sufficient, therefore, to rotate the panel 30 with minimal force in order to overcome the action of the compression springs 56, so that the bolt 55, dragging on the rounded flank of the retaining seating 57 and on the flank 571 of the tooth 570, is brought into the retracted position thereof and the panel 30 is free to rotate towards the closed position by means of the return action exerted by the torsion spring 53.

[0118] 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 abutment appendage 511, pushes the panel 30 towards the closed position thereof.

[0119] The invention as it is conceived is susceptible to numerous modifications and variations, all falling within the inventive concept.

[0120] Moreover, all the details can be replaced by other technically equivalent elements.

[0121] In practice, the materials used, as well as the contingent shapes and dimensions, can be any according to requirements without thereby forsaking the scope of protection of the following claims.

Claims

1. A hinge group (50) for closing panels of an entry access 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 the hinge axis (X) parallel to the panel (30) in such a way as to enable rotation of the panel (30) between a closed position and an open position of the access entry (12),
- 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),
- 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), **characterised in that** the transforming means comprise cam means (511, 545) comprising a pin (545) associated to the first end (53a) of the torsion spring (53) and a profiled abutment appendage (511) solidly associated to the first support ele-

ment (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).

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 body (542) rotatably associated to the second support element (54), the pin (545) projecting from the cylindrical body (542).
3. The group (50) of claim 2, wherein the pin (545) is able to drag on the abutment appendage (511) during the rotation of the second support element (54) with respect to the first support element (51), activating the cylindrical body (542) in rotation with respect to the second support element (54).
4. The group (50) of claim 1, wherein the second end (53b) of the torsion spring (53) is solidly rotatably inserted in a bushing (520) deriving from the second support element (54) and solid in rotation therewith.
5. The group (50) of claim 1, wherein the torsion spring (53) comprises a bar having a straight longitudinal axis and a substantially quadrangular section.
6. The group (50) of claim 1, wherein the hinge axis (X) is arranged at a corner of at least the second support element (54).
7. The group (50) of claim 1, **characterised in that** it comprises blocking means (55, 57) able to removably block to one another the first and the second support element (51, 54) in the open position.
8. The group (50) of claim 7, wherein the blocking means comprise two snap-fitting elements associated respectively to the first support element (51) and the second support element (54), of which a bolt (55) and a retaining seating (57) able to realise a reciprocal automatic engagement between the first and the second support element (51, 54).
9. A door (20) for refrigerator cabinets which comprises a fixed frame (21) able to delimit an access entry (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) according to any one of the preceding claims.
10. The door (20) of claim 9, wherein the panel (30) comprises a buffer strip (31) and a frame (32) for perimetally encircling the buffer strip (31), the torsion spring (53) being inserted internally of the frame (32).
11. The door (20) of claim 9, wherein the distance be-

tween the edge of the panel (30) parallel to the hinge axis (X) and close to the hinge axis from the fixed frame (21) is substantially constant during the rotation between the closed position and the open position of the panel.

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12. The door (20) of claim 9, wherein the distance between the edge of the panel (30) parallel to the hinge axis (X) and in proximity of the hinge axis from the fixed frame (21) is substantially comprised between 3.5 mm and 6.5 mm.

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13. The door (20) of claim 9, wherein the external edge of the fixed frame (21) and the frame (32) of the panel (30) are substantially coplanar when the panel (30) is in the closed position.

