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(54) **Refrigerating appliance with guiding element for a flexible tubular element**

Kühlschrank mit Führungselement für ein flexibles, rohrförmiges Element

Appareil frigorifique avec élément de guidage pour un élément flexible tubulaire

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Description

[TECHNICAL FIELD]

[0001] The present invention relates to a refrigerating appliance, typically for household use. In particular, the present invention relates to a refrigerating appliance comprising a flexible tubular element that connects the cabinet of the refrigerating appliance to a door of the refrigerating appliance.

[PRIOR ART]

[0002] Refrigerating appliances are equipped with a cabinet that contains one or more refrigerating cells. At least one door is present for closing these refrigerating cells, and commonly there is one door for each cell. Each door is connected to the cabinet by means of one or more hinges that allow for constrained outward rotation of the door for opening the same.

[0003] In the case of household refrigerators, the cells are adapted to contain food; often there are two cells: one cell for fresh food and one cell for frozen food.

[0004] Household refrigerators, and more in general refrigerating appliances, quite often require the presence of a tubular connection element, which is inserted into the cabinet on one side and into the door on the other side.

[0005] Said tubular connection element may be an electric cable or a pipe. The pipe may, for example, be connected to a refrigerated-water dispenser, while the electric cable may electrically connect a door-mounted light source or display. In these cases, since the door is mounted to the cabinet with the possibility of rotating about the hinges, it is necessary to adopt a solution that allows the door to rotate without being hindered by the tubular element and without damaging the same.

[0006] A solution is described in patent US 2,148,787, which describes a refrigerator comprising an electric cable secured to the door on one side and to the cabinet on the other side, in positions close to a hinge, where relative motion between the door and the cabinet is limited; of course, this solution requires a cable which is long and flexible enough to follow the door movement. It is clear that, in the solution summarized above, frequent door opening operations will lead to wear of the cable and especially of the sheath thereof, with the risk of dangerously exposing the electric wires; moreover, this solution is hardly applicable to pipes to be used for liquids, due to their rigidity.

[0007] Another example of a solution is described in document EP1624264, which relates to a refrigerating appliance equipped with a door connected to the cabinet by means of hinges and with a seat on the door for inserting a tubular element; the seat is coaxial to the axis of rotation of the hinges, in a position detached from the latter. In this manner, the tubular element is isolated from the hinges, thus avoiding the risk of damaging the tubular

element while opening the door. However, this solution has some drawbacks as well, since the adopted configuration requires much room for accommodating the tubular element without interference with the hinge. This drawback is made even more important by the fact that modern household appliances need to be as compact and capacious as possible, with no wasted room.

[0008] Another example of a solution is described in document EP1191289, which relates to a refrigerating appliance wherein the door is connected to the cabinet by means of hinges, and wherein the hinges are provided with a shaped portion with an elongated aperture, which allows some movement of the tubular element therein. In this manner, the tubular element can be accommodated and guided within the aperture, and the slack of the tubular element is taken up by a return spring. However, also this solution has some drawbacks; in particular, the flexible tubular element is subject to movements that are more or less free, and risks being pinched or, even worse, cut by the rigid elements of the door and/or the cabinet, which have edges, some sharp. In general, it is also desirable to provide solutions that allow the door of the refrigerator to be opened to the right or to the left, which require the installation of hinges on both the right and left sides of the cabinet. The refrigerator can thus be easier to place into a household environment, such as a kitchen, according to the user's preferences.

[0009] It is therefore advantageous to provide also those refrigerators which comprise a flexible tubular element as described above with the possibility of "reversing" the door opening direction by mounting the door differently to the hinges and a different solution for the flexible tubular element, which will follow a path on the side on which the hinges are located.

[0010] One example of a refrigerator comprising a flexible tubular element is known from document EP 1 565 637 B1. Said document describes a refrigerator comprising an electric power cable running in the cabinet and connected to a respective electric power cable running in the door, which supplies power to a display. According to such a solution, an auxiliary cabling is provided for changing the position of the hinges from one side of the cabinet to the other and reversing the door opening direction. Said auxiliary cabling is adapted to extend the electric power cable that runs in the cabinet up to a different side of the cabinet itself, so that the auxiliary cabling will be connected to the power cable running in the door, when the door opening direction is reversed.

[0011] The solution known from EP 1 565 637 B1 implies, however, the drawback that it requires an auxiliary cabling, which runs in a seat specially formed inside the cabinet; therefore, the refrigerator's structure becomes more complex, with elements that might be unused (if the door opening direction remains the standard one) and that will increase the costs incurred for manufacturing the appliance.

[0012] Document FR2522891 relates to a refrigerating appliance comprising a hinge locatable on the left or right

side of the appliance, and further comprising electric wires having such a length as to run along a path extending from the central portion of the appliance to the hinge; however, document FR2522891 fails to disclose that the wires comprise a connector. Document EP1653180 relates to an appliance cabinet comprising a hinge which is movable from the pivoting edge of the door to an opposite edge of the door. The appliance disclosed in document EP1653180 further comprises a first conduit extending from an in-door dispenser to an end within the endcap. A second conduit extends from within the cabinet to an end exterior of the cabinet and within the endcap. An end connector is provided to receive the ends of the first and second conduits. According to EP1653180, the connector is located within the endcap of the cabinet. However, document EP1653180 thus fails to disclose that the connector is located on a segment of said flexible tubular element comprised between the hinge and the central portion of the door. Document EP2329208 relates to a refrigerating appliance comprising a display placed on the door, wherein the display is connected to a processing unit by means of a cable running on the top side of the door. The sense of aperture (left/right) can be reversed, according to document EP2329208, by means of a different routing of the cable with respect of the door. However, document EP2329208 fails to disclose a connector.

[OBJECTS AND SUMMARY OF THE INVENTION]

[0013] The object of the present invention is to provide a refrigerating appliance capable of solving some of the problems suffered by the prior art.

[0014] It is in particular one object of the present invention to provide a refrigerating appliance that comprises a tubular connection element between the cabinet and the door, wherein the tubular element will not risk suffering any damage when opening or closing the door.

[0015] It is another object of the present invention to provide a refrigerating appliance wherein the tubular element is accommodated in a compact fashion, so as to minimize the room it occupies with the door open and with the door closed.

[0016] It is a further object of the present invention to provide a refrigerating appliance wherein the tubular element has such a configuration that it can be easily assembled, thus improving the production and/or maintenance of the refrigerating appliance.

[0017] It is a further object of the present invention to provide a refrigerating appliance that comprises a tubular element for a connection between the cabinet and the door, wherein the door opening direction can be reversed by moving the hinges from one side of the cabinet to the other in a simple and effective manner.

[0018] It is a further object of the present invention to provide a refrigerating appliance wherein the configuration of the tubular element can be changed in a simple manner for switching to a different side of the refrigerating

appliance, without requiring any additional components.

[0019] It is a further object of the present invention to provide a refrigerating appliance wherein the tubular element is housed in a protected and compact fashion, so as to minimize its dimensions and reduce the risk of damage thereto.

[0020] It is yet another object of the present invention to provide a refrigerating appliance wherein the tubular element has such a configuration that it can be easily assembled, so as to improve the reversal of the opening direction of the door of the refrigerating appliance itself.

[0021] These and other objects are achieved through a refrigerating appliance as set out in the appended claims, which are an integral part of the present description.

[0022] One idea at the basis of the present invention is to provide a refrigerating appliance comprising a cabinet, at least one door and at least one flexible tubular element inserted on one side in the cabinet and on the other side in the door, wherein the door is connected to the cabinet through hinges allowing it to rotate about an axis of rotation for opening and closing; the refrigerating appliance further comprises a guiding element that comprises a guiding fulcrum, wherein the guiding fulcrum defines a guiding axis around which the flexible element is adapted to wind and unwind, at least partially, during said closing and opening respectively, and further comprises a support defining a surface substantially perpendicular to the guiding axis and adapted to support the flexible tubular element.

[0023] Said guiding element allows to protect the tubular element while opening and closing the door. Its particular configuration, comprising a fulcrum around which the tubular element is adapted to wind, allows the guiding element to remain compact both when the door is open and when the door is closed; in addition, assembling the flexible tubular element inside the guiding element is a simple and straightforward operation.

[0024] Preferably, the guiding fulcrum defines a guiding axis which is substantially parallel to the axis of rotation of the hinges, thus preventing the flexible tubular element from being stressed.

[0025] In this manner, the tubular element remains substantially orthogonal to the axis of rotation of the hinges, and a predetermined minimum value of the radius of curvature of the flexible tubular element is ensured.

[0026] Preferably, the guiding element is adapted to further rotate about the guiding axis. Moreover, the guiding element comprises a guiding portion with a housing that accommodates a segment of the flexible tubular element on the door side. In this way, the guiding element provides better protection of the tubular element while opening and closing the door. Preferably, the housing is so shaped as to define a trajectory of the flexible tubular element that is convex in projection on the support surface, facing outwards from the cabinet, thereby improving the door closing operations.

[0027] In a preferred embodiment, the dimension of

the housing along the flexible tubular element is equal to or greater than 5 times the diameter of the flexible tubular element, thus improving the guidance thereof.

[0028] Preferably, the support of the guiding element comprises a shaped annular portion and a tapered lateral portion, which are connected together to hold the flexible tubular element, which is partially wound around the guiding fulcrum, also laterally.

[0029] Preferably, inside the refrigerating appliance the flexible tubular element runs on a trajectory between the guiding axis and the axis of rotation of the hinges.

[0030] Preferably, the guiding element is supported by a bracket constrained to the cabinet of the refrigerating appliance. Preferably, the guiding element and the flexible tubular element are positioned at an edge of the door, preferably the upper edge.

[0031] Typically, the flexible tubular element can be a pipe carrying a liquid or a sheath incorporating at least one electric cable to be connected, for example, to a display or to electric devices arranged in the door.

[0032] According to another aspect of the present invention, a refrigerating appliance is provided which comprises a cabinet, at least one door and at least one flexible tubular element inserted one side in the cabinet and on the other side in the door, wherein the door is connected to the cabinet through at least one hinge allowing it to rotate about an axis of rotation for opening and closing; the refrigerating appliance further comprises a guiding element further comprising a passage element for the flexible tubular element; said passage element comprises a substantially annular or semi-annular portion having a central axis substantially parallel to the axis of rotation of the hinge, wherein the flexible tubular element passes inside the passage element, and wherein the guiding element further comprises a supporting element constrained to the passage element and adapted to hold the passage element in a fixed position relative to the hinge while opening and closing the door.

[0033] Said guiding element allows to protect the tubular element while opening and closing the door. Its particular configuration allows the tubular element to be guided in such a way that at least a segment thereof within the annular or semi-annular portion of the passage element is aligned with respect to the central axis, and hence parallel to the axis of rotation of the hinges, about which the whole door rotates as it opens, so as to avoid stressing the flexible tubular element.

[0034] Preferably, the refrigerating appliance comprises a supporting bracket for the hinge, which bracket is rigidly constrained to the cabinet, the supporting element being rigidly constrained to this bracket. Furthermore, the flexible tubular element is preferably further guided by the bracket along a trajectory substantially perpendicular to the central axis, thus creating a first bend of the flexible tubular element as it enters the passage element. Said bend allows the guiding element to have more compact dimensions, both with the door open and with the door closed.

[0035] Preferably, the guiding element further comprises a guiding portion, rotatably constrained to the passage element and adapted to rotate in a plane perpendicular to the axis of rotation of the hinges, wherein said guiding portion comprises a housing for a segment of said flexible tubular element (12), thus accommodating said flexible tubular element on the side thereof inserted in said door (3a). This further improves the guidance and protection of the flexible tubular element.

[0036] Preferably, the flexible tubular element is further guided by the guiding element along a trajectory substantially perpendicular to the central axis, thus creating a second bend of the flexible tubular element as it exits the passage element towards the door. Said bend allows the guiding element to have even more compact dimensions, both with the door open and with the door closed.

[0037] Preferably, the housing of the guiding portion is substantially straight, and its length is preferably equal to at least 5 times the diameter of the flexible tubular element.

[0038] In a preferred embodiment, the substantially semi-annular portion of the passage element has a substantially C-shaped cross-section relative to the central axis to allow the flexible tubular element to be mounted inside of it even if said guiding element has been previously assembled. In this way, assembling the flexible tubular element inside the guiding element becomes a simple and straightforward operation.

[0039] Preferably, in a refrigerating appliance according to the present invention the guiding element is adapted to be reversibly housed on a right side or on a left side of the cabinet, and the length of the flexible tubular element is such that it can run on the right side or on the left side, respectively, depending on the opening direction of said door about said axis of rotation. In this manner, it is possible to ensure reversibility of the door opening direction while keeping intact all functionalities of the refrigerating appliance.

[0040] Preferably, the guiding element and the flexible tubular element are positioned near an edge of the door, preferably the upper edge.

[0041] Typically, the flexible tubular element can be a pipe carrying a liquid or a sheath incorporating at least one electric cable to be connected, for example, to a display or to electric devices arranged in the door.

[0042] According to yet another aspect of the present invention, a refrigerating appliance is provided which comprises a cabinet, at least one door and at least one flexible tubular element inserted on one side in the cabinet and on the other side in the door; the door is connected to the cabinet through at least one hinge on a left side or a right side of the cabinet, which allows the door to rotate about an axis of rotation for opening or closing; the flexible tubular element is inserted in the front panel of the cabinet, in a central portion relative to the left side and right side, and has such a length as to run along a path extending from the central portion to the hinge, whether it is located on the left side or on the right side

of the cabinet.

[0043] In this manner, it becomes possible to provide reversibility of the door opening direction by simply changing the path of the flexible tubular element, moving it to the hinge side whether the left or the right one.

[0044] Such a configuration can be easily changed to switch to a different side of the refrigerating appliance without requiring any additional components, and this change can be made during production as well as by service personnel or by the user him/herself.

[0045] The tubular element is accommodated in a protected and compact fashion in the refrigerating appliance near the hinges, in the cabinet and in the door, thus minimizing room occupation and protecting it from undesired access.

[0046] The present invention allows, therefore, to provide a refrigerating appliance wherein the tubular element can be easily accommodated, and wherein reversing the door opening direction is a simple operation.

[0047] Typically, the flexible tubular element can be a pipe carrying a liquid or a sheath incorporating at least one electric cable to be connected, for example, to a display or to electric devices arranged in the door.

[0048] The present invention also relates to a method for configuring the opening of a door of a refrigerating appliance, which is preferably implemented in an appliance as herein described.

[0049] Further advantageous and particular aspects will become apparent from the following detailed description and from the dependent claims.

[BRIEF DESCRIPTION OF THE DRAWINGS]

[0050] Some preferred and advantageous embodiments will now be described by way of non-limiting example with reference to the annexed drawings, wherein:

- Figure 1 schematically shows a refrigerating appliance according to the present invention.
- Figure 2 schematically shows the refrigerating appliance of Figure 1 with the door open.
- Figure 3 shows in detail a solution for guiding a tubular element in a refrigerating appliance according to the present invention, in closed door configuration.
- Figure 4 illustrates the solution of Figure 3 in open door configuration.
- Figure 5 shows in more detail a solution for guiding a tubular element in a refrigerating appliance according to the present invention.
- Figure 6 shows in detail yet another solution for guiding a tubular element in a refrigerating appliance according to the present invention.
- Figure 7 exemplifies a further variant of a refrigerating appliance according to the present invention.
- Figure 8 schematically shows a further refrigerating appliance.
- Figure 9 schematically shows the refrigerating appliance of Figure 8 with the door open.

