July 7, 1970 R. S. LARSON 3,518,716

SELF-CLOSING HINGE

Filed May 24, 1968 2 Sheets-Sheet 1

Fig. 1

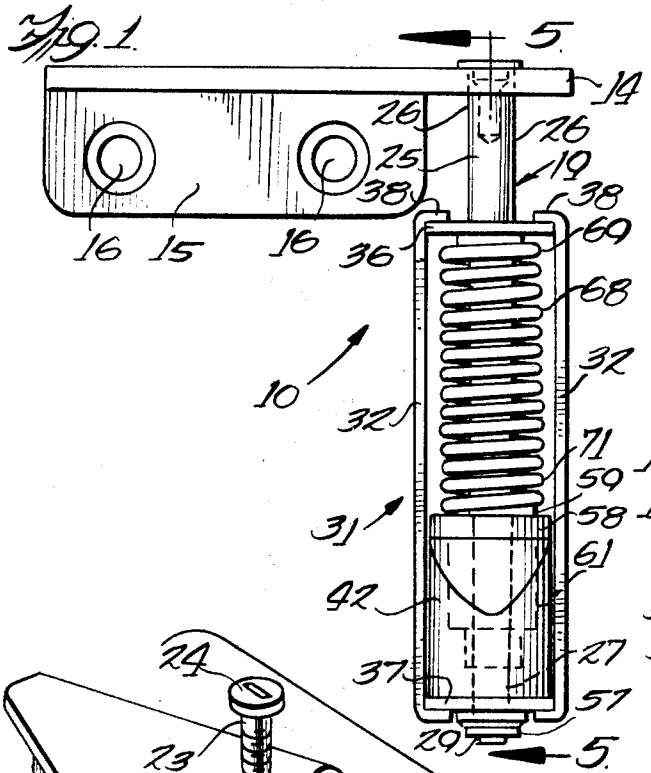


Fig. 2

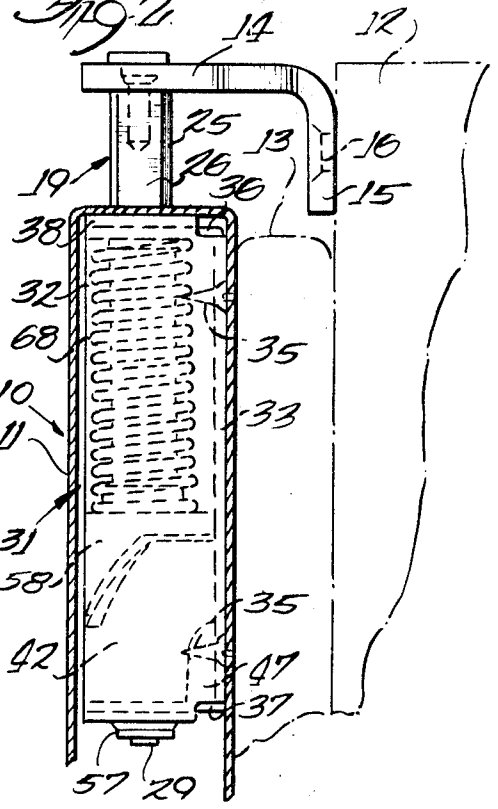
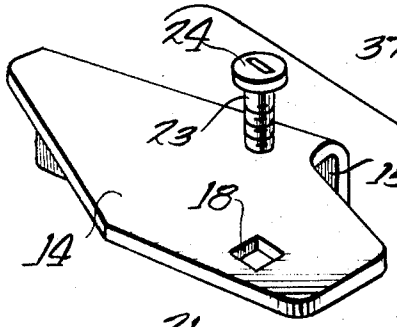