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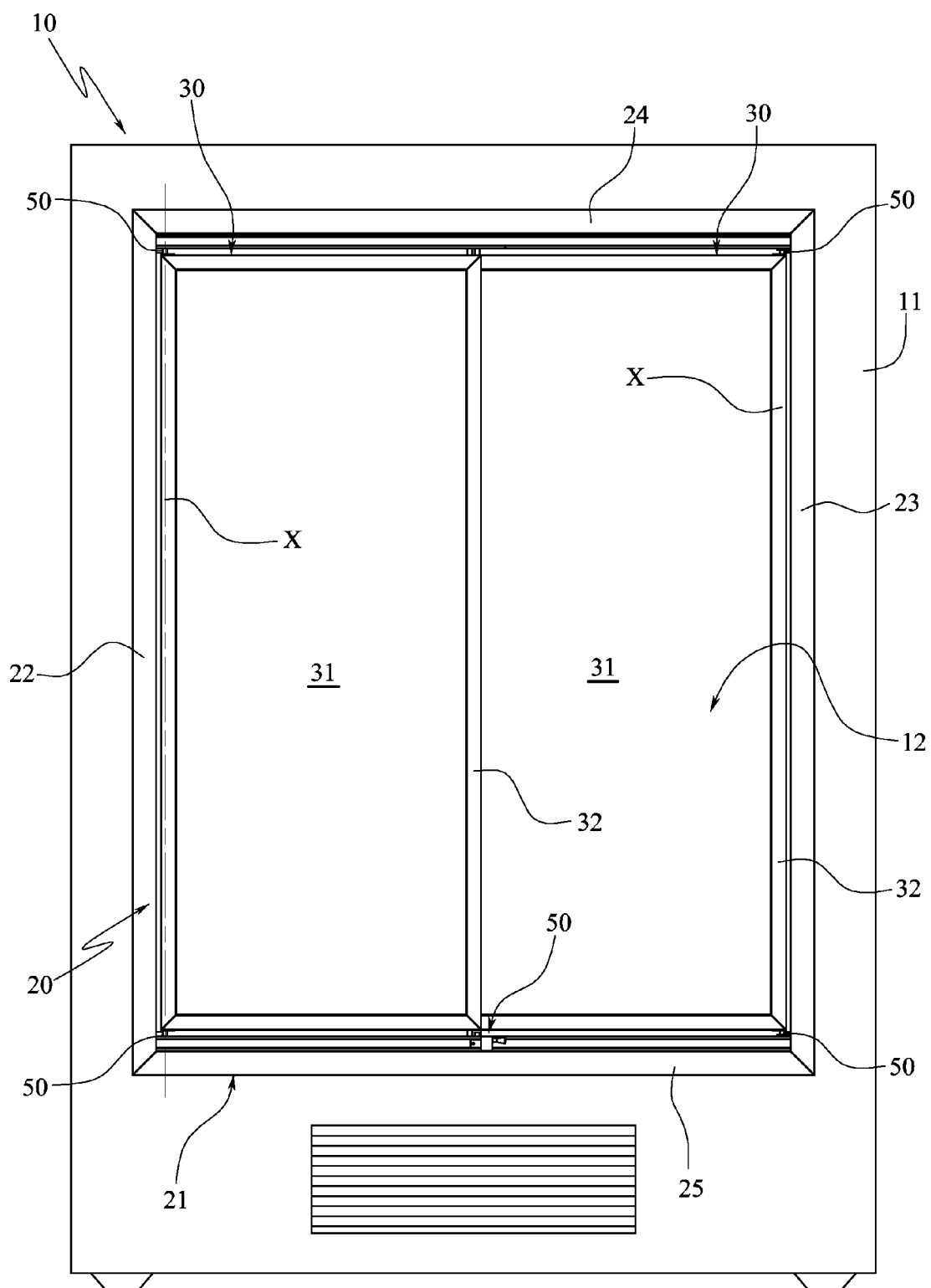
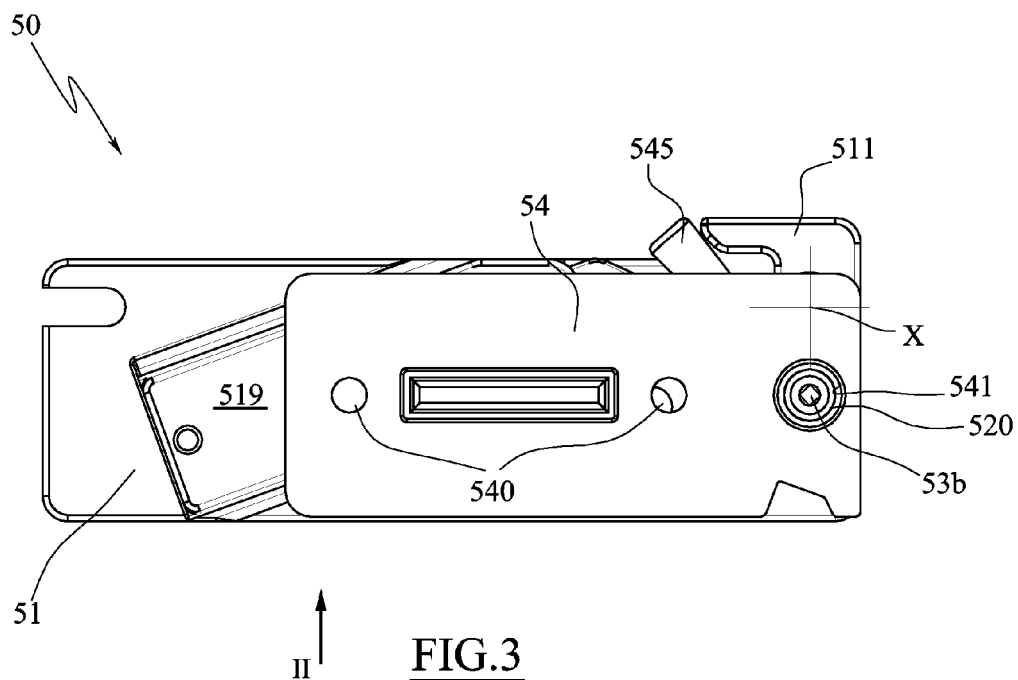