- Figure 10 shows in detail a solution for guiding a tubular element in a refrigerating appliance.
- Figure 11 shows a different view of the solution of Figure 10.
- Figure 12 shows a solution for guiding a tubular element in a refrigerating appliance, wherein the door hinges have been omitted for clarity.
- Figure 13 illustrates in detail the solution of Figure 12, wherein the door hinges are present as well.
- Figure 14 schematically shows yet another refrigerating appliance according to the present invention.
- Figure 15 schematically shows the refrigerating appliance of Figure 14 with the door open, with right-hand (a) or left-hand (b) hinges.
- Figure 16 shows in detail a solution for the passage of a tubular element in a refrigerating appliance according to the present invention.
- Figure 17 illustrates the solution of Figure 16, with covers added thereto.

[0051] The drawings show different aspects and embodiments of the present invention and, where appropriate, similar structures, components, materials and/or elements in the various drawings are designated by the same reference numerals.

[DETAILED DESCRIPTION OF THE INVENTION]

[0052] Common refrigerating appliances include refrigerators for household use; the following description will refer to said appliances, without the invention being however limited thereto.

[0053] Figure 1 schematically shows a refrigerator 101 according to the present invention. Said refrigerator 101 comprises a cabinet 102 placed on a base laid on the ground; typically, the walls of the cabinet comprise a thick layer of thermoinsulating material to ensure that the operating temperatures are maintained.

[0054] The refrigerator 101 comprises two refrigeration cells, one of which is used for fresh food and is arranged in the upper part of the cabinet 102, while the other one is used for frozen food and is arranged in the lower part of the cabinet 102. The refrigerator 101 comprises two doors; in particular, there is an upper door 103a for the cell for fresh food, and a lower door 103b for the cell for frozen food.

[0055] The doors 103a and 103b of the refrigerator 101 are each connected to the cabinet by means of one or more hinges, which allow the doors to be opened and closed by the user through a rotary movement about a vertical axis; in the field of refrigerating appliances, hinges of various types are commonly used, which are generally known to those skilled in the art.

[0056] In this non-limiting example of embodiment, the refrigerator 1 comprises a display 104 positioned on the outside of the door 3a. Through the display 104 the user can, for example, control the operation of the refrigerator by setting the operating temperature thereof. In general,

a plurality of functions can be executed by means of the display 104 and its user interface, in accordance with the prior art.

[0057] It can therefore be appreciated that the display 104 requires, for its operation, a power connection, and preferably also a signal connection, that connect the display 104 to the main body of the cabinet 102, in which the electric and electronic devices that ensure the proper operation of the refrigerator 101 are typically found.

[0058] It is therefore apparent that the refrigerator 101 comprises a flexible tubular element for an electric cable, which connects the cabinet 102 to the door 103a. Said electric cable may be used, for example, for supplying power to the display 104 and also to a light source mounted on the door 103a and facing towards the inside of the refrigerator, i.e. towards the upper refrigeration cell.

[0059] In the example shown in the drawing, the tubular element is a sheath containing multiple electric wires and/or signal wires for powering and controlling the display 104, e.g. a touchscreen-type display. Alternatively, said tubular element may be, for instance, a pipe carrying a liquid, which connects the cabinet 102 to the door 103a; said pipe may be used, for example, to supply a refrigerated water distributor mounted on the door 103a and facing outwards from the refrigerator. Other possible applications of the flexible tubular element will become apparent to the man skilled in the art in the light of the present description and of the advantages deriving therefrom. Furthermore, alternative embodiments of the present invention may utilize multiple tubular elements, even different from one another, whether coupled in parallel or not.

[0060] Figure 2 schematically shows the refrigerator 101 with the door 103a open; this drawing clearly shows the path followed by the flexible tubular element, which runs in the highlighted region 105, near the upper hinge of the door 103a.

[0061] The tubular element must therefore be flexible enough to follow the opening and closing movements of the door 103a, which cause it to flex considerably, particularly in the region 105.

[0062] In the preferred embodiment, the display 104 is positioned at the centre of the door 103a, and the flexible tubular element is arranged near the right-hand hinges of the door 103a.

[0063] Since it would be easy to conceive a variant of the refrigerating appliance 101 with left-hand hinges, which would change the opening direction of the door 103a, it is advantageous to provide an embodiment of the refrigerator 101 wherein the flexible tubular element comprises suitable electric or hydraulic connectors allowing the refrigerator 101 to be easily assembled, whether it has right-hand hinges (as shown in Figure 1) or left-hand hinges (not shown) for the door.

[0064] Figure 3 illustrates in more detail the region 105 of Figure 2, clearly showing the path followed by the flexible tubular element.

[0065] The refrigerator 101 comprises at least one

hinge 110 having an axis of rotation 111 to allow the door 103a to rotate relative to the cabinet 102. The axis of rotation 110 is substantially vertical in the normal operating conditions of the refrigerator 101. In a preferred embodiment, the hinge 110 comprises a first hinge element fastened to the cabinet 102 and a second hinge element fastened to the door 103a and mounted on the first hinge element, with the possibility of rotating about the axis 111.

[0066] As previously illustrated, the refrigerator comprises a flexible tubular element 112 that connects the cabinet 102 to further elements (not shown) comprised in the door 103a. In order to protect and guide the tubular element as the door is opened or closed, the refrigerator 101 comprises a guiding element 113.

[0067] In particular, the guiding element 113 comprises a guiding fulcrum 114 about which the flexible tubular element 112 is adapted to at least partially wind when the door 103a is closed or unwind when the door 103a is opened. The guiding fulcrum 114 has a guiding axis 115, about which the flexible tubular element can wind; said guiding axis 115 is substantially parallel, in space, to the axis of rotation 111 of the hinge 110. In other words, the guiding axis 115 is substantially vertical in the normal operating conditions of the refrigerator 101.

[0068] Thanks to the above-specified solution, in particular to the substantial parallelism between the axis of rotation 111 and the guiding axis 115, the door 103a can rotate without being hindered by the flexible tubular element 112, and therefore with less risk of causing damage thereto.

[0069] Furthermore, since the passage of the tubular element 112 is independent of the structure of the hinge 110, both the passage for the tubular element 112 and the hinges can be more freely designed and positioned in the refrigerator 101. The guiding element 113 further comprises a support 116, inside of which the flexible tubular element 112 is housed and supported. The support 116 comprises an annular surface, substantially perpendicular to the guiding axis 115, which supports the flexible tubular element 112 from below. The support 116 further comprises a scroll-shaped lateral portion adapted to laterally contain the flexible tubular element 112, in particular as the door 103a opens or closes. Preferably, the surface of the support 116 is radiused between the annular portion and the lateral portion, with a radius substantially equal to the radius of the flexible tubular element 112.

[0070] In particular, the flexible tubular element 112 follows, in space, a trajectory defined by the support 116 of the guiding element 113, wherein this trajectory extends in space in such a way as to cause the flexible tubular element 112 to pass between the axis of rotation 111 and the guiding axis 115, thereby defining a particularly advantageous kinematic configuration that requires less than a complete turn of the flexible tubular element 112 around the guiding fulcrum 114. Other spatial configurations may, on the other hand, require a

greater number of turns.

[0071] As will be described more in detail below, the support 116 is in its turn supported by a bracket.

[0072] The lateral surface of the support 116 is so shaped as to allow the flexible tubular element 112 to slide at least tangentially, so that it can still make small settling movements which are necessary during the opening and closing actions of the door 103a. In other words, the edge of the supporting element 116 has such dimensions that allow the flexible tubular element to wind and unwind, and comprises rounded edges that will not damage or cut the flexible tubular element.

[0073] Preferably, the support 116, and in general the whole guiding element 113, are made of plastic material. The guiding element 113 may either be made as one piece or comprise a plurality of elements constrained to one another, e.g. by joining, welding or glueing.

[0074] In turn, the guiding element 113 is adapted to rotate about the guiding axis 115, e.g. by means of an additional hinge (not shown in the drawing), or it is adapted to rotate about an axis near the guiding fulcrum 114, so as to better follow the settling movements of the flexible tubular element 112 as the door 103a opens or closes.

[0075] The guiding element 113 comprises, in the illustrated preferred embodiment, a guiding portion 117a that defines a channel in which the flexible tubular element 112 is housed and runs. The guiding portion 117a is located on the side of the guiding element 113 that faces towards the door 103a, and performs the function of accompanying the flexible tubular element 112 as the door 103a opens or closes. Preferably, the guiding portion 117a comprises retaining means adapted to retain therein the flexible tubular element; for example, the guiding portion 117a comprises an inward-facing protrusion on its edge, which prevents the flexible tubular element 112 from coming out of the channel defined by the guiding portion 117a; preferably, the guiding portion 117a comprises a specially shaped portion to allow the flexible tubular element 112 to be fitted in a controlled manner by the assembler into the respective seat inside the guiding portion 117a. Alternatively, the retaining means may be resilient mobile portions, interference fit couplings, mechanical hooks, clamps, or other known retaining means for cables and pipes.

[0076] The width of the channel of the guiding portion 117a is preferably slightly greater than the diameter of the flexible tubular element 112, and its development length along the section of flexible tubular element 112 is preferably equal to at least 5 times the diameter of the flexible tubular element 112; this makes for improved guidance when opening or closing the door 103a.

[0077] Preferably, the guiding portion 117a is rigidly constrained to the support 116, and is adapted to rotate together with it about the guiding axis 115, as aforementioned.

[0078] The guiding portion 117a is preferably so shaped as to have a curvature that extends in a plane perpendicular to the guiding axis 115, i.e. a plane sub-

stantially parallel or substantially coinciding with the plane of the annular surface of the support 116. Therefore, the curvature of the guiding portion 117a extends with respect to the plane of motion of the guiding element 113 when the door is opened or closed.

[0079] Preferably, the curvature of the guiding portion 117a is convex outwards, i.e. towards the opening direction of the door 103a. In particular, this curvature follows, in general, the curvature of the flexible tubular element 112 inside the support 116 when the door 103a is in the closed condition. As will become more apparent later on, this particular curvature of the guiding portion 117a allows to improve the closing of the door 103a by further guiding the flexible tubular element and protecting it during the movement.

[0080] Figure 4 shows a view of the refrigerator 101 with the door 103a in the open position, i.e. angled by more than 90° relative to the front surface of the cabinet 102.

[0081] In this view one can appreciate the bracket 118 that supports the guiding element 113. The bracket 118 is constrained to the cabinet 102 and comprises a profiled flat surface on which the guiding element 113 rests, the latter being preferably constrained in such a way as to still be able to rotate, as previously described.

[0082] In the embodiment of Figure 4 one can appreciate a variant of the guiding portion, designated by reference 117b. Said variant of the guiding portion 117b does not comprise the retaining means described with reference to the element 117a; it is therefore to be understood that the guiding portion 117b integrates different, invisible retaining means, e.g. glue, i.e. it does not include any retaining means if they are not necessary for a specific application in the refrigerating appliance.

[0083] In this view one can also appreciate the trajectory followed by the flexible tubular element 112 when the door 103a is open. It must be noted that the flexible tubular element 112 has different curvatures between the piece comprised in the guiding portion 117b and the piece comprised in the scroll of the support 116. As previously described, the curvature of the guiding portion 117b is convex outwards, so that it already complies with the curvature that the flexible tubular element 112 will take when the door 103a is closed; it thus becomes easier to close the door, while still avoiding any risk of damage to the flexible tubular element, which will not encounter any obstacle and will be already prearranged for the correct closure of the door 103a.

[0084] Figure 5 illustrates the guiding element 113 with the door 103a in the open condition. In this embodiment, the refrigerator 101 further comprises a covering element 119 to be fitted on the bracket 118 and having a shape substantially matching the annular portion of the support 116. While the covering element 119 certainly has aesthetic functions, it also protects the flexible tubular element 112 against accidental access as well as against cutting and abrasion.

[0085] Preferably, also the covering element 119 is

made of plastic material.

[0086] Considering the presence of the covering element 119, the man skilled in the art will certainly appreciate the advantages resulting therefrom when assembling the refrigerator 101, particularly as regards the flexible tubular element 112 and the passage thereof inside the guiding element 113. In fact, it will be sufficient to put the guiding element 113 in the operating position, fit the flexible tubular element 112 into it by following the path exemplified in Figure 4, and then add the covering element 119 as exemplified in Figure 5.

[0087] Numerous variations are of course possible for the covering element 119, whether it is constrained to the cabinet, to the bracket or even to the door, or it simply consists of an annular portion directly secured to the element 116 or to the guiding fulcrum 114.

[0088] In Figure 5 one can also appreciate the presence of a connector 120, which is positioned substantially at the centre of the door 103a, near the upper edge thereof, which allows assembling an electric or hydraulic circuit as previously described with reference to Figures 1 and 2. Figure 6 shows again the guiding element 113 with the door 103a in the open condition. In this embodiment, the refrigerator 101 further comprises a moulding 121, which essentially has aesthetic functions while also protecting the flexible tubular element, which is in fact no longer visible in this drawing.

[0089] The moulding 121 comprises an aperture 122, which is adapted to allow the flexible tubular element to pass and reach the door 103a; the aperture 122 has such shape and dimensions that also allow the guiding element 113 to rotate and the guiding portion 117b to be inserted into the moulding 121. Figure 7 shows an exemplary variant of a refrigerator comprising a guiding device 113 according to the present invention.

[0090] As aforementioned, a refrigerator according to the present invention may be equipped with a door 103a comprising hinges 110 on the right side of the cabinet 102, as shown, or it may be equipped with a different door comprising hinges on the left side of the cabinet 102, depending on the user's requirements and the available room. It is therefore advantageous to offer, in this respect, the possibility of making the door of the refrigerating appliance "reversible".

[0091] It is therefore clear that, if one wants to change the door configuration, e.g. from "left-hand" hinges to "right-hand" hinges on the cabinet, it will also be necessary to modify the path of the flexible tubular element, in particular inside the guiding element.

[0092] A guiding element provided in a refrigerator in accordance with the present invention offers significant advantages in a situation wherein "reversibility" of the refrigerator door is needed.

[0093] In fact, the preferred embodiment of the guiding element 113, described and shown in the drawing, allows mounting the same element, with no structural modifications, also on the opposite side of the cabinet, so that the flexible tubular element will still be guided also even when

the door opening direction is changed.

[0094] Figure 7 exemplifies this possibility, representing a refrigerator configuration that, though it has little practical importance, is well representative of the flexibility and of the advantages of this solution.

[0095] The guiding element 113 mounted towards the right side of the cabinet 102, near the door 103a, acts as a guide for the flexible tubular element as described above.

[0096] A guiding element 113b perfectly analogous to the element 113 can be positioned on the opposite side, i.e. the left side of the cabinet 102. The guiding element 113b therefore exactly corresponds to the guiding element 113, but it is "reversed" to take a configuration that allows guiding the flexible tubular element also on the other side of the cabinet.

