ABSTRACT OF THE DISCLOSURE

A door for a relatively large cabinet such as a large refrigerator or freezer, particularly of the walk-in type, is hinged at the top and bottom at one vertical edge to swing between open and closed positions, and a torque rod is arranged in the pivot axis of the hinges and is fixed at its respective ends to the cabinet and to the door so that the swinging of the door to open position builds up a torque in the torque rod so that the door is self-closing when released.

SUMMARY OF THE INVENTION

Top and bottom aligned hinges connect the refrigerator or similar door to the top and bottom walls of a cabinet so that the door is adapted to swing on a vertical axis. To bias the door to closed position so that it will be self-closing when released, a torque rod is arranged between and in alignment with the hinges. The lower end of the torque rod is fixed with respect to the bottom wall of the cabinet while the upper end is fixed to a block carried by a channel within the door. The relative fixing of the two ends of the rod thus causes a torque to be built up in the rod when the door is opened so that it is self-closing when released. A threaded bushing is mounted in the bottom wall of the cabinet and fixed against movement and is provided with a circular axial recess preferably hexagonal, to receive the lower end of a vertical bar non-circularly shaped. The upper end of the bar is provided with a polygonal recess to receive the lower end of the torque rod. A wrench is adapted to be applied to the bar to turn it to tension the torque rod, and when properly tensioned, a set screw locks the bar against turning.

Below the upper hinge within the channel in which the torque bar is arranged, a block is fixed to the door within the channel and is provided with a short polygonal bar adapted to be fixed to the block by a set screw. Such upper bar is provided at its lower end with an axial recess corresponding in cross-sectional shape to the torque bar and such upper end of the torque bar is thus fixed against turning movement relative to the door. With the upper and lower ends of the torque bar thus fixed against turning movement, respectively, relative to the door and cabinet, opening movement of the door twists the torque bar and thus builds up therein a torque to bias the door to closed position when it is released.

In one form of the invention, the upper hinge member is formed by a vertical hinge pin having a disk at its lower end mounted in a vertical casing closed at its bottom, and a compression spring is arranged between the bottom of such casing and the disk to bias the latter upwardly. The upper end of the upper hinge pin is seated in a socket carried by the top portion of the cabinet to limit its upward movement and effect the hinging of the upper end of the door. When it is desired to remove the door, the door may be swung into open position and lifted. The top edge of the door is spaced beneath the top wall of the cabinet which carries the hinge pin socket. Hence, the door can be raised against the tension of the compression spring to release the lower hinge connection, whereupon the bottom of the door may be swung outwardly and the door lowered to remove the upper hinge pin from its socket.

In a modified form of the invention, a different upper hinge pin arrangement is provided in which the compression spring is omitted. An elongated block is mounted in the upper end of the channel referred to and a polygonal shank is vertically slidable in such block and carries the hinge pin projecting from the upper end thereof. The shank is held in its upper position by a set screw, and a torque rod is provided with a slideable connection with the block. Thus, when the set screw is released, the shank carrying the hinge pin may be lowered to disconnect the hinge from the casing to permit the removal of the door.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a face view of a refrigerator or freezer cabinet;
FIGURE 2 is an enlarged fragmentary vertical sectional view through the upper hinge means and associated elements looking in the same direction as FIGURE 1;
FIGURE 3 is a detail section on line 3—3 of FIGURE 1;
FIGURE 4 is a similar view on line 4—4 of FIGURE 1;
FIGURE 5 is a similar view on line 5—5 of FIGURE 1;
FIGURE 6 is a view similar to FIGURE 2 showing the lower hinge connection;
FIGURE 7 is a detail section on line 7—7 of FIGURE 6;
FIGURE 8 is a similar view on line 8—8 of FIGURE 6;
FIGURE 9 is a fragmentary bottom plan view of the lower hinge arrangement looking in the direction of the arrows on the line 9—9 of FIGURE 6;
FIGURE 10 is an enlarged fragmentary sectional view of the upper and lower hinge connections of a modified form of the invention; and
FIGURE 11 is a detail section on line 11—11 of FIGURE 10.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGURES 1 to 5, inclusive, the numeral 10 designates a cabinet as a whole, preferably but not necessarily, in the form of a large refrigerator or freezer. The cabinet is shown as being provided with a pair of doors 12, each of which is provided with a handle 14 to be pulled to open position about the vertical axis of hinge means to be described.