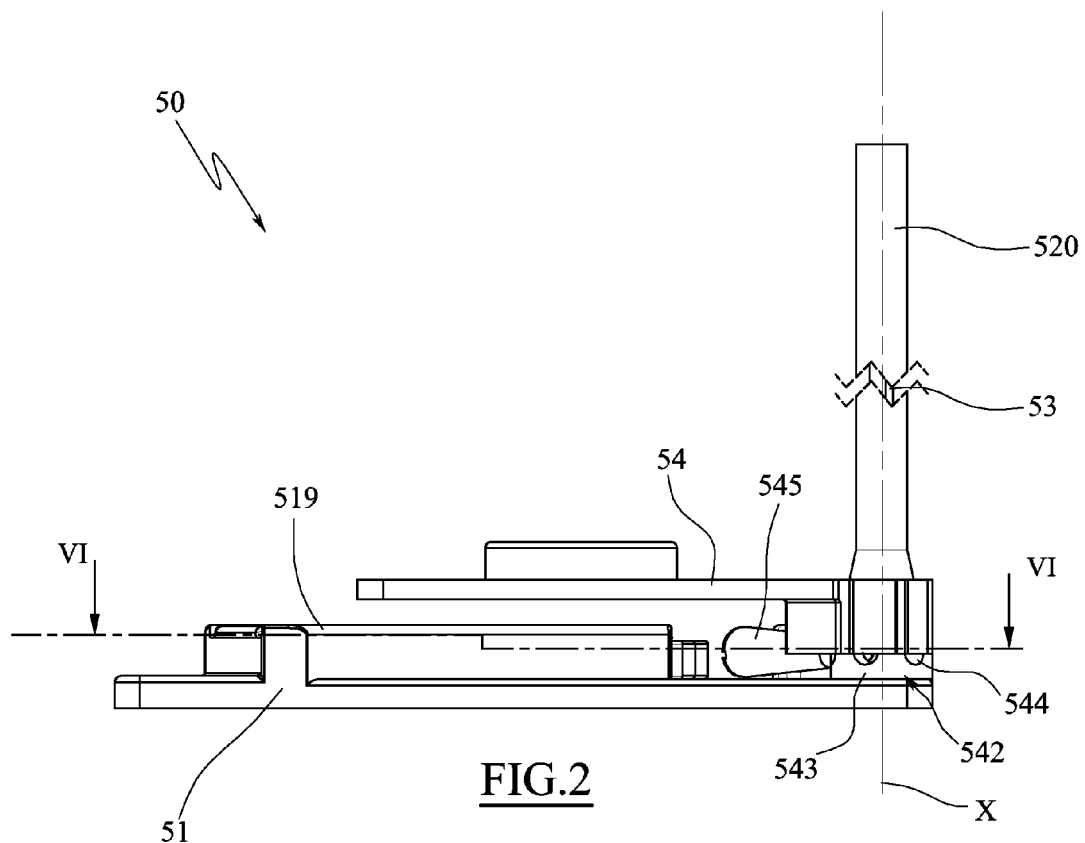