[0097] In fact, within the guiding element 113b there is a guiding fulcrum, i.e. the same fulcrum 114 which is not visible in this drawing; also, the guiding element 113 further comprises a support that defines a surface adapted to support the flexible tubular element: in the case of the guiding element 113b, the support is integrated into the component 119 already described, but it is positioned under the guiding element 113b as shown in the drawing. Likewise, the component 116 of the guiding element 113b acts as a cover for the flexible tubular element. In other words, the components 116 and 119 have respective opposite configurations depending on whether the guiding element is assembled according to the configuration 113 or 113b.

[0098] In addition, the guiding element 113b comprises the guiding portion 117a, which, as previously described, comprises retaining means to avoid that the flexible tubular element might fall downwards as it is guided into the guiding element 113b in the configuration shown in the drawing.

[0099] Said guiding portion 117a faces towards the inside of the portion defined by the door 103a and by the respective seat in the cabinet 102; it can therefore be appreciated that the guiding element 113b would provide guidance and protection of the flexible tubular element, as already described, even if the door were applied to hinges mounted on the left side of the cabinet 102.

[0100] To this end, the refrigerator embodiment shown in Figure 7 employs a hinge support, i.e. the bracket 123, which at the same time allows the following: mounting a hinge to rotatably support the door 103a when constrained to the left side of the cabinet; and housing the guiding element 113b as already described, with the component 119 constrained to the cabinet.

[0101] The bracket 123 is therefore appropriately shaped, distinctly from the bracket 118 previously described, on the right side of the cabinet 102.

[0102] In a preferred embodiment, aiming at simplifying the assembly of the refrigerator and the reversal of the door opening direction, the flexible tubular element comprises suitable connectors, e.g. hydraulic or electric ones, that define multiple lengths thereof.

[0103] In particular, it is advantageous that the flexible tubular element comprises connectors which have such shapes and are arranged in such positions as to allow the flexible tubular element to run, without distinction, on the left side or on the right side of the cabinet.

[0104] For example, the flexible tubular element may have such a length as to arrive in proximity of the centre of the upper edge of the door, by following a path on the right or on the left with respect to the door itself, depending on the side where the door hinges have been positioned. Therefore, the flexible tubular element preferably originates from a cavity formed in the upper central part of the front edge of the cabinet 102, running inside a profile up to the hinges of the door 103a (being guided by the guiding element 113 on the right side or by the guiding element 113b on the left side), then ending into the door 103a and making the desired connection.

[0105] Appropriate clearances are allowed between the various mobile elements to ensure that the door 103 will open and close accurately, without encountering any obstacles or resistance which might jeopardize the integrity of the system.

[0106] Likewise, appropriate clearances and tolerances allowing the door to open and close properly will also have to be provided in the cabinet 102, along the path of the flexible tubular element; such clearances will have to be determined on the basis of specific design choices and, most importantly, of the flexibility and durability of the tubular element.

[0107] According to a particular aspect of the present invention, the refrigerating appliance comprises a flexible tubular element 112 inserted along a trajectory extending between the guiding axis 115 and the axis of rotation 111.

[0108] According to a further particular aspect of the present invention, the refrigerating appliance comprises a guiding element 113 adapted to be reversibly accommodated 113b on a right side or on a left side of the cabinet 102, wherein the length of the flexible tubular element 112 is such that it can run on the right side or on the left side, respectively, depending on the opening direction of the door 103 about the axis of rotation 111.

[0109] Figure 8 schematically shows a refrigerator 201.

[0110] Said refrigerator 201 comprises a cabinet 202 placed on a base laid on the ground; typically, the walls of the cabinet comprise a thick layer of thermoinsulating material to ensure that the operating temperatures are maintained.

[0111] The refrigerator 201 comprises two refrigeration cells, one of which is used for fresh food and is arranged in the upper part of the cabinet 202, while the other one is used for frozen food and is arranged in the lower part of the cabinet 202. The refrigerator 201 comprises two doors; in particular, there is an upper door 203a for the cell for fresh food, and a lower door 203b for the cell for frozen food.

[0112] The doors 203a and 203b of the refrigerator 201 are each connected to the cabinet by means of one or

more hinges, which allow the doors to be opened and closed by the user through a rotary movement about a vertical axis; in the field of refrigerating appliances, hinges of various types are commonly used, which are generally known to those skilled in the art.

[0113] In this non-limiting example of embodiment, the refrigerator 201 comprises a display 204 positioned on the outside of the door 203a. Through the display 204 the user can, for example, control the operation of the refrigerator by setting the operating temperature thereof. In general, a plurality of functions can be executed by means of the display 204 and its user interface, in accordance with the prior art.

[0114] It can therefore be appreciated that the display 204 requires, for its operation, a power connection, and preferably also a signal connection, that connect the display 204 to the main body of the cabinet 202, in which the electric and electronic devices that ensure the proper operation of the refrigerator 201 are typically found.

[0115] It is therefore apparent that the refrigerator 201 comprises a flexible tubular element for an electric cable, which connects the cabinet 202 to the door 203a. Said electric cable may be used, for example, for supplying power to the display 204 and also to a light source mounted on the door 203a and facing towards the inside of the refrigerator, i.e. towards the upper refrigeration cell.

[0116] In the example shown in the drawing, the tubular element is a sheath containing multiple electric wires and/or signal wires for powering and controlling the display 204, e.g. a touchscreen-type display. Alternatively, said tubular element may be, for instance, a pipe carrying a liquid, which connects the cabinet 202 to the door 203a; said pipe may be used, for example, to supply a refrigerated water distributor mounted on the door 203a and facing outwards from the refrigerator. Other possible applications of the flexible tubular element will become apparent to the man skilled in the art in the light of the present description and of the advantages deriving therefrom. Furthermore, alternative embodiments may utilize multiple tubular elements, even different from one another, whether coupled in parallel or not.

[0117] Figure 9 schematically shows the refrigerator 201 with the door 203a open; this drawing clearly shows the path followed by the flexible tubular element, which runs in the highlighted region 205, near the upper hinge of the door 203a.

[0118] The tubular element must therefore be flexible enough to follow the opening and closing movements of the door 203a, which cause it to flex considerably, particularly in the region 205.

[0119] In the preferred embodiment, the display 204 is positioned at the centre of the door 203a, and the flexible tubular element is arranged near the right-hand hinges of the door 203a.

[0120] Since it would be easy to conceive a variant of the refrigerating appliance 201 with left-hand hinges, which would change the opening direction of the door 203a, it is advantageous to provide an embodiment of

the refrigerator 201 wherein the flexible tubular element comprises suitable electric or hydraulic connectors allowing the refrigerator 201 to be easily assembled, whether it has right-hand hinges (as shown in Figure 8) or left-hand hinges (not shown) for the door.

[0121] Figure 10 illustrates in more detail the region 205 of Figure 9, clearly showing the path followed by the flexible tubular element.

[0122] The refrigerator 201 comprises at least one hinge 210 having an axis of rotation 211 to allow the door 203a to rotate relative to the cabinet 202. The axis of rotation 210 is substantially vertical in the normal operating conditions of the refrigerator 201. In a preferred embodiment, the hinge 210 comprises a first hinge element fastened to the cabinet 202 and a second hinge element fastened to the door 203a and mounted on the first hinge element, with the possibility of rotating about the axis 211.

[0123] As previously illustrated, the refrigerator comprises a flexible tubular element 212 that connects the cabinet 202 to further elements (not shown) comprised in the door 203a. In order to protect and guide the tubular element as the door is opened or closed, the refrigerator 1 comprises a guiding element 230.

[0124] In particular, the guiding element 230 comprises a passage element 231 in which the flexible tubular element 212 can pass; said passage element 231 comprises a semi-annular portion having a central axis 232 substantially parallel to the axis of rotation 211 of the hinge 210.

[0125] As aforesaid, the flexible tubular element 212 passes inside the passage element 231, in particular inside the semi-annular portion. Variants of the passage element 231 may have different shapes, e.g. a substantially annular shape.

[0126] The guiding element 231 further comprises a supporting element 233, constrained to the passage element 231. In a preferred embodiment, the supporting element 233 is rigidly constrained, e.g. by means of a plug connection, to the bracket 234 that supports the hinge 210.

[0127] Since the bracket 234 is rigidly constrained to the cabinet 202, the supporting element 233, which is rigidly constrained to the bracket 234 itself, becomes capable of holding the passage element 231 in a fixed position relative to the hinge 210 as the door 203a opens or closes. Furthermore, the flexible tubular element 212, being under the bracket 234 prior to entering into the guiding element 231, follows a trajectory which is substantially perpendicular to the central axis 232, thus creating a first bend of the flexible tubular element 212, which allows to minimize the room occupied by the guiding element 230.

[0128] It must be pointed out that the central axis 232 is substantially parallel, in space, to the axis of rotation 211 of the hinge 210; in other words, it is substantially vertical when the refrigerator 201 is in normal operating conditions. Thanks to the above-specified solution, par-

ticularly to the substantial parallelism between the axis of rotation 211 and the central axis 232, the door 203a can rotate without being hindered by the flexible tubular element 212, resulting in the latter being less at risk of damage.

[0129] Furthermore, since the passage of the tubular element 212 is independent of the structure of the hinge 210, both the passage for the tubular element 212 and the hinges 210 can be more freely designed and positioned in the refrigerator 201.

[0130] In general, the surfaces of the guiding element, such as the surfaces of the passage element 231, are so shaped as to allow the flexible tubular element 212 to slide at least partially, thus not hindering its small settling movements which are necessary during the opening and closing action of the door 203a. In other words, the semi-annular portion has such dimensions as to allow the flexible tubular element to pass, and comprises rounded edges that will not damage or cut the flexible tubular element.

[0131] Preferably, the guiding element 230 is made of plastic material. The passage element 231 and the supporting element 233 may either be made as one piece or else comprise a plurality of elements constrained to one another, e.g. by joining, welding or glueing.

[0132] The guiding element 230 comprises, in the illustrated preferred embodiment, a guiding portion 235 that defines a channel in which the flexible tubular element 212 is housed and runs. The guiding portion 235 is located on the side of the guiding element 230 that faces towards the door 203a, and performs the function of accompanying the flexible tubular element 212 as the door 203a opens or closes. Preferably, the guiding portion 235 comprises retaining means adapted to retain therein the flexible tubular element; for example, the guiding portion 235 comprises resilient elements that hold the flexible tubular element 212 in position and prevent the flexible tubular element 212 from coming out of the channel defined by the guiding portion 235. Alternatively, the retaining means may be protrusions, interference fit couplings, mechanical hooks, clamps or other known retaining means for cables and pipes. The guiding portion 235 is rotatably constrained to the passage element, and is therefore adapted to rotate in a plane perpendicular to the axis of rotation 211, i.e. about the central axis 232, so as to follow the movement of the flexible tubular element 212 as the door 203a opens or closes.

[0133] The width of the channel of the guiding portion 235 is preferably slightly greater than the diameter of the flexible tubular element 212, and its development length along the section of flexible tubular element 212 is preferably equal to at least 5 times the diameter of the flexible tubular element 212; this makes for improved guidance when opening or closing the door 203a.

[0134] The guiding portion 235 is preferably straight.

[0135] In an alternative embodiment (not shown), it is conceivable that the guiding portion has a curvature extending in a plane perpendicular to the central axis 232, or in a plane substantially parallel to the plane of the

annular portion of the passage element 231. Therefore, the curvature of the guiding portion will develop relative to the plane of motion of the guiding element when opening and closing the door. Preferably, the curvature of the guiding portion will be convex outwards, i.e. towards the opening direction of the door 203a. In particular, this curvature will follow, in general, the curvature of the flexible tubular element 212. Figure 11 shows a different view of the solution of Figure 10. In this view one can better appreciate the configuration when the door 203a is closed, and the passage of the flexible tubular element 212 inside the guiding element 230. In particular, it must be pointed out that the flexible tubular element 212 may be composed of several pieces, connected together by means of suitable connections 236a and 236b, whether electric or hydraulic ones, etc.

[0136] Figure 12 shows a view of the refrigerator 201 with the door 203a in the open position, i.e. angled by more than 90° relative to the front surface of the cabinet 202.

[0137] This view does not show, for clarity, the bracket 234 and the hinge 210, in order to highlight the passage of the flexible tubular element 212 inside the guiding element 230. In this view one can appreciate the presence of a further portion 237 of the passage element 231. Said portion 237 is a semi-cylindrical shell wall, which is adapted to further protect the flexible tubular element 212 when the door is open, thus hiding it from sight and reducing the risk of cutting or pinching.

[0138] In this view one can also appreciate the trajectory followed by the flexible tubular element 212 when the door 203a is open. It can be observed that the flexible tubular element 212 has two different curvatures, between the segments that precede and follow its entry into the passage element 231. As already described, such curvatures contribute to creating a compact solution, without however damaging the flexible tubular element, which encounters no obstacles and is prearranged for ensuring the proper closure of the door 203a.

[0139] Figure 13 illustrates in detail the solution of Figure 12, showing the hinge 210 of the door 203a and the supporting bracket 234.

[0140] In this view one can appreciate the bracket 234 that supports the guiding element 230. The bracket 230 is constrained to the cabinet 202 and comprises a profiled flat surface under which the flexible tubular element runs, as previously described.

[0141] A further variation of a refrigerator comprising a guiding device is also conceivable, which will be described below.

[0142] As aforementioned, a refrigerator may be equipped with a door 203a comprising hinges 210 on the right side of the cabinet 202, as shown, or it may be equipped with a different door comprising hinges on the left side of the cabinet 202, depending on the user's requirements and the available room. It is therefore advantageous to offer, in this respect, the possibility of making the door of the refrigerating appliance "reversible". It is

therefore clear that, if one wants to change the door configuration, e.g. from "left-hand" hinges to "right-hand" hinges on the cabinet, it will also be necessary to modify the path of the flexible tubular element, in particular inside the guiding element.

[0143] A guiding element provided in a refrigerator in accordance with the present invention may offer significant advantages in a situation wherein "reversibility" of the refrigerator door is needed.

[0144] A conceivable embodiment of the guiding element 230 would make it possible, in fact, to mount a similar element, thanks to particular symmetries requiring no structural modifications, also on the opposite side of the cabinet of the refrigerator. In this way, the guiding element could be used for guiding the flexible tubular element even when the door opening direction needs to be reversed.

[0145] In fact, a guiding element perfectly analogous to its counterpart (or even the very same element) could be positioned on the opposite side.

[0146] Should the guiding element have to be "reversed", it would nonetheless be possible to prevent the flexible tubular element from falling downwards thanks to means for retaining the guiding portion.

[0147] A guiding element according to the present invention will ensure, therefore, guidance and protection of the flexible tubular element as already described, even if the door is reversed onto hinges mounted on the left side of the cabinet 202.

[0148] In a preferred embodiment, aiming at simplifying the assembly of the refrigerator and the reversal of the door opening direction, the flexible tubular element comprises suitable connectors, as already described with reference to Figure 11.

[0149] In particular, it is advantageous that the flexible tubular element comprises connectors which have such shapes and are arranged in such positions as to allow the flexible tubular element to run, without distinction, on the left side or on the right side of the cabinet.

[0150] For example, the flexible tubular element may have such a length as to arrive in proximity of the centre of the upper edge of the door, by following a path on the right or on the left with respect to the door itself, depending on the side where the door hinges have been positioned. Therefore, the flexible tubular element preferably originates from a cavity formed in the upper central part of the front edge of the cabinet 202, running inside a profile up to the hinges of the door 203a (being guided by the guiding element 213 on the right side or by the guiding element 213b on the left side), then ending into the door 203a and making the desired connection.