Fig. 3



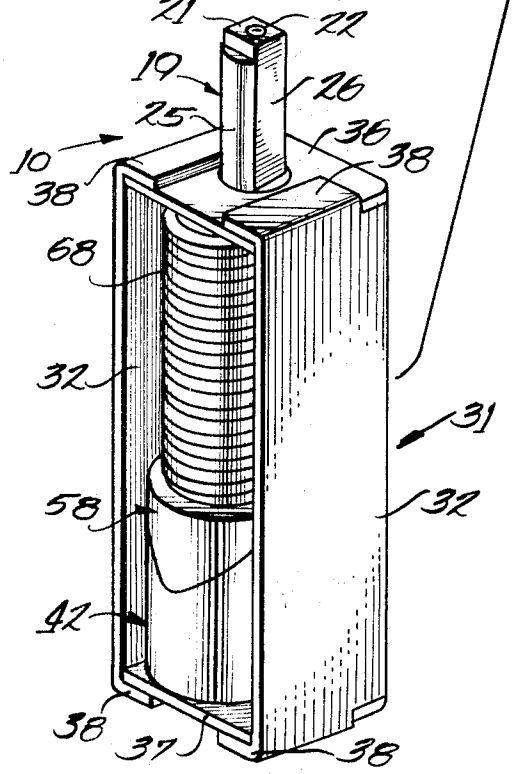
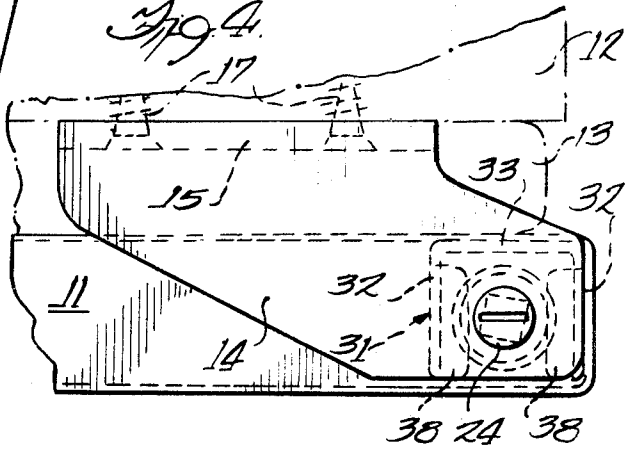