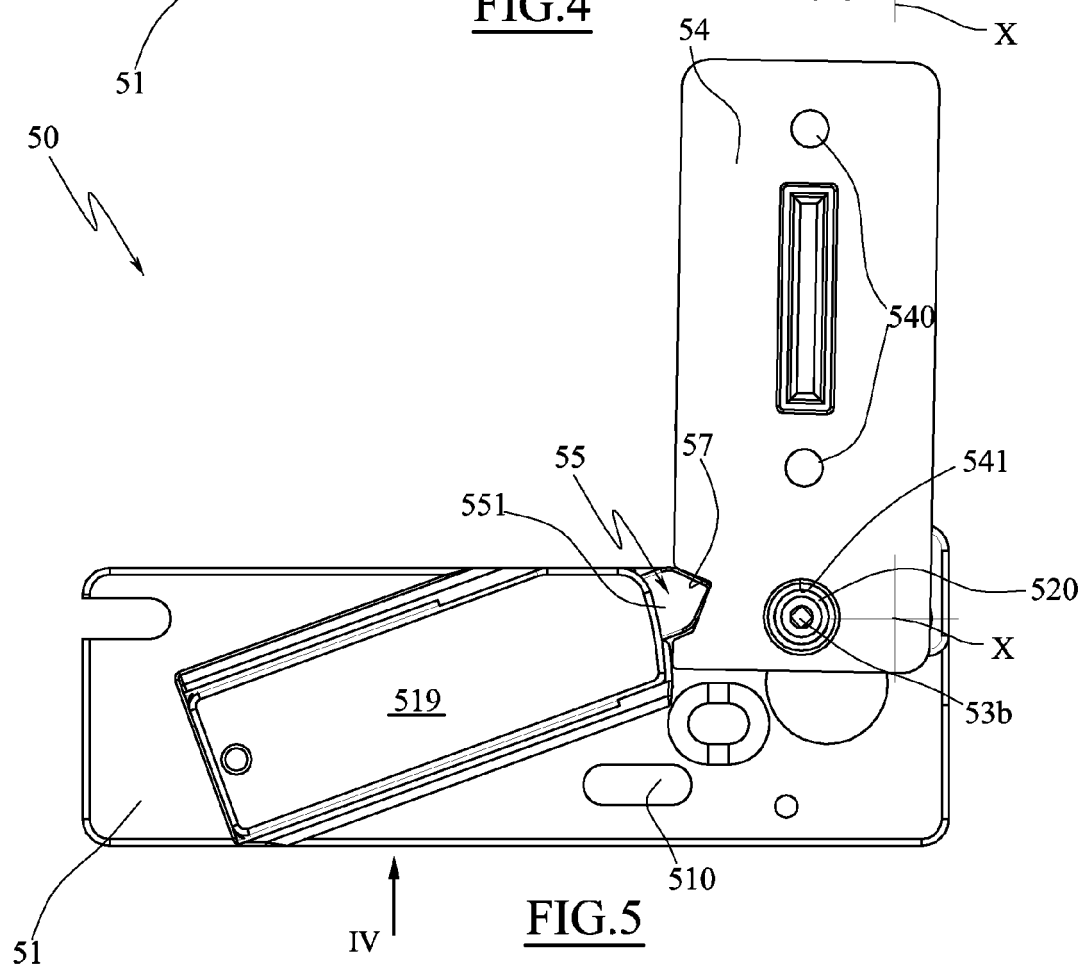
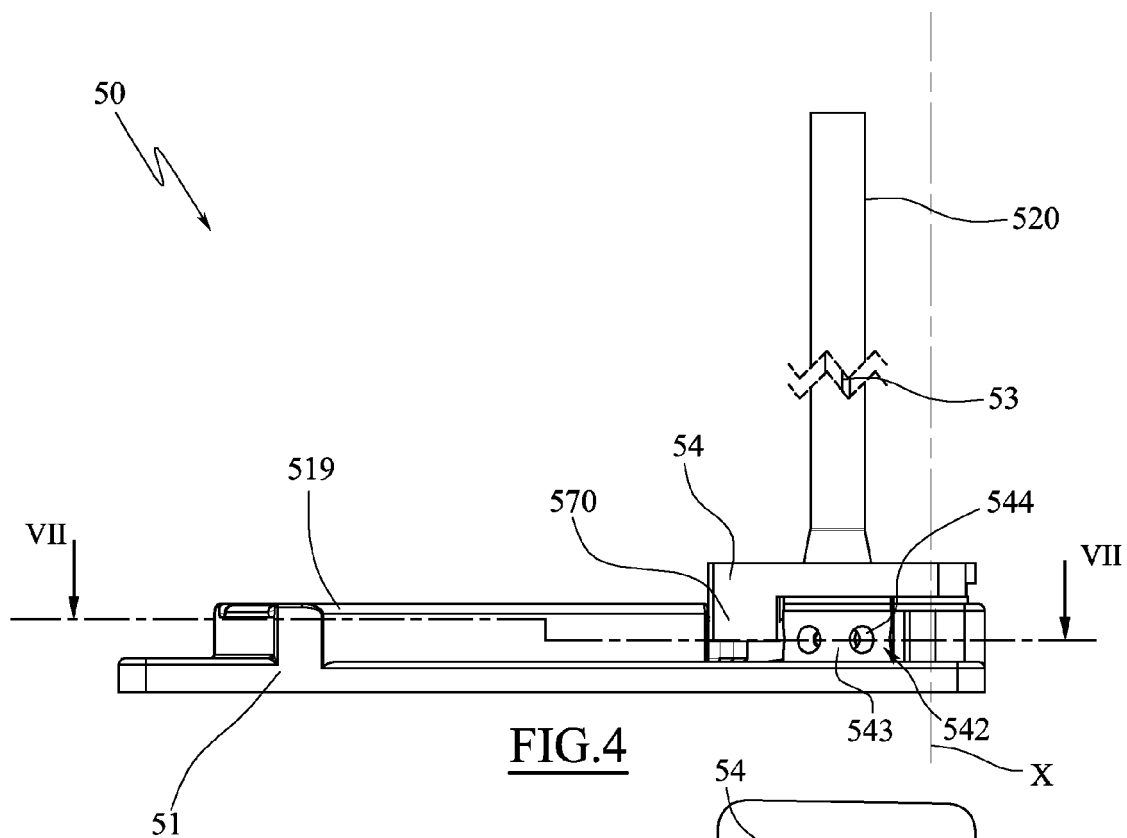