[0151] Appropriate clearances are allowed between the various mobile elements to ensure that the door 203a will open and close accurately, without encountering any obstacles or resistance which might jeopardize the integrity of the system.

[0152] Likewise, appropriate clearances and tolerances allowing the door to open and close properly will also

have to be provided in the cabinet 202, along the path of the flexible tubular element; such clearances will have to be determined on the basis of specific design choices and, most importantly, of the flexibility and durability of the tubular element.

[0153] According to a particular aspect, the housing of the guiding portion 235 has a substantially straight extension.

[0154] According to a further particular aspect, the dimension of the housing along the flexible tubular element 212 is equal to at least 5 times the diameter of the flexible tubular element 212.

[0155] According to yet another particular aspect, the guiding element 230 is adapted to be reversibly housed on a right side or on a left side of said cabinet 202, wherein the length of said flexible tubular element 212 is such that it can run on said right or left side, respectively, depending on the opening direction of said door 203a about said axis of rotation 211.

[0156] Figure 14 schematically shows a refrigerator 301 according to the present invention. Said refrigerator 301 comprises a cabinet 302 placed on a base laid on the ground; typically, the walls of the cabinet comprise a thick layer of thermoinsulating material to ensure that the operating temperatures are maintained.

[0157] The refrigerator 301 comprises two refrigeration cells, one of which is used for fresh food and is arranged in the upper part of the cabinet 302, while the other one is used for frozen food and is arranged in the lower part of the cabinet 302. The refrigerator 301 comprises two doors; in particular, there is an upper door 303a for the cell for fresh food, and a lower door 303b for the cell for frozen food.

[0158] The doors 303a and 303b of the refrigerator 301 are each connected to the cabinet through one or more hinges, which allow the doors to be opened and closed by the user through a rotary movement about a vertical axis; in the field of refrigerating appliances, hinges of various types are commonly used, which are generally known to those skilled in the art.

[0159] In this non-limiting example of embodiment, the refrigerator 301 comprises a display 304 positioned on the outside of the door 303a. Through the display 304 the user can, for example, control the operation of the refrigerator by setting the operating temperature thereof. In general, a plurality of functions can be executed by means of the display 304 and its user interface, in accordance with the prior art.

[0160] It can therefore be appreciated that the display 304 requires, for its operation, a power connection, and preferably also a signal connection, that connect the display 304 to the main body of the cabinet 302, in which the electric and electronic devices that ensure the proper operation of the refrigerator 301 are typically found.

[0161] It is therefore apparent that the refrigerator 301 comprises a flexible tubular element for an electric cable, which connects the cabinet 302 to the door 303a. Said electric cable may be used, for example, for supplying

power to the display 304 and also to a light source mounted on the door 303a and facing towards the inside of the refrigerator, i.e. towards the upper refrigeration cell.

[0162] In the example shown in the drawing, the tubular element is a sheath containing multiple electric wires and/or signal wires for powering and controlling the display 304, e.g. a touchscreen-type display. Alternatively, said tubular element may be, for instance, a pipe carrying a liquid, which connects the cabinet 302 to the door 303a; said pipe may be used, for example, to supply a refrigerated water distributor mounted on the door 303a and facing outwards from the refrigerator. Other possible applications of the flexible tubular element will become apparent to the man skilled in the art in the light of the present description and of the advantages deriving therefrom. Furthermore, alternative embodiments of the present invention may utilize multiple tubular elements, even different from one another, whether coupled in parallel or not.

[0163] Figure 15 shows a first view (a) of the refrigerator 1 with the door 303a open; this drawing shows more clearly the path followed by the flexible tubular element, which runs in the region near the upper hinge, highlighted by dashed circles.

[0164] The tubular element must therefore be flexible enough to follow the opening and closing movements of the door 303a, which cause it to flex considerably, particularly in the region near the hinges.

[0165] Figure 15 shows a second view (b) of a refrigerator 301b, which partially corresponds to the refrigerator 301, since it has an identical cabinet 302; however, the refrigerator 1b differs in that, unlike the refrigerator 301 having right-hand hinges, in this case the hinges are mounted on the left side.

[0166] Therefore, the refrigerator 301b is the result of a reversal of the door opening direction; in fact, the door 303c and the door 303d open in the direction opposite to that of their counterparts 303a and 303b of the refrigerator 301.

[0167] It follows that the refrigerator 301 and the refrigerator 301b, in accordance with the present invention, utilize different door opening solutions, respectively 303a and 303c, with hinges on the right side or on the left side of the cabinet 302, depending on the user's requirements and on the available room. It is therefore advantageous to offer, in this respect, the possibility of making the opening direction of the door of the refrigerating appliance "reversible".

[0168] It is therefore apparent that, in order to change the door configuration, e.g. from "left-hand" hinges in the refrigerator 301b to "right-hand" hinges in the refrigerator 301, it will also be necessary to modify the path of the flexible tubular element.

[0169] Figure 16 illustrates in detail a solution for the passage of the flexible tubular element 312 in a refrigerating appliance 301 according to the present invention, and exemplifies important advantages obtained in a situation wherein "reversibility" of the opening direction of

the door of the refrigerator 301 is needed, e.g. in order to obtain the configuration of the refrigerator 301b.

[0170] The flexible tubular element 312 is inserted in the cabinet 302 in a central portion 340 of the front panel of the cabinet 302, centrally relative to the left and right sides thereof. The length of the flexible tubular element 312 is such that it runs along a path extending from the central portion 340 to the hinge 310, whether on the left side or on the right side of the cabinet 302.

[0171] The hinge 310 has an axis of rotation that allows the door 303a to rotate relative to the cabinet 302. The axis of rotation of the hinge 310 is substantially vertical in the normal operating conditions of the refrigerator 301. In a preferred embodiment, the hinge 310 comprises a first hinge element fastened to the cabinet 302 and a second hinge element fastened to the door 303a and mounted on the first hinge element, with the possibility of rotating about the axis of rotation.

[0172] Preferably, the refrigerating appliance comprises at least one guiding element 341 in the proximity of the hinge 310, for guiding and protecting the flexible tubular element as it passes near the hinge 310, which is a particularly stressed area, as already described.

[0173] The guiding element 341 positioned on the right side can be reversibly accommodated also on the left side of the cabinet 302. A preferred embodiment of the guiding element 341, shown in the drawing, allows, in fact, to mount the same element designated by reference 342, with no structural modifications, also on the opposite side of the cabinet, i.e. on the left side, for guiding in that position the flexible tubular element 312 in the event that the opening direction of the door 303a should be reversed to obtain the configuration of the door 303c.

[0174] Figure 16 exemplifies this possibility, representing a configuration of the refrigerator 301 that, though it has little practical importance, is well representative of the flexibility and of the advantages of this solution. The guiding element 341 mounted towards the right side of the cabinet 302, near the door 303a, acts as a guide for the flexible tubular element 312 as described above.

[0175] A guiding element 342 perfectly analogous to the element 341 can be positioned on the opposite side, i.e. the left side of the cabinet 302. The guiding element 342 therefore corresponds exactly to the guiding element 341, but it has been "reversed" to take a configuration that allows guiding the flexible tubular element 312 also on the other side of the cabinet.

[0176] The guiding element 341 or 342 preferably comprises inside a guiding fulcrum and, additionally, a support that defines a surface adapted to support the flexible tubular element. Furthermore, the guiding element 341 or 342 comprises a guiding portion for housing and guiding at least one segment of the flexible tubular element 312.

[0177] The flexible tubular element 312 comprises two respective connectors 343 and 344, e.g. hydraulic or electric ones, which define multiple lengths thereof for simplifying the assembly of the refrigerator and the re-

versal of the door opening direction. In particular, it is advantageous that the flexible tubular element comprises connectors which have such shapes and are arranged in such positions as to allow the flexible tubular element to run, without distinction, on the left side or on the right side of the cabinet.

[0178] The connector 343 defines a segment of the flexible tubular element 312 that follows a path from the hinge 310 to a central portion 345 of the door 303a relative to the left side and to the right side. In the preferred embodiment, the display 304 is positioned at the centre of the door 303a, i.e. under the central portion 345.

[0179] The connector 344 defines another segment of the flexible tubular element 312, which follows a path originating from the central portion 345 of the door 303a, up to the connector 343. Therefore, the connectors are located on a segment of the flexible tubular element 312 comprised between the hinge 310 and said central portion 345 of the door 303a.

[0180] The refrigerating appliance comprises a recess 346, located in the cabinet 302 near the central portion 340, which houses at least partially a segment of the flexible tubular element 312, thereby protecting it and facilitating the change of the passage configuration on either side (left or right). Therefore, the flexible tubular element preferably originates from a cavity or recess 346 formed in the upper central part 340 of the front edge of the cabinet 302, running inside a profile up to the hinges of the door 303a (being guided by the guiding element 341 on the right side or by the guiding element 342 on the left side), then ending into the door 303a and making the desired connection.

[0181] Also with reference to the above description of the refrigerating appliance, the present invention further relates to a method for configuring the opening of a door of a refrigerating appliance.

[0182] Said refrigerating appliance comprises a cabinet 302, at least one door 303a and at least one flexible tubular element 312 inserted on one side in the cabinet 302 and on the other side in the door 303a.

[0183] According to this method, the door 303a is connected to the cabinet 302 through at least one hinge 310 allowing the door 303a to rotate about an axis of rotation for opening and closing; the hinge 310 may be provided on a left side or on a right side of the cabinet 302, depending on the desired opening configuration, as represented by the refrigerators 301 and 301b.

[0184] Furthermore, the flexible tubular element 312 is made to follow a path from the central portion 340, in which the flexible tubular element 312 is inserted, to the hinge 310, whether the hinge is on a left side or on a right side of the cabinet 302.

[0185] Preferably, connectors 343 and 344 are provided for connecting a first segment of the flexible tubular element 312, comprised by the central portion 340 of the cabinet 302, to a second segment of said flexible tubular element, comprised by the central portion 345 of the door 303a; the connectors 343 and 344 are comprised be-

tween the hinge 310 and the central portion 345 of the door 33a.

[0186] Preferably, at least one guiding element 341 or 342, for guiding the flexible tubular element 312, is reversibly housed on the left or right side of the cabinet 302 in the proximity of the hinge. Within said guiding element is passed, on either the left side or the right side, depending on the desired opening direction of the door 303, . Preferably, a segment of the flexible tubular element 312 is at least partially housed in a recess 346 formed in the central portion 340 of the cabinet 302.

[0187] Figure 17 illustrates the solution of Figure 16, with the addition of the removable cover 350 on the central portion 340 of the cabinet 302 and of the removable cover on the central portion 345 of the door 303a.

[0188] In fact, the method provides for covering the flexible tubular element 312, which thus becomes invisible, by means of one or both of the removable covers 350 and 351.

[0189] The moulding 351 comprises, in particular, an aperture adapted to allow the flexible tubular element to pass and reach the door 303a, which aperture has such shape and dimensions that also allow the guiding element 341 to be inserted and possibly to rotate.

[0190] In general, appropriate clearances are allowed between the various mobile elements to ensure that the door 303a will open and close accurately, without encountering any obstacles or resistance which might jeopardize the integrity of the system. Likewise, appropriate clearances and tolerances allowing the door 303a to open and close properly will also have to be provided along the path of the flexible tubular element 312 in the cabinet 302; such clearances will have to be determined on the basis of specific design choices and, most importantly, of the flexibility and durability of the tubular element.

[0191] According to a particular aspect of the present invention, the cabinet 302 comprises a recess 346 in said central portion 340, said recess 346 being adapted to house, at least partially, said flexible tubular element 312. According to a further particular aspect of the present invention, the refrigerating appliance comprises at least one removable cover 350 in said central portion 340 of said cabinet 302.

[0192] In brief, the method for configuring the opening of a door of a refrigerating appliance 301, 301b, wherein said refrigerating appliance 301, 301b comprises a cabinet 302, at least said door 303a and at least one flexible tubular element 312 inserted on one side in said cabinet 302 and on the other side in said door 303a, comprises the steps of:

connecting said door 303a to said cabinet 302 through at least one hinge 310 allowing said door 303a to rotate about an axis of rotation for opening or closing, said hinge 310 being provided on a left side or on a right side of said cabinet 302, depending on the desired opening configuration 301, 301b;

running said flexible tubular element 312 along a path extending from a central portion 340 relative to said left side and right side of said cabinet 302, said flexible tubular element 302 being inserted into said central portion 340 up to said hinge 310, whether said hinge 310 is located on said left side or said hinge 310 is located on said right side of said cabinet 302.

[0193] The method preferably comprises the step of: connecting, through at least one connector 343, 344, a first segment of said flexible tubular element 312 running along a path originating from said central portion 340 of said cabinet 302 to a second segment of said flexible tubular element 312 running along a path originating from a central portion 345 of said door 303a relative to a left side and a right side, wherein said connector 343, 344 is located on a segment of said flexible tubular element 312 comprised between said hinge 310 and said central portion 345 of said door 303a.

[0194] The method preferably comprises the further step of: reversibly housing at least one guiding element 341, 342 for guiding said flexible tubular element 312 on said left side or on said right side of said cabinet 302 in the proximity of said hinge 310, in order to run said flexible tubular element 312 within said guiding element 341, 342, respectively on said left side 301b or on said right side 301a, depending on the opening direction of said door 303a. The method preferably further comprises the step of: housing said flexible tubular element 12, at least partially, in a recess 346 of said central portion 340 of said cabinet 302. The method preferably further comprises the step of: covering said flexible tubular element 312 in said central portion 340 of said cabinet 302 by means of at least one removable cover 350. In the light of the description of the present invention relating to preferred and advantageous embodiments thereof, it will be apparent to the man skilled in the art that the invention may be subject to many further modifications and variations.

[0195] For example, guiding elements may also be used for guiding flexible tubular elements for the door 103b, 203b, 303b, i.e. flexible tubular elements arranged at the lower hinges of the door 103a, 203a, 303a.

[0196] Furthermore, refrigerating appliances may be conceived which comprise a plurality of flexible tubular elements connecting the doors to the cabinet, wherein each flexible tubular element has its own guiding element.

[0197] In general, the present invention has been described herein with reference to a refrigerator comprising two doors and two cells. However, this example is not limiting, since the invention may be successfully applied to refrigerating appliances comprising just one cell, just one door, or any number of cells and doors.