Referring to FIGURE 2, the numeral 16 designates a horizontal portion of the upper wall 18 of the cabinet connected to one of the side walls 20. The top wall 16 is provided with a downwardly opening threaded socket 22 maintained in position by a jamb nut 24 and receiving the upper end of a vertical hinge pin 26. Beneath the socket 22 is arranged a casing 28 carried by the door 12 and provided with upper and lower walls 30 and 32, the latter of which is threaded into the vertical surrounding wall 34. The bottom wall is provided with a polygonal projection 36 to be engaged by a wrench to turn it upwardly into position. The lower end of the hinge pin 26 is provided with a disk or flange 38 urged upwardly by a compression spring 40, the lower end of which engages the bottom wall 36. Thus, the hinge pin is normally urged to its upper limit of movement as shown in FIGURE 2.

The door 12 is shown as being provided with upper and lower walls 42 and 44 and spaced inner and outer side walls 46 and 48, the latter of which define there between a channel 50 open at one side as at 52 (FIGURE 4). The casing 28 is arranged above the upper end of the channel 50 as shown in FIGURE 2.

The principal subject matter of the present invention comprises a torque rod 54 of polygonal cross-sectional
A vertical bar or securing member 56 is provided with a polygonal opening corresponding in shape to the cross-sectional shape of the torque rod and receiving the upper end thereof. The bar 56 is fixed by a set screw 58 to block 60 anchored to the walls 46 and 48 within the channel 50. Accordingly, the upper end of the torque rod is fixed against rotation relative to the door 12.

The mounting for the bottom of the door is shown in FIGURES 6 to 9, inclusive. A vertical bar 62 is provided with a polygonal socket 64 receiving the lower end of torque rod 54. The bar 62 has a hexagonal lower end 66 extending downwardly through a washer 68 engaging the bottom wall 70 of the door 12, this wall being spaced beneath an upper wall 72. The upper portion of the bar 62 may be of circular cross-section and serves as a hinge pin within an opening 74 in the bottom wall 70 of the door.

The bottom wall 70 rests on the washer 68 which, in turn, bears upon a vertical bushing 78 threaded in the bottom wall 80 of the cabinet. The bushing 78 is provided with an upper head 82 seating on the bottom wall 80 and is provided at its lower end with a nut 84 threaded thereon to clamp the bushing in position very lightly and to fix it against turning movement. The bushing 78 is provided in its upper end with a circular axial recess 86 in which the hexagonal lower end of the bar 62 is arranged, and the bushing head 82 is provided preferably with an Allen screw 88 adapted to engage one of the faces of the hexagonal end 66 to prevent turning movement thereof.

In FIGURES 10 and 11 of the drawings, a modified form of the invention is shown in which the torque rod and the lower door mountings may be identical with these elements previously described. Accordingly, these elements are indicated with the same reference characters as in FIGURES 6, 7 and 8. In the modified form of the invention the spring mounting (FIGURE 2) for the upper hinge pin has been eliminated. Referring to FIGURES 10 and 11, the torque rod 54 is provided at its upper end with a transverse pin 90 detachable in a vertical slot 92 in a vertically slidable rod 94 which is preferably square in cross-section. The rod 94 is mounted in a sleeve 96 which may be square in cross-section, as shown in FIGURE 11, and mounted in the channel 50 of the door 12. The bar 92 is held in its upper position by a set screw 98 threaded in the interior of the sleeve 96. The upper end of the bar 94 is normally seated against the bottom of the top wall 42 of the door and is provided with a reduced circular upper end 100 rotatable in a bearing bushing 102 mounted in the upper wall 16 of the cabinet.

OPERATION

The parts of the preferred form of the invention normally occupy the positions shown in FIGURES 2 and 6. It will be understood that each door 12 (FIGURE 1) is provided with identical elements of the character described. Accordingly, the user may grasp either door 14 and swing the associated door to open position, the door swinging from about the common vertical axis of the upper hinge pin 26 and the lower bar 62 (FIGURE 6) forming a hinge pin where it extends through the opening 74.

Torque is normally maintained in the torque rod 54 to bias the associated door to closed position. To tension the torque rod, the set screw 88 is loosened and a wrench, preferably of the ratchet type, is inserted through the bottom portion of the opening 52 (FIGURE 3) to turn the bar 62. With the torque rod thus twisted to provide it with inherent torque, the set screw 88 is tightened against one of the faces of the hexagonal lower end 66 of the bar 62. The upper end of the torque rod is prevented from turning by its engagement in the socket 56 which is fixed against turning movement by the set screw 58. Accordingly, when either door is opened, the torque in the torque rod 54 is increased, and when the door is released, it automatically swings to closed position.