FIG.1





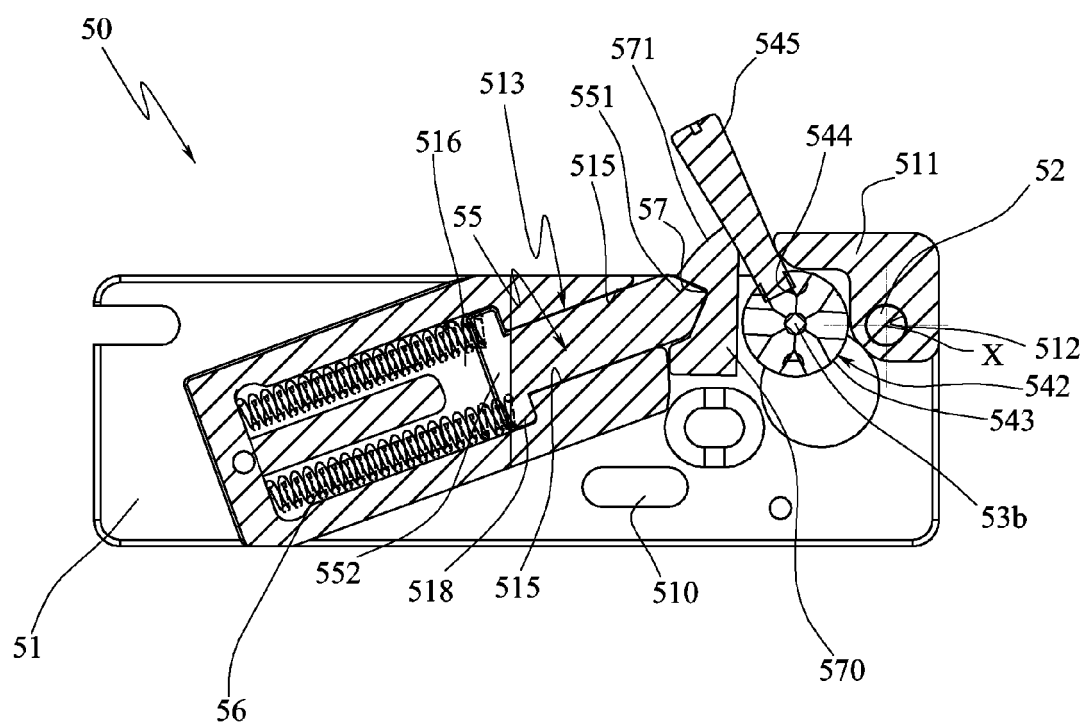
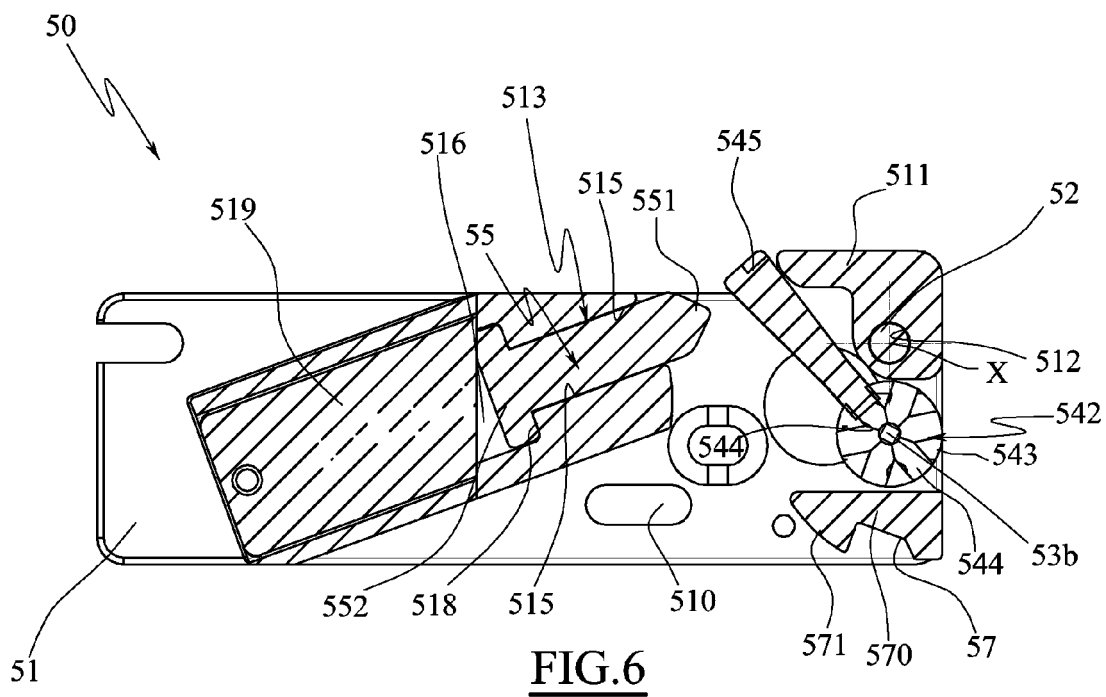
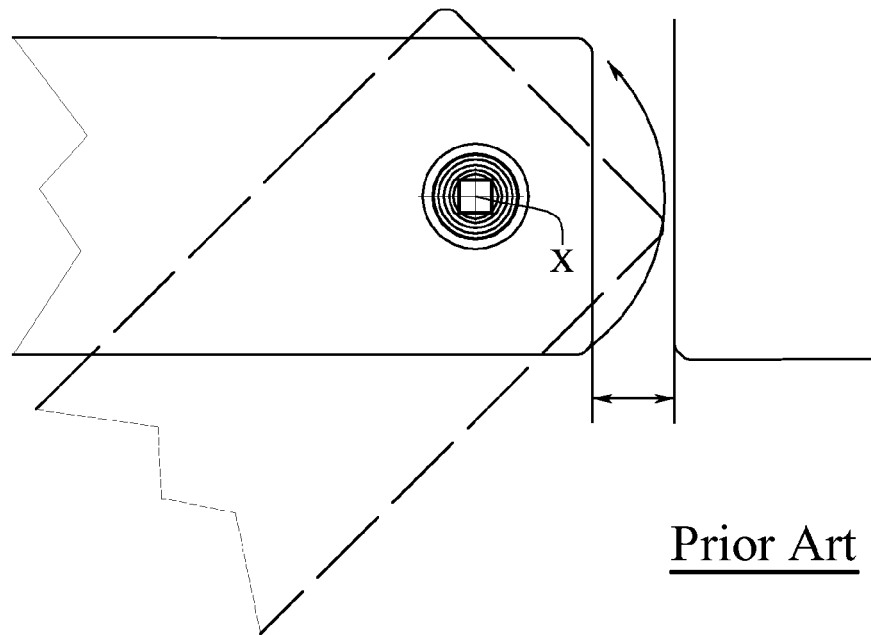