Claims

1. A refrigerating appliance (101;301,301b) comprising a cabinet (102;302), at least one door (103a;303a) and at least one flexible tubular element (112;312) inserted on one side in said cabinet (102;302) and on the other side in said door (103a;303a), said door (103a;303a) being connected to said cabinet (102;302) through at least one hinge (110;310) allowing said door (103a;303a) to rotate about an axis of rotation (111) for opening and closing, said hinge (110;310) being provided on a left side (301b) or on a right side (301a) of said cabinet (102;302), wherein said flexible tubular element (112;312) is inserted in said cabinet (102;302) in a central portion (340) relative to said left side and right side, and in that said flexible tubular element (112;312) has such a length as to run along a path extending from said central portion (340) to said hinge (110;310), whether said hinge (110;310) is located on said left side or on said right side of said cabinet (102;302), wherein said flexible tubular element (112;312) comprises at least one connector (113,113b;343,344), wherein said flexible tubular element (112;312) runs along a path extending from said hinge (110;310) to a central portion (345) relative to a left side and a right side of said door (103a;303a), **characterized in that** said connector (343,344) is located on a segment of said flexible tubular element (112;312) comprised between said hinge (110;310) and said central portion (345) of said door (103a;303a) and **in that** said refrigerating appliance (101;301,301b) further comprises at least one guiding element (113,113b;341,342) in the proximity of said hinge (110;310) for guiding said flexible tubular element (112;312), wherein said guiding element (113,113a;341,342) is adapted to be reversibly housed on said left side (342) or on said right side (341) of said cabinet (102;302), wherein the length of said flexible tubular element (112;312) is such as to run in said guiding element (341,342) on said left side (342) or on said right side (341) respectively, depending on the opening direction of said door (103a;303a) about said axis of rotation, the guiding element (113,113b;341,342) comprising: - a guiding fulcrum (114) having a guiding axis (115) around which said flexible tubular element (112) is adapted to at least partially wind when the door (103a) is closed or unwind when the door (103a) is opened; - a support (116) comprising an annular surface substantially perpendicular to the guiding axis (115) which supports the flexible tubular element (112) from below, and a scroll-shaped lateral portion adapted to laterally contain the flexible tubular element (112); and - on the side of the guiding element (113,113a), a guiding portion (117a,117b) that defines a channel in which the flexible tubular element (112) is housed and runs adapted to rotate together with the guiding element about the guiding axis (115).
2. A refrigerating appliance (101;301,301b) according to claim 1, wherein said cabinet (102;302) comprises a recess (346) in said central portion (340), said recess (346) being adapted to house, at least partially, said flexible tubular element (112;312).
3. A refrigerating appliance (101;301,301b) according to any one of claims 1 to 2, further comprising at least one removable cover (350) in said central portion (340) of said cabinet (302).
4. A method for configuring the opening of a door of a refrigerating appliance (101;301,301b) according to any one of claims 1 to 3, wherein said refrigerating appliance (101;301,301b) comprises a cabinet (102;302), at least a door (103a;303a) and at least one flexible tubular element (112;312) inserted on one side in said cabinet (102;302) and on the other side in said door (103a;303a), said method comprising the steps of: connecting said door (103a;303a) to said cabinet (102;302) through at least one hinge (110;310) allowing said door (103a;303a) to rotate about an axis of rotation for opening or closing, said hinge (110;310) being provided on a left side or on a right side of said cabinet (102;302), depending on the desired opening configuration; running said flexible tubular element (112;312) along a path extending from a central portion (340) relative to said left side and right side of said cabinet (102;302), said flexible tubular element (112;312) being inserted into said central portion (340) up to said hinge (110;310), whether said hinge (110;310) is located on said left side or on said right side of said cabinet (102;302), **characterized by** comprising the steps of: - connecting, through at least one connector (343, 344), a first segment of said flexible tubular element (112;312) running along a path originating from said central portion (340) of said cabinet (102;302) to a second segment of said flexible tubular element (112;312) running along a path originating from a central portion (345) of said door (103a;303a) relative to a left side and a right side, wherein said connector (343, 344) is located on a segment of said flexible tubular element (112;312) comprised between said hinge (110;310) and said central portion (345) of said door (103a;303a); - reversibly housing at least one guiding element (113,113b;341,342) for guiding said flexible tubular element (112;312) on said left side or on said right side of said cabinet (102;302) in the proximity of said hinge (110;310), in order to run said flexible tubular element (112;312) within said guiding element (113,113b;341,342), respectively on said left side (301b) or on said right side (301a), depending on the opening direction of said door (303a).

5. A method according to claim 4, further comprising the step of: housing said flexible tubular element (112;312), at least partially, in a recess (346) of said central portion (340) of said cabinet (102;302).
6. A method according to any one of claims 4 to 5, further comprising the step of: covering said flexible tubular element (112;312) in said central portion (340) of said cabinet (102;302) by means of at least one removable cover (350).

Patentansprüche

1. Ein Kältegerät (101; 301,301 b), umfassend ein Gehäuse (102; 302), mindestens eine Tür (103a; 303a) und mindestens ein flexibles rohrförmiges Element (112, 312), welches auf einer Seite in das Gehäuse (102; 302) und auf der anderen Seite in die Tür eingebracht ist, wobei die Tür (103a; 303a) mit dem Gehäuse (102; 302) über mindestens ein Gelenk (110; 310) verbunden ist, welches der Tür (103a; 303a) erlaubt um einen Rotationsachse (111) zum Öffnen und Schließen zu rotieren, wobei das Gelenk (110; 310) an der rechten Seite (301a) oder an der linken Seite (301 b) des Gehäuses (102; 302) angebracht sein kann, wobei das flexible rohrförmige Element (112, 312) in das Gehäuse (102; 302) in einem mittleren Bereich (340) bezüglich der rechten und der linken Seite eingebracht ist, und das flexibel rohrenförmige Element (112, 312) eine Länge aufweist, so dass es sich entlang eines Weges von dem mittleren Bereich (340) zu dem Gelenk (110; 310) erstreckt, je nachdem, ob das Gelenk (110; 310) auf der rechten oder auf der linken Seite des Gehäuses (102; 302) angebracht ist, wobei das flexible rohrenförmige Element (112, 312) mindestens ein Verbindungselement (113, 113b; 343, 344) aufweist, wobei das flexible rohrenförmige Element (112; 312) sich entlang eines Weges von dem Gelenk (110; 310) zu einem mittleren Bereich (345) bezüglich der linken und der rechten Seite der Tür (103a; 303a) erstreckt, **dadurch gekennzeichnet, dass** das Verbindungselement (343, 344) in einem Bereich des flexiblen rohrenförmigen Elements (112; 312) angebracht ist, eingeschlossen zwischen dem Gelenk (110; 310) und dem mittleren Bereich (345) der Tür (130a; 303a) und dadurch, dass das Kühlgerät (101; 301,301 b) weiterhin mindesten ein Führungselement (113, 113b; 341, 342) in der Nähe des Gelenks (110; 310) zum Führen des flexiblen rohrenförmigen Elements (112; 312) aufweist, wobei das Führungselement (113, 113b; 341, 342) dazu geeignet ist reversibel in der linken Seite (342) oder der rechten Seite (341) des Gehäuses (102; 302) untergebracht zu sein, wobei das flexible rohrenförmige Element (112; 312) eine Länge aufweist, derart, dass es durch das Führungselement (341, 342)

entsprechend auf der linken Seite (342) oder auf der rechten Seite (341) führt, abhängig von der Öffnungsrichtung der Tür (103a; 303a) um die Rotationsachse, das Führungselement (113, 113b; 341, 342) umfassend: einen Führungsdrehpunkt (114), welcher eine Führungsachse (115) aufweist, um die sich das flexible rohrenförmige Element (112) zumindest teilweise wickeln kann, wenn die Tür (103 a) geschlossen wird, oder abwickeln kann, wenn die Tür (103 a) geöffnet wird; - eine Stütze (116), welche eine ringförmige Oberfläche im Wesentlichen senkrecht zur Führungsachse (115), welche das flexibel rohrenförmige Element (112) von unten stützt, und einen schraubenförmigen Seitenabschnitt, welcher das flexible rohrenförmige Element (112) seitlich aufnehmen kann; und - auf einer Seite des Führungselements (113, 113a), ein Führungsteil (117a, 117b), das einen Kanal definiert, in dem das flexibel rohrenförmige Element (112) untergebracht ist und läuft, sodass es zusammen mit dem Führungselement um die Führungsachse rotieren kann (115).

2. Ein Kältegerät (101; 301,301 b) gemäß Anspruch 1, wobei das Gehäuse (102; 302) eine Aussparung (346) in dem mittleren Bereich (340) umfasst, wobei die Aussparung (346) dazu geeignet ist, das flexible rohrenförmige Element (112; 312) zumindest teilweise aufzunehmen.
3. Ein Kältegerät (101; 301,301 b) gemäß einem der Ansprüche 1 oder 2, weiter umfassend mindestens eine abnehmbare Abdeckung (350) in dem mittleren Bereich (340) des Gehäuses (302).
4. Ein Verfahren zum Einstellen des Öffnens einer Tür eines Kühlgerätes (101; 301, 301 b) gemäß einem der Ansprüche 1 bis 3, wobei das Kühlgerät (101; 301, 301 b) ein Gehäuse (102; 302), mindestens eine Tür (103a; 303a) und mindesten ein flexibles rohrenförmiges Element (112; 312), welches auf einer Seite in das Gehäuse (102; 302) und auf der anderen Seite in die Tür (133 a; 303 a) eingebracht ist, umfasst, wobei das Verfahren folgenden Schritte umfasst: Verbinden der Tür (133a; 303a) mit dem Gehäuse (102; 302) durch mindestens ein Gelenk (110; 310), welches der Tür (102a; 303a) erlaubt, zum Öffnen und Schließen um einen Rotationsachse zu rotieren, wobei das Gelenk (110; 310) auf der rechten oder auf der linken Seite des Gehäuses (102; 302) vorgesehen ist, abhängig von der gewünschten Öffnungseinstellung; Führen des flexiblen rohrenförmigen Elements (112; 312) entlang eines Weges von einem mittleren Bereich (340) bezüglich der linken Seite und der rechten Seite des Gehäuses (102; 302), wobei das flexible rohrenförmige Element (112; 312) in den mittleren Bereich (340) bis zu dem Gelenk (110, 310) eingebracht ist, **dadurch gekennzeichnet, dass** folgende Schritte umfasst sind:

- Verbinden, durch mindestens ein Verbindungselement (343; 344), eines ersten Teils des flexiblen röhrenförmigen Elements (112; 312) welches entlang eines Weges ausgehend von dem mittleren Bereich (340) des Gehäuses (102; 302) zu einem zweiten Bereich des flexiblen röhrenförmigen Elements (112; 312) welches entlang eines Weges ausgehend von dem mittleren Bereich (345) der Tür (103a; 303a) bezüglich ihrer rechten und der linken Seite verläuft, wobei das Verbindungselement (343, 344) in einem Bereich des flexiblen röhrenförmigen Elements (112; 312) angebracht ist, der sich zwischen dem Gelenk (110; 310) und dem mittleren Bereich (345) der Tür (103a; 303a) befindet;
- reversibles Unterbringen mindestens eines Führungselements (113, 113b; 341, 342) zum Führen des flexiblen röhrenförmigen Elements (112; 312) auf der linken Seite oder der rechten Seite des Gehäuses (102; 302) in der Nähe des Gelenks (110; 310), um das flexible röhrenförmige Element (112; 312) in dem Führungselement (113, 113b; 341, 342) auf der linken Seite (301 b) oder auf der rechten Seite (301a), abhängig von der Öffnungsrichtung der Tür (303a), zu führen.
5. Ein Verfahren gemäß Anspruch 4, weiter umfassend den Schritt: Unterbringen des flexiblen röhrenförmigen Elements (112; 312), zumindest teilweise, in einer Aussparung (346) des mittleren Bereiches (340) des Gehäuses (102; 302).
6. Ein Verfahren gemäß einem der Ansprüche 4 bis 5, weiter umfassend den Schritt: Abdecken des flexiblen röhrenförmigen Elements (112, 312) in dem mittleren Bereich (340) des Gehäuses (102; 302) durch mindestens eine abnehmbare Abdeckung (350).

Revendications

1. Appareil frigorifique (101 ; 301, 301b) comprenant une caisse (102 ; 302), au moins une porte (103a ; 303a) et au moins un élément tubulaire flexible (112 ; 312) inséré sur un côté dans ladite caisse (102 ; 302) et sur l'autre côté dans ladite porte (103a ; 303a), ladite porte (103a ; 303a) étant raccordée à ladite caisse (102 ; 302) par au moins une charnière (110 ; 310) permettant à ladite porte (103a ; 303a) de tourner autour d'un axe de rotation (111) pour s'ouvrir et se fermer, ladite charnière (110 ; 310) étant prévue sur un côté gauche (301b) ou sur un côté droit (301a) de ladite caisse (102 ; 302), dans lequel ledit élément tubulaire flexible (112 ; 312) est inséré dans ladite caisse (102 ; 302) dans une partie centrale (340) par rapport auxdits côtés gauche et droit, et

ledit élément tubulaire flexible (112 ; 312) présente une longueur de nature à passer le long d'un chemin s'étendant de ladite partie centrale (340) à ladite charnière (110 ; 310), que ladite charnière (110 ; 310) soit située sur ledit côté gauche ou sur ledit côté droit de ladite caisse (102 ; 302), dans lequel ledit élément tubulaire flexible (112 ; 312) comprend au moins un raccord (113 , 113b ; 343, 344), dans lequel ledit élément tubulaire flexible (112 ; 312) passe le long d'un chemin s'étendant de ladite charnière (110 ; 310) à une partie centrale (345) par rapport à un côté gauche et un côté droit de ladite porte (103a ; 303a), **caractérisé en ce que** ledit raccord (343, 344) est situé sur un segment dudit élément tubulaire flexible (112 ; 312) compris entre ladite charnière (110 ; 310) et ladite partie centrale (345) de ladite porte (103a ; 303a) et **en ce que** ledit appareil frigorifique (101 ; 310, 301b) comprend en outre au moins un élément de guidage (113, 113b ; 341, 342) à proximité de ladite charnière (110 ; 310) pour guider ledit élément tubulaire flexible (112 ; 312) ; dans lequel ledit élément de guidage (113, 113a ; 341, 342) est adapté pour être logé de façon réversible sur ledit côté gauche (342) ou sur ledit côté droit (341) de ladite caisse (102 ; 302), dans lequel la longueur dudit élément tubulaire flexible (112 ; 312) est de nature à passer dans ledit élément de guidage (341, 342) sur ledit côté gauche (342) ou sur ledit côté droit (341) respectivement, selon la direction d'ouverture de ladite porte (103a ; 303a) autour dudit axe de rotation, l'élément de guidage (113, 113b ; 341, 342) comprenant :

- un pivot d'appui de guidage (114) ayant un axe de guidage (115) autour duquel ledit élément tubulaire flexible (112) est adapté pour au moins partiellement s'enrouler lorsque la porte (103a) est fermée ou se dérouler lorsque la porte (103a) est ouverte ;
- un support (116) comprenant une surface annulaire sensiblement perpendiculaire à l'axe de guidage (115) qui supporte l'élément tubulaire flexible (112) par le dessous, et une partie latérale en forme de rouleau adaptée pour contenir latéralement l'élément tubulaire flexible (112) ; et
- sur le côté de l'élément de guidage (113, 113a), une partie de guidage (117a, 117b) qui définit un canal dans lequel l'élément tubulaire flexible (112) est logé et passe adaptée pour tourner conjointement avec l'élément de guidage autour de l'axe de guidage (115).

2. Appareil frigorifique (101 ; 301, 301b) selon la revendication 1, dans lequel ladite caisse (102 ; 302) comprend un évidement (346) dans ladite partie centrale (340), ledit évidement (346) étant adapté pour loger, au moins partiellement, ledit élément tubulaire flexi-

ble (112 ; 312).

3. Appareil frigorifique (101 ; 301, 301b) selon l'une quelconque des revendications 1 à 2, comprenant en outre au moins un recouvrement amovible (350) dans ladite partie centrale (340) de ladite caisse (302).