Fig. 4



Inventor
Robert S. Larson
By Wilson & Jeppers
Attys

July 7, 1970 R. S. LARSON 3,518,716

SELF-CLOSING HINGE

Filed May 24, 1968 2 Sheets-Sheet 1

Fig 5

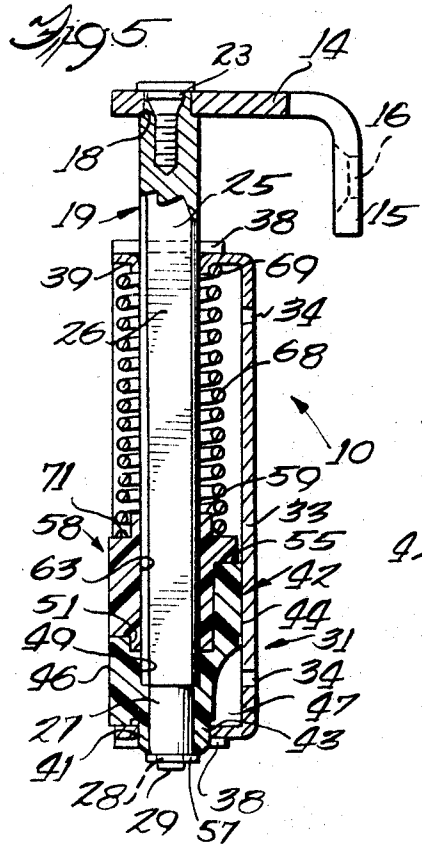


Fig 6

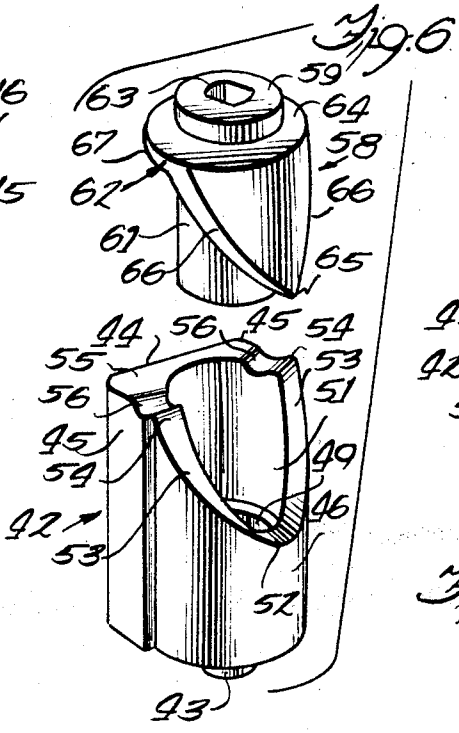


Fig 7

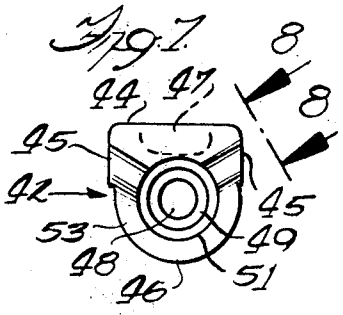


Fig 8

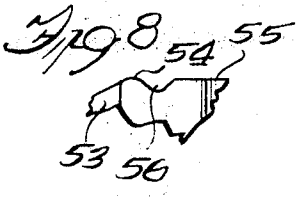


Fig 9

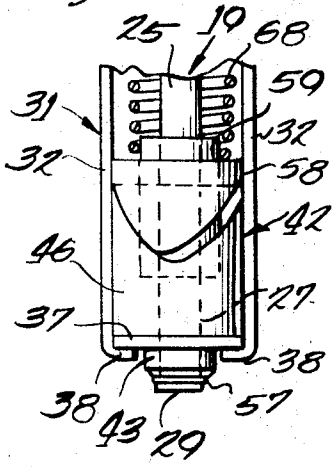
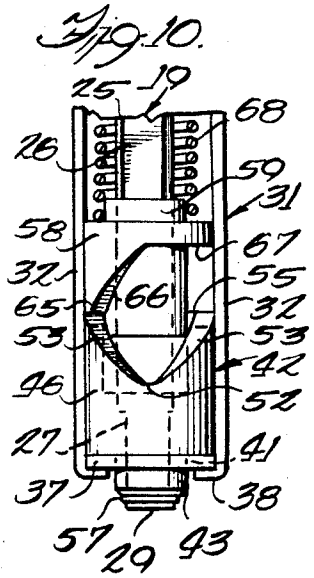


Fig 10



Inventor
Robert S. Larson
By Wilson & Hoppers
Atty's

United States Patent Office

3,518,716
Patented July 7, 1970

3,518,716

SELF-CLOSING HINGE

Robert S. Larson, Loves Park, Ill., assignor to Keystone Consolidated Industries, Inc., a corporation of Delaware

Filed May 24, 1968, Ser. No. 731,894
Int. Cl. E05f 1/12
U.S. Cl. 16—189 6 Claims

ABSTRACT OF THE DISCLOSURE

A self-closing hinge adapted to be mounted on a refrigerator or other cabinet and associated door having a bracket secured to the cabinet or other enclosure and a door wing or housing secured to the door and mounted on and rotating on a shaft extending into the housing. A stationary cam member provides a pivot axis for the shaft and is positioned at the lower end of the housing, and a slidable and vertically movable cam member is positioned thereabove to move on the shaft. A compression spring encompasses the shaft and biases the movable cam member downward so that the camming surfaces on the stationary and movable cam members cooperate to return the movable cam member, housing and door to a closed position.

The present invention relates to a self-closing hinge and more particularly to a hinge providing a pivotal axis for and biasing a door of an enclosure, such as a refrigerator or other cabinet, to its closed position, and always providing spring pressure to the closed position.