FIG.7



Prior Art

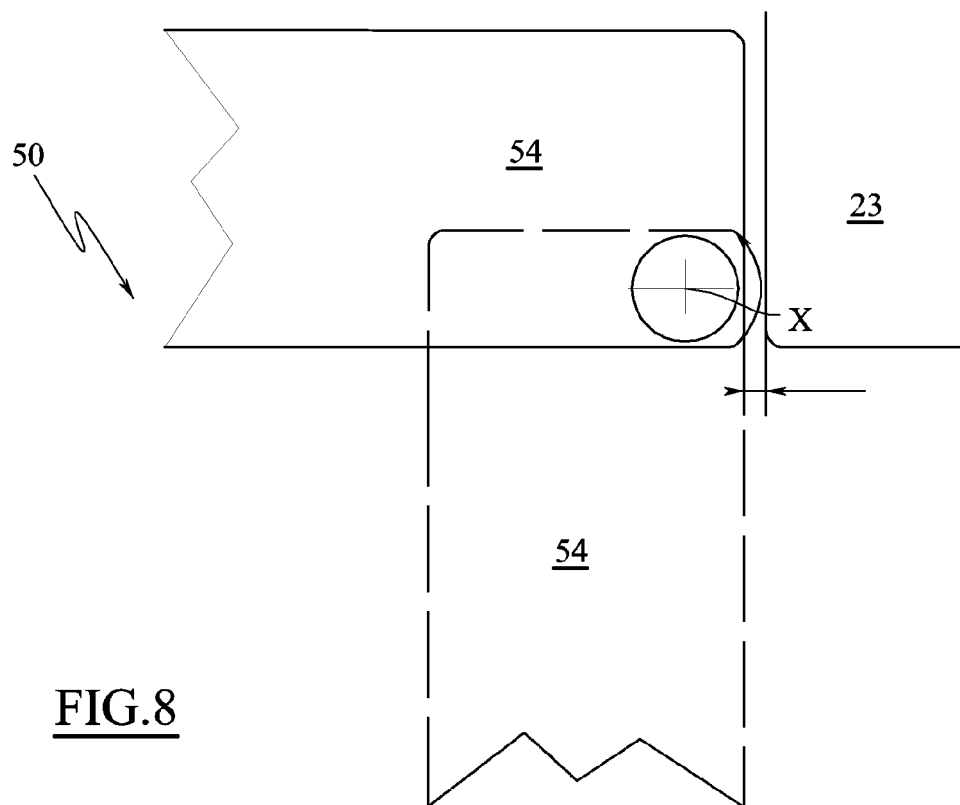


FIG.8



EUROPEAN SEARCH REPORT

Application Number
EP 13 18 3763

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2008/050975 A1 (I ONE INNOTECH CO LTD [KR]; HONG CHAN HO; CHOI SOON WOO [KR]) 2 May 2008 (2008-05-02) * abstract; figures 1A,1B,1C * * page 16, lines 10-21 * * page 18, line 12 - page 19, line 24 * -----	1-13	INV. F25D23/02
A	US 3 339 225 A (SUMMER BOOTH JOHN) 5 September 1967 (1967-09-05) * figures 1,2 * -----	1-13	
A	US 2 987 782 A (KUROWSKI WALTER J) 13 June 1961 (1961-06-13) * figures 1,2 * -----	1-13	
A	US 3 510 986 A (BERKOWITZ IRVING L) 12 May 1970 (1970-05-12) * figures 1-3 * -----	1-13	
			TECHNICAL FIELDS SEARCHED (IPC)
			F25D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 24 September 2013	Examiner Salaün, Eric
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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24-09-2013

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