4. Procédé de configuration de l'ouverture d'une porte d'un appareil frigorifique (101 ; 301, 301b) selon l'une quelconque des revendications 1 à 3, dans lequel ledit appareil frigorifique (101 ; 301, 301b) comprend une caisse (102 ; 302), au moins une porte (103a ; 303a) et au moins un élément tubulaire flexible (112 ; 312) inséré sur un côté dans ladite caisse (102 ; 302) et sur l'autre côté dans ladite porte (103a ; 303a), ledit procédé comprenant les étapes de : raccordement de ladite porte (103a ; 303a) à ladite caisse (102 ; 302) par au moins une charnière (110 ; 310) permettant à ladite porte (103a ; 303a) de tourner autour d'un axe de rotation pour s'ouvrir ou se fermer, ladite charnière (110 ; 310) étant prévue sur un côté gauche ou sur un côté droit de ladite caisse (102 ; 302), selon la configuration d'ouverture souhaitée ; passage dudit élément tubulaire flexible (112 ; 312) le long d'un chemin s'étendant depuis une partie centrale (340) par rapport auxdits côté gauche et côté droit de ladite caisse (102 ; 302), ledit élément tubulaire flexible (112 ; 312) étant inséré dans ladite partie centrale (340) jusqu'à ladite charnière (110 ; 310), que ladite charnière (110 ; 310) soit située sur ledit côté gauche ou sur ledit côté droit de ladite caisse (102 ; 302), **caractérisé en ce qu'il** comprend les étapes de :

- raccordement, par au moins un raccord (343, 344), d'un premier segment dudit élément tubulaire flexible (112 ; 312) passant le long d'un chemin issu de ladite partie centrale (340) de ladite caisse (102 ; 302) jusqu'à un second segment dudit élément tubulaire flexible (112 ; 312) passant le long d'un chemin issu d'une partie centrale (345) de ladite porte (103a ; 303a) par rapport à un côté gauche et un côté droit, dans lequel ledit raccord (343, 344) est situé sur un segment dudit élément tubulaire flexible (112 ; 312) compris entre ladite charnière (110 ; 310) et ladite partie centrale (345) de ladite porte (103a ; 303a) ;
- logement de façon réversible d'au moins un élément de guidage (113, 113b ; 341, 342) pour guider ledit élément tubulaire flexible (112 ; 312) sur ledit côté gauche ou sur ledit côté droit de ladite caisse (102 ; 302) à proximité de ladite charnière (110 ; 310), afin de faire passer ledit élément tubulaire flexible (112 ; 312) au sein dudit élément de guidage (113, 113b ; 341, 342), respectivement sur ledit côté gauche (301b) ou

sur le côté droit (301a), selon la direction d'ouverture de ladite porte (303a).

5. Procédé selon la revendication 4, comprenant en outre l'étape de : logement dudit élément tubulaire flexible (112 ; 312), au moins partiellement, dans un évidement (346) de ladite partie centrale (340) de ladite caisse (102 ; 302).
6. Procédé selon l'une quelconque des revendications 4 à 5, comprenant en outre l'étape de : recouvrement dudit élément tubulaire flexible (112 ; 312) dans ladite partie centrale (340) de ladite caisse (102 ; 302) au moyen d'au moins un recouvrement amovible (350).