The form of the invention in FIGURES 1 to 9, inclusive, provides means for readily mounting and unmounting either door 12. To place a door in position, it will be tilted inwardly slightly at its lower end toward the cabinet, and the lower end of the bar 62 will be inserted in the socket 86 (FIGURE 6). The upper hinge pin 26 is then depressed downwardly against the loading of the spring 40 whereupon the upper end of the door is moved into position so that the spring 40 will hold hinge pin 26 upwardly to engage in the socket 22. If it is desired to remove the door for any reason, the set screw 88 will be loosened (FIGURE 6) to release the positive connection of the lower end of the bar 62 with the bushing 78. The door may be elevated, and the spring 40 (FIGURE 2) will be compressed. As the door swings upwardly, the lower end 66 of the bar 62 (FIGURE 6) will be lifted out of its socket 86. The lower end of the door then may be swung outwardly and the door dropped to withdraw the upper hinge pin 26 from the socket 22. In the form of the invention shown in FIGURES 10 and 11, the placing and removing of the door may be carried out with equal facility. In the event of the upper hinge pin 90 being removed and the bar 94 dropped, the slot 92 moving downwardly over the transverse pin 90. With the parts in such position, the door may be placed in position by inserting the lower end of the bar 62 in the socket 86. The door is now free to be moved inwardly toward the cabinet to align the upper pin 100 with the opening in the bushing 102. The bar 94 will now be moved upwardly to the position shown in FIGURE 10, whereupon the set screw 98 is tightened to complete the assembly of the parts.

The reverse operation is carried out by loosening the set screw 98 to drop the bar 94, whereupon the top of the door may be moved slightly outwardly from the cabinet and then upwardly to release the lower end of the bar 62 from the socket 86.

Each construction provides a novel arrangement of parts with no exposed door-closing springs. The closing of the door is accomplished by the torque rod 54 which is housed within the channel 50. The torque bar is preferably arranged in the common turning axis of the hinge elements and provides an effective adjustable door-closing force.

I claim:

1. In a door mounting for a cabinet wherein the door is provided with a hinge side having a vertical channel, separate upper and lower hinges and a means for opening and closing the door to the cabinet, and a torque rod within said channel fixed at one end with respect to the door and at its other end with respect to the cabinet whereby the opening of the door will place said rod under torque to exert a force to close the door when the latter is released, said door being provided in said channel below said hinge means with a block fixed to said door and fixed to the upper end of said torque rod to prevent turning movement of the latter relative to said door, said upper hinge means comprising a vertical hinge pin, the top of said cabinet having a bearing for said hinge pin, and means for supporting said hinge pin for downward vertical movement to release it from said bearing, the mounting of the lower hinge means being such that the elevation of the door will disconnect said lower hinge means whereby when said hinge pin is lowered, the top portion of the door may be swung outwardly from the cabinet and the door elevated to disconnect said lower hinge means whereby removal of the door from the cabinet, the means for supporting said hinge pin for downward movement comprising a vertical polygonal bar connected to and projecting downwardly from said hinge pin into said channel, a guide in said channel having an opening corresponding in shape to the cross-sectional shape of said bar, a set screw maintaining said bar in its upper operative position, the loosening of said set screw providing for downward movement of said bar and said hinge pin to free the lat-
5 ter from the cabinet, the lower end of said bar being pro-
vided with a vertical slot, the upper end of said torque rod
having a transverse pin slidably in said slot to allow for
downward movement of said bar and said hinge pin when
said set screw is loosened.

<table>
<thead>
<tr>
<th>Patent Number</th>
<th>Date</th>
<th>Inventor(s)</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,331,159</td>
<td>7/1967</td>
<td>Cooke et al.</td>
<td>49—386 XR</td>
</tr>
<tr>
<td>3,365,747</td>
<td>1/1968</td>
<td>Barroero</td>
<td>49—386 XR</td>
</tr>
<tr>
<td>3,396,490</td>
<td>8/1968</td>
<td>Dukas</td>
<td>49—388 XR</td>
</tr>
<tr>
<td>3,402,509</td>
<td>9/1968</td>
<td>Hagland</td>
<td>49—386</td>
</tr>
</tbody>
</table>

References Cited

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Patent Number</th>
<th>Date</th>
<th>Inventor(s)</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,987,782</td>
<td>6/1961</td>
<td>Kurowski</td>
<td>49—386</td>
</tr>
<tr>
<td>3,254,452</td>
<td>6/1966</td>
<td>Constantini et al.</td>
<td>49—386</td>
</tr>
</tbody>
</table>

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