Among the objects of the present invention is the provision of a novel self-closing hinge for use on the door of a cabinet or other enclosure, such as a refrigerator door, where the door is normally constantly biased toward a closed position. The hinge assembly includes a housing mounted in the door and having a pair of complementary and relatively movable camming members cooperating with a stationary shaft extending from one end of the housing and secured to the enclosure through a cabinet bracket.

Another object of the present invention is the provision of a self-closing hinge having a compression spring encompassing the shaft in the housing with one end of the spring bearing against an end of the housing and the opposite end bearing against one of the two camming members tending to urge the camming members to a central inoperative position where the door is closed and biased to seal the door on the enclosure, if so desired.

A further object of the present invention is the provision of a self-closing hinge for the door of an enclosure having a pair of relatively movable cam members in a housing secured to the door; one cam member being stationary in the housing to rotate therewith and receiving the end of a stationary shaft, and the other cam member is vertically reciprocable on the shaft. The cam members have complementary camming surfaces providing for rotation of the door and housing in either direction, with one camming surface being provided with detent stops to yieldably retain the stationary cam member and associated door in an open position; plus allowing the door to be moved beyond the detent stops for a further open position.

Further objects are to provide a construction of maximum simplicity, efficiency, economy and ease of assembly and operation, and such further objects, advantages and capabilities as will later more fully appear and are inherently possessed thereby.

In the drawings:

FIG. 1 is a front elevational view of the self-closing hinge assembly of the present invention.

FIG. 2 is a side elevational view of the hinge assembly illustrating its mounting on the door and enclosure.

FIG. 3 is an enlarged perspective view, partially exploded, of the hinge assembly.

FIG. 4 is a top plan view of the hinge assembly as mounted on the door and enclosure.

FIG. 5 is a vertical cross sectional view taken on the line 5—5 of FIG. 1.

FIG. 6 is an enlarged exploded perspective view of the cam members of the hinge.

FIG. 7 is a top plan view of the stationary cam member.

FIG. 8 is a partial side elevational view of the stationary cam member taken on line 8—8 of FIG. 7.

FIG. 9 is a partial front elevational view of the hinge showing the position of the cam members when the door is closed.

FIG. 10 is a front elevational view similar to FIG. 9, but showing the position of the cam members with the door in open position.

Referring more particularly to the disclosure in the drawings wherein is shown an illustrative embodiment of the present invention, FIGS. 2 and 4 disclose a self-closing hinge assembly **10** secured to a door **11** for an enclosure **12**, such as a refrigerator or other cabinet. If the door is for a refrigerator, then a sealing gasket **13** is secured to the door **11** for contact with the enclosure **12** to minimize any heat transfer during operation of the refrigerator.

The self-closing hinge assembly **10** includes a cabinet bracket **14** having a depending mounting flange **15** perpendicular to the bracket **14** and having openings **16** to receive suitable securing means, such as screws **17**, to secure the bracket onto the cabinet **12**. The bracket **14** has a square or polygonal opening **18** offset and spaced from the mounting flange **15** to receive the reduced complementary end **21** of a stationary shaft **19**. The end **21** has a threaded opening **22** therein adapted to receive a screw **23** or similar threaded means having an enlarged head **24** to secure the bracket **14** and shaft **19** together. The shaft **19** has a generally cylindrical surface **25** with opposed flattened surfaces **26** extending for a substantial portion of the length of the shaft and forming opposed sides of the reduced end **21**, and also provided with a short cylindrical portion **27** having a diameter substantially equal to the distance across the flattened sides **26** which terminates in a further reduced cylindrical end **28** adapted to be headed at **29** as seen in FIGS. 1, 2 and 5.

The hinge assembly **10** also includes a door wing or housing **31** having side walls **32** and a rear wall **33** with spaced openings **34** to receive suitable attaching means, such as screws **35**, to secure or mount the housing to the door **11**. The housing is provided with a top wall **36** and a bottom wall **37** integral with the rear wall **33**; both top and bottom walls **36** and **37** being retained in position

by a pair of inwardly extending flanges 38 integral with the side walls 32 of the housing. The top wall 36 has an extruded opening 39 to conformably and rotatably receive the shaft 19, and the bottom wall 37 has an opening 41 to receive the reduced depending portion 43 of a hollow lower stationary cam member 42.