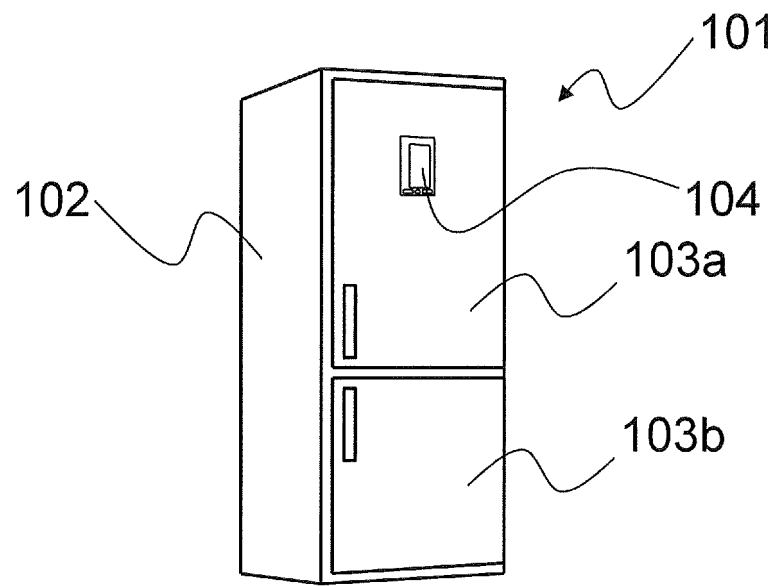


FIG. 1

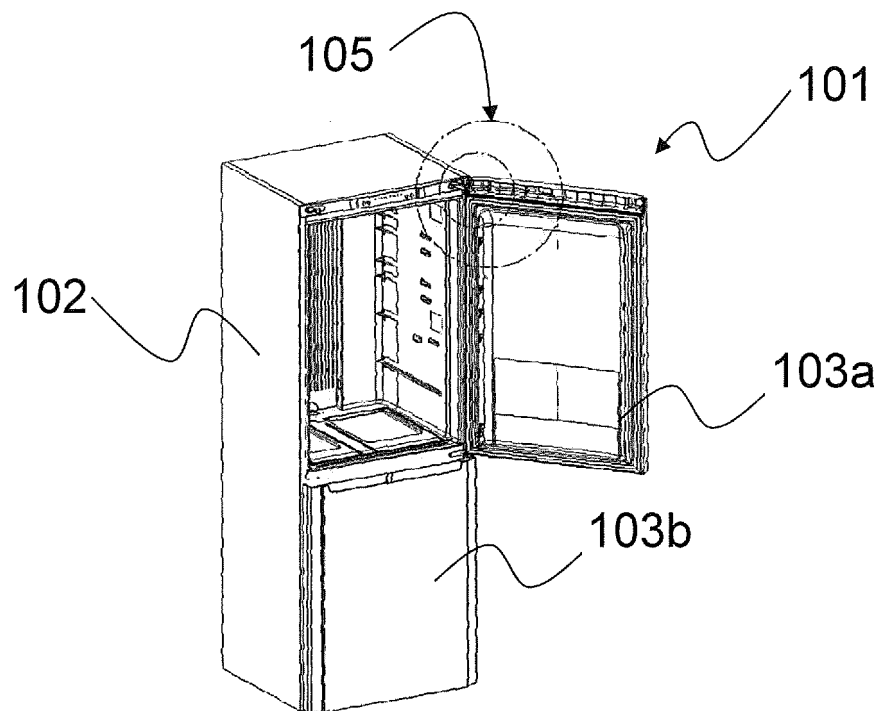


FIG. 2

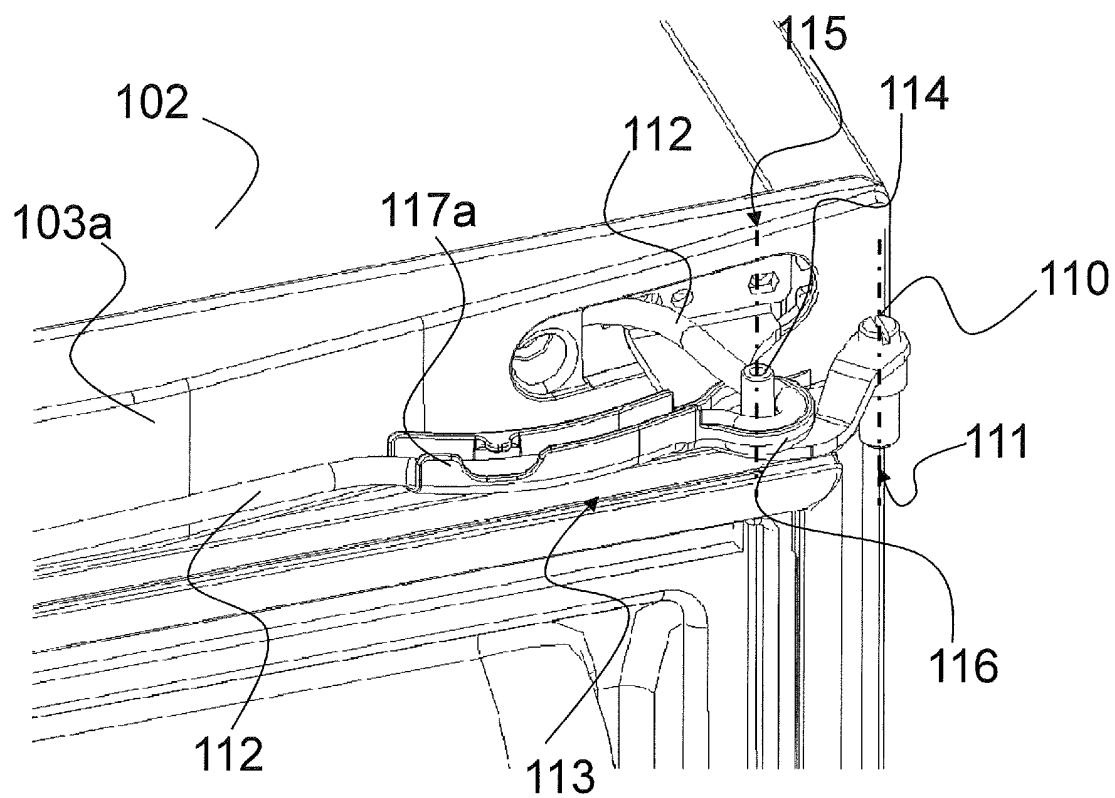


FIG. 3

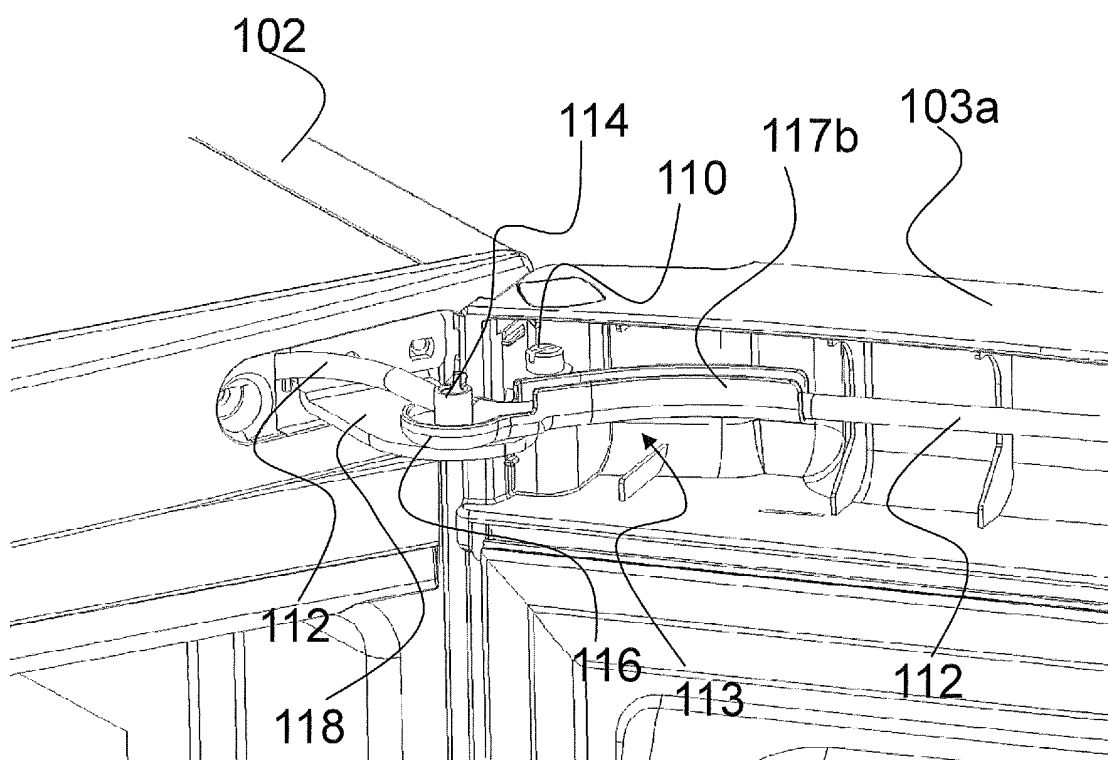


FIG. 4

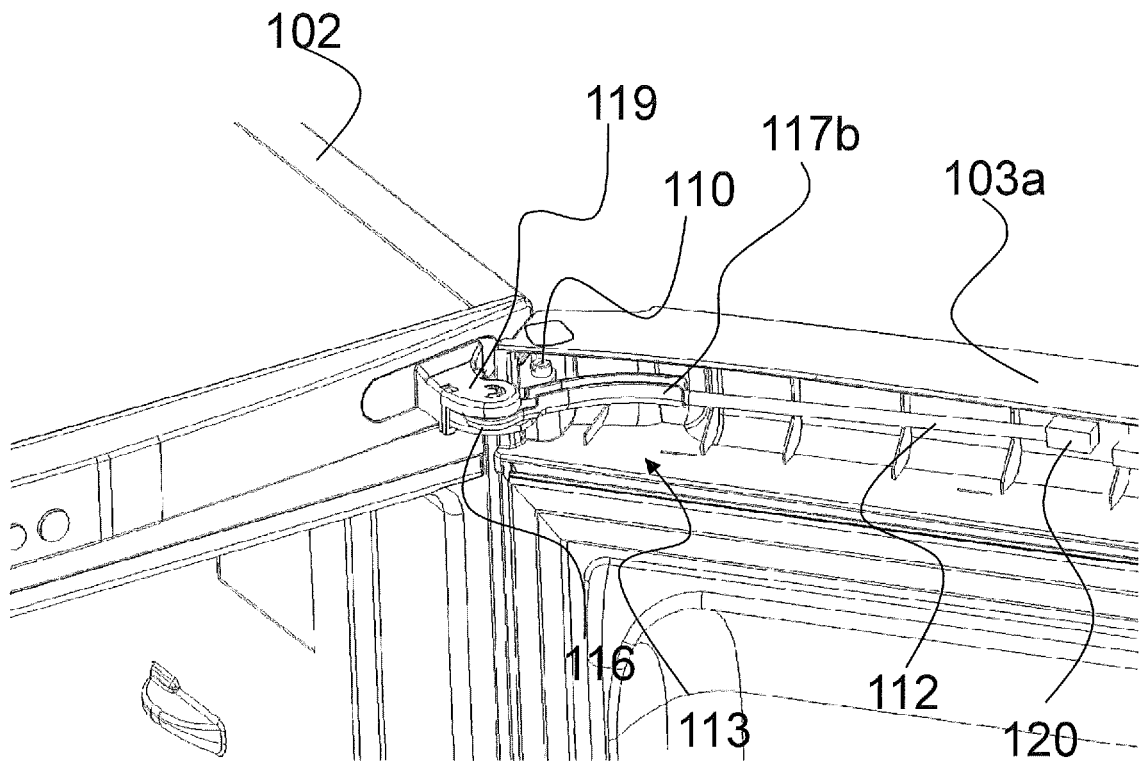


FIG. 5

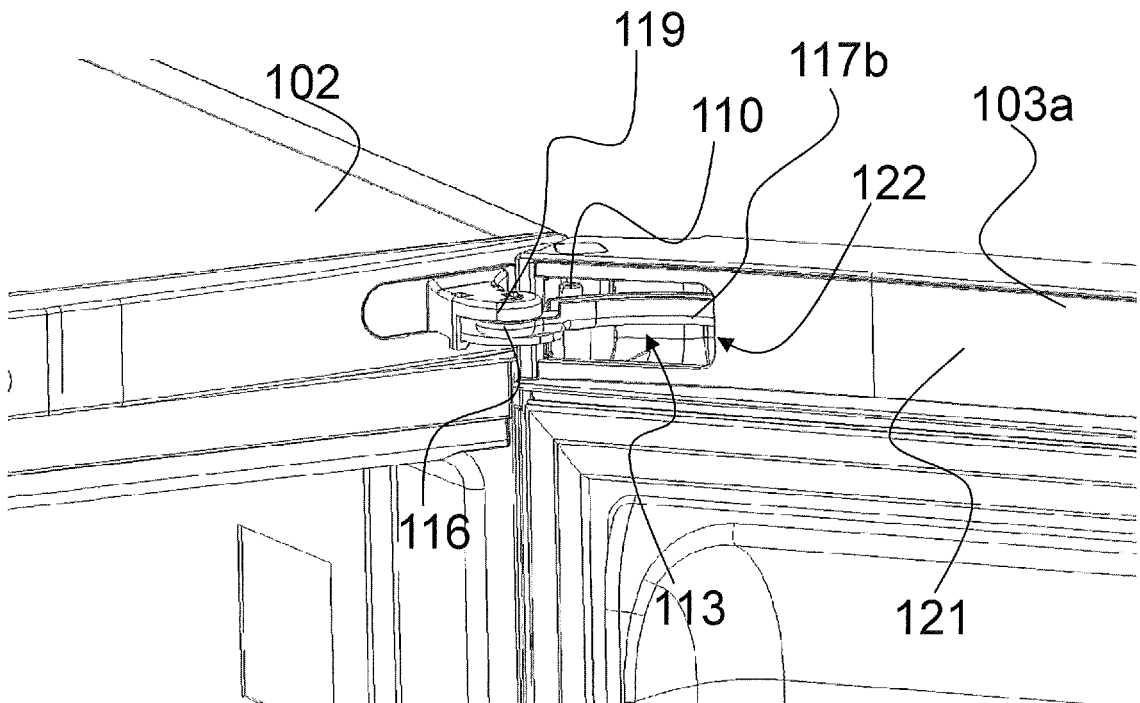


FIG. 6

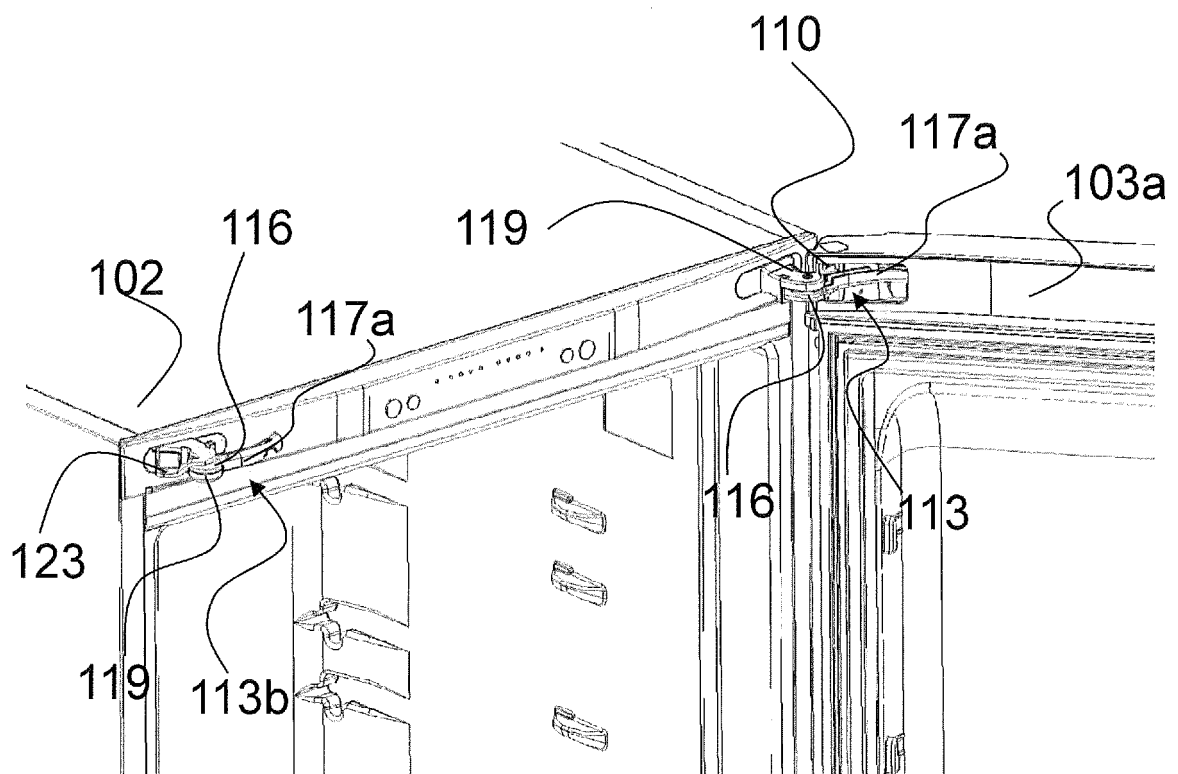


FIG. 7

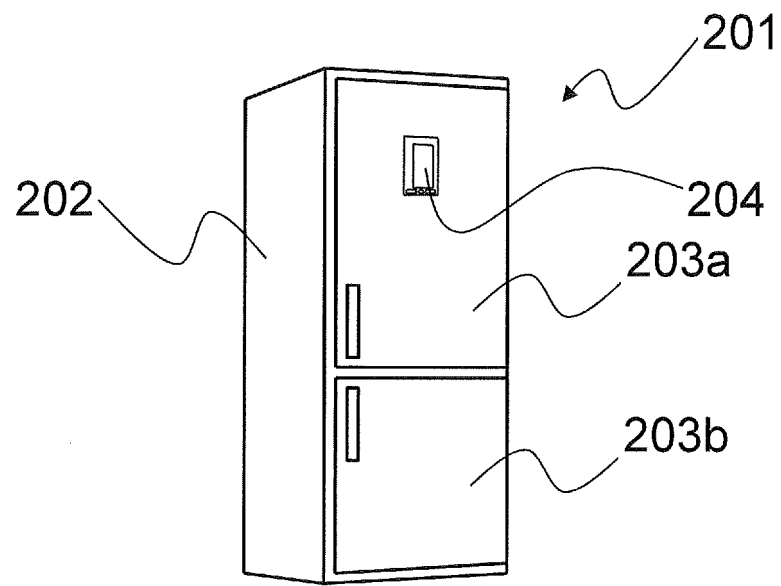


FIG. 8

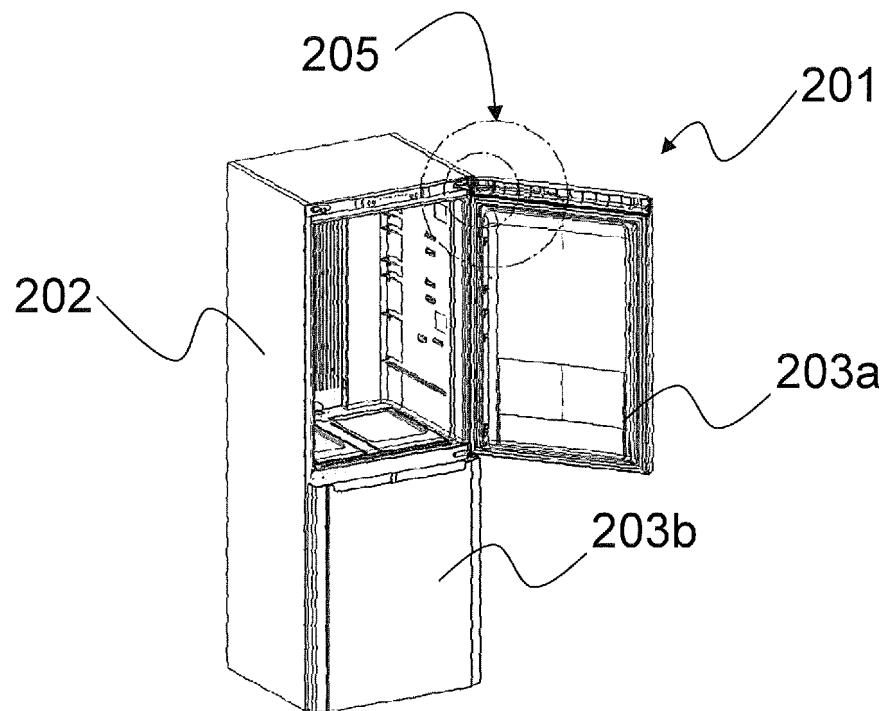


FIG. 9

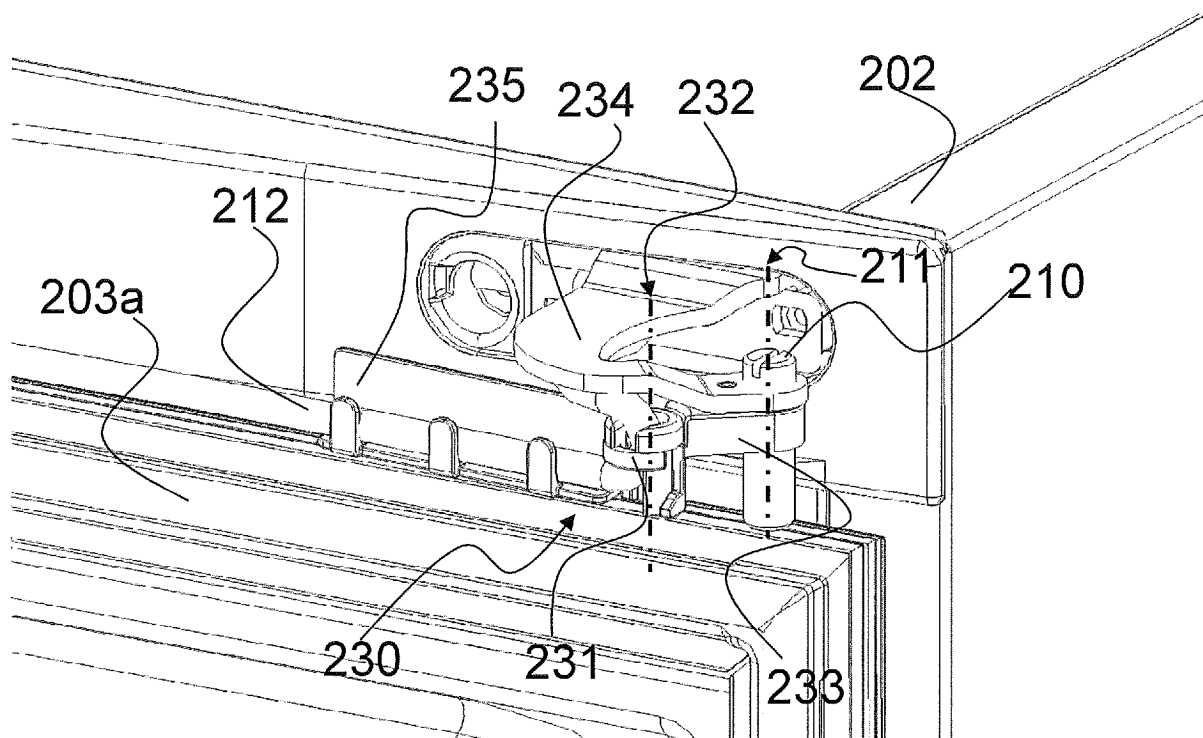


FIG. 10

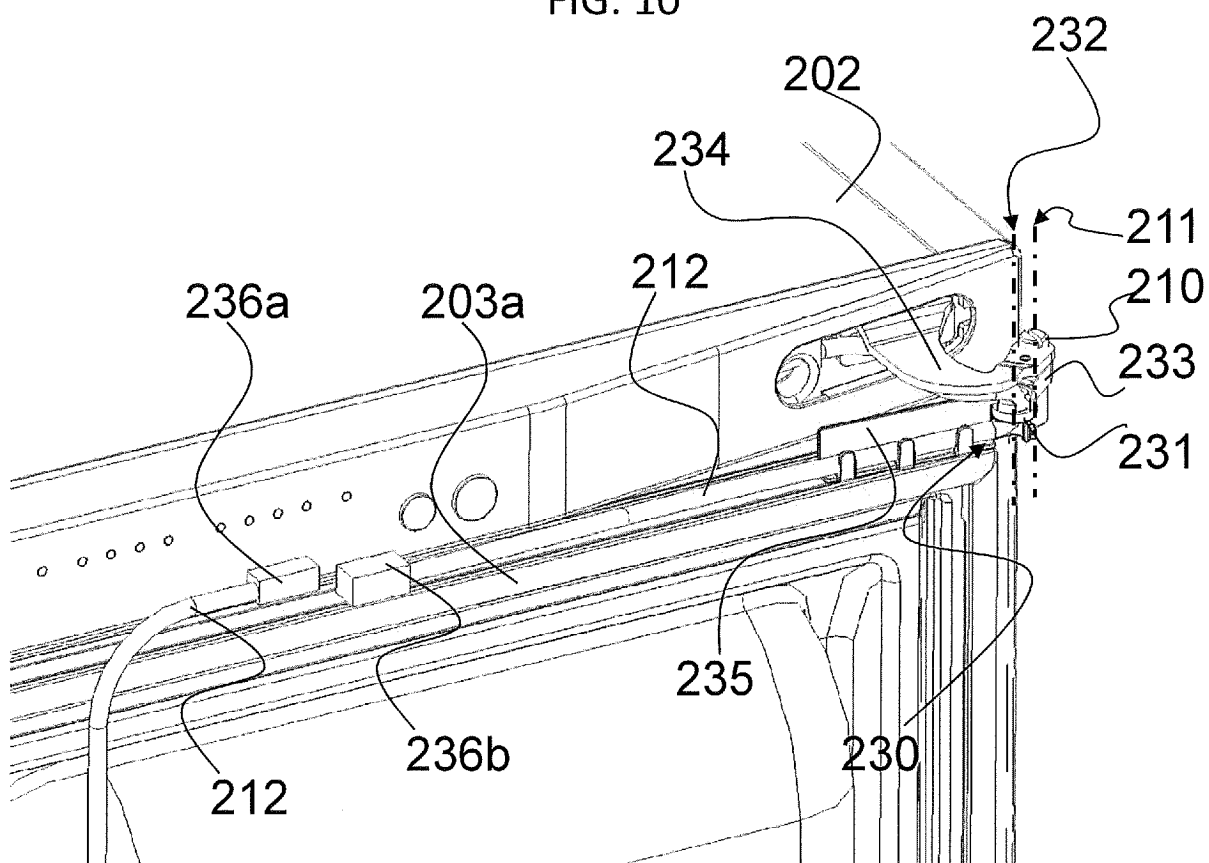


FIG. 11

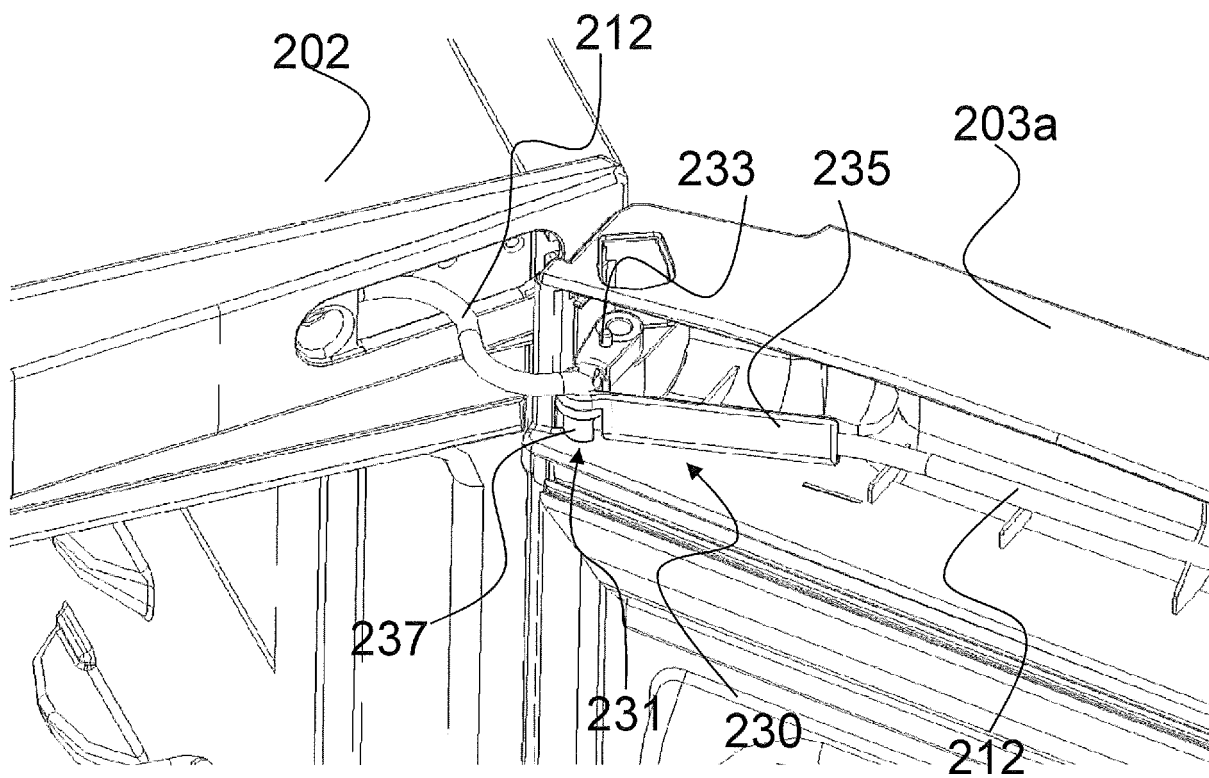


FIG. 12

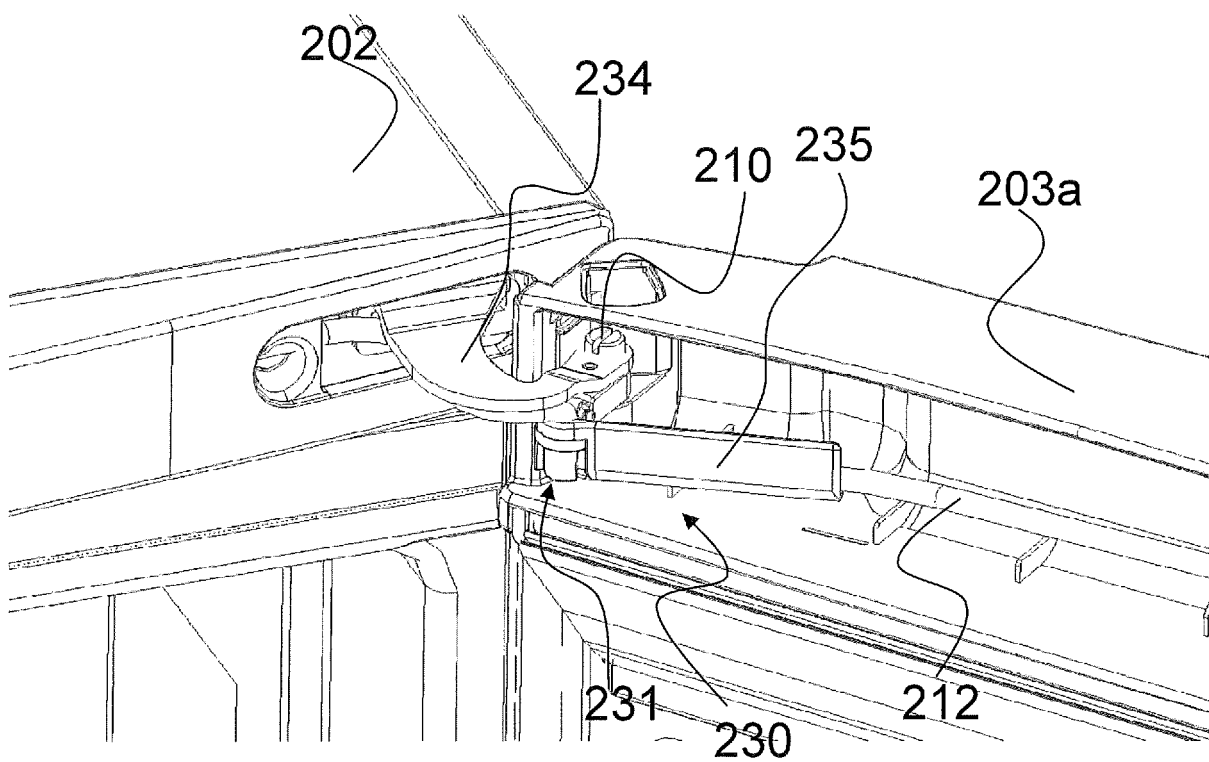


FIG. 13

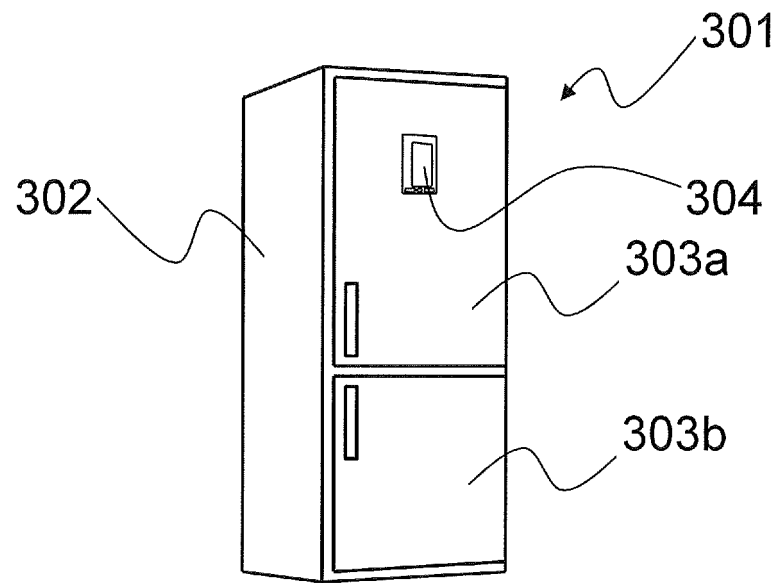


FIG. 14

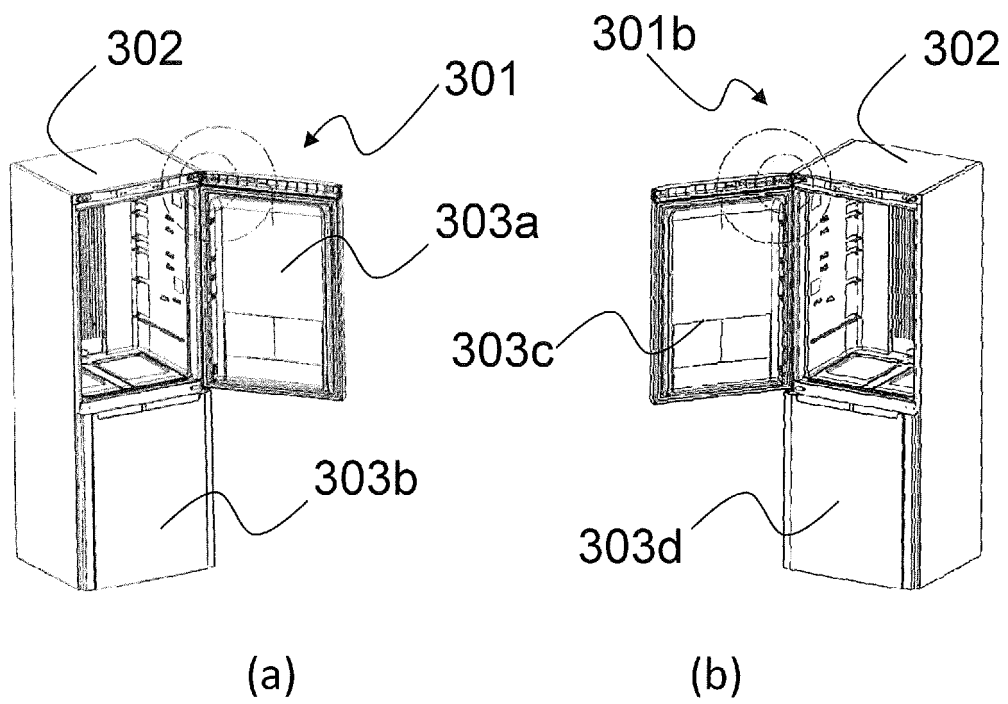


FIG. 15

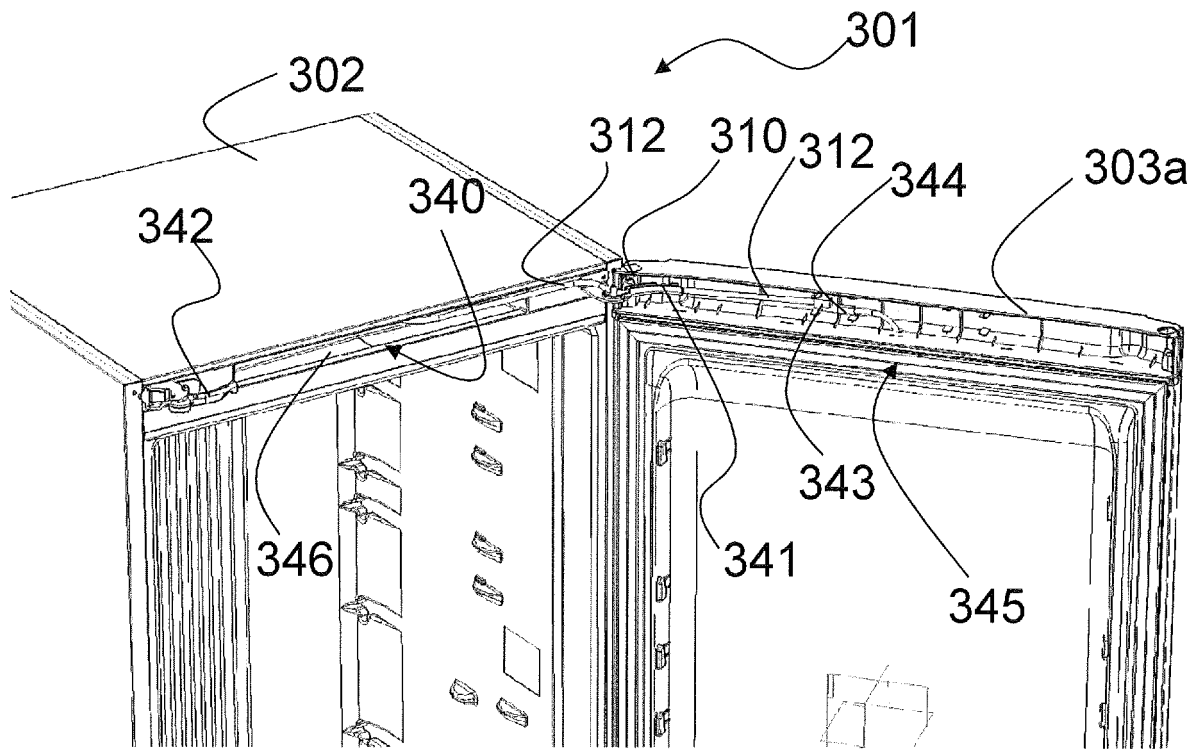


FIG. 16

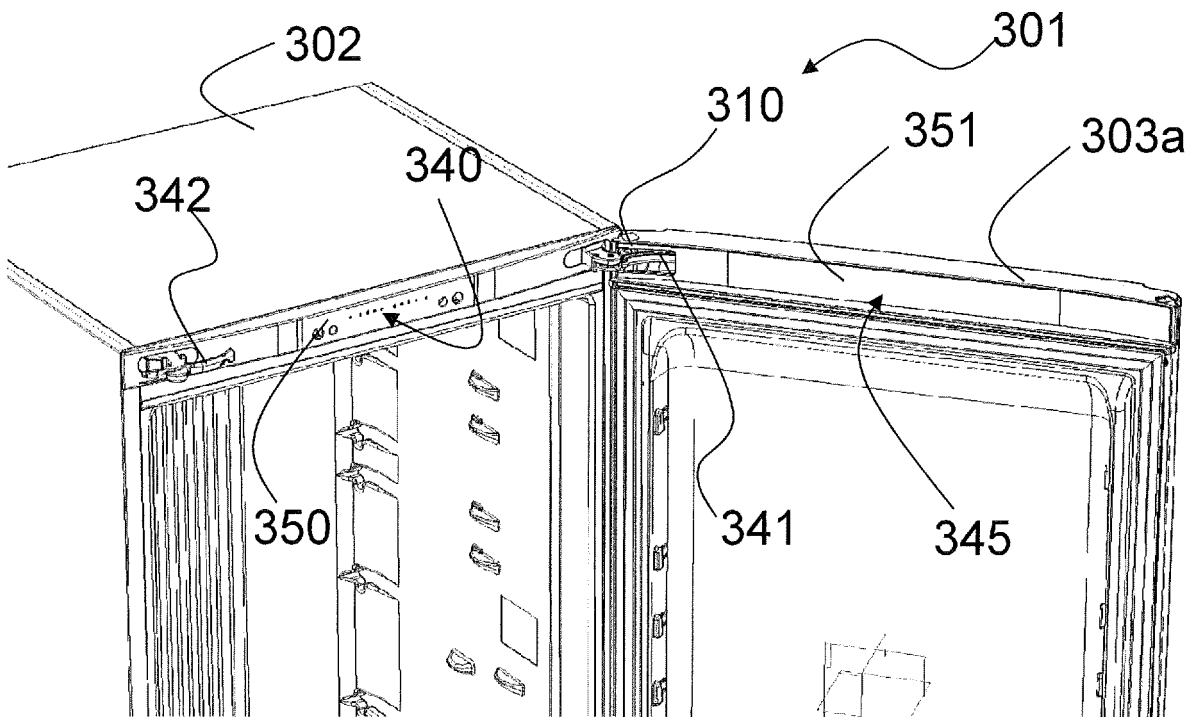


FIG. 17

REFERENCES CITED IN THE DESCRIPTION

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