The stationary cam member 42 has an irregular contour (FIG. 6) provided wtih a flat rear wall 44, parallel side walls 45 extending from the rear wall and generally merging into a semicylindrical front wall 46. The rear wall 44 is recessed at 47 to provide clearance for the body of the lower securing screw 35. The rear wall 44 and parallel side walls 45 are generally complementary to the rear wall 33 and side walls 32 of the housing 31 so that the cam member 42 will not be able to rotate in the housing. A cylindrical passage 48 is formed in the cam member to extend therethrough and centrally through the depending portion 43; the passage being counterbored at 49 to receive the lower end of the flattened portion of shaft 19 and further counterbored at 51 to receive the depending cylindrical portion 61 of the movable cam member 58.

The stationary cam member 42 also has a semicylindrical cam track having a central low point 52 with upwardly extending curved portions 53 from each side of the low point 52 through an arc of approximately 90°, allowing said hinge to be used as either right-hand or left-hand application, to opposed high points 54, the rearward upper surface 55 of the cam member being flat except for a pair of detent notches 56 each removed from the low point 52 through an arc of approximately 120°. The shaft 19 extends through the cam member 42 to the counter bore 49 with the reduced cylindrical portion 27 extending through the passage 48 to a point slightly beyond the portion 43, and a washer 57 is located on the further reduced end 28 with the end headed at 29 to retain the washer thereon; the washer 57 retaining the shaft 19 in the housing 31 and the cam member 42.

The movable cam member 58 has an upper cylindrical portion 59, a lower cylindrical portion 61 and an intermediate cam portion 62. A central passage 63 extends axially through the cam member 58 and is complementary to the cylindrical surface 25 with the flattened surfaces 26 of the shaft 19 so that the cam member cannot rotate relative to the shaft but is capable of vertical movement relative to the shaft 19 and the stationary cam member 42. The intermediate cam portion includes a flat upper surface 64 and a lower cam track having a low point 65 and curved camming surfaces 66 extending from each side of the low point 65 and terminating in a semicircular flat surface 67; the low point 65 and surfaces 66 and 67 being complementary to the low point 52 and surfaces 53 and 55 of the cam member 42. The cam members are formed of dissimilar plastic materials, preferably Delrin and nylon.

A compression spring 68 is located in the housing 31 encompassing the shaft 19 with one end 69 bearing against the top wall 36 encompassing the flange of the extruded opening 39 thereon, and the lower end 71 bears against the flat upper surface 64 of the movable cam member 58 and encompasses the upper cylindrical portion 59 thereof. The spring yieldably biases the movable cam member 58 downward relative to the shaft 19 and against the stationary cam member 42.

Now considering the operation of the hinge assembly, FIGS. 2 and 9 disclose the positions of the stationary and movable cam members 42 and 58, respectively, when the door 11 is closed relative to the cabinet or enclosure 12. The opening 18 in the bracket 14 is slightly angularly removed relative to the mounting portion 15 so that the cam members 42 and 58 and spring 68 will urge the door 11 to a point beyond normal closed position, thus constantly biasing the door into sealing relation. Manual rotation of the door 11 toward open position causes rotation of the housing and the stationary cam member 42 relative to the shaft 19 about the longitudinal axis of the shaft. Rotation of the stationary cam member 42 about the shaft 19 causes simultaneous vertical movement of the movable cam member 58. In closed position, the low point 65 of cam member 58 is received adjacent to the low point 52 of cam member 42, and at least one pair of curved camming surfaces 53 and 66 are in engagement. Upon rotation of the cam member 58, the low point 52 is moved away from the low point 65 and the low point 65 rides upwardly on one of the curved surfaces 53 toward a high point 54, thus causing upward vertical movement of the cam member 58 relative to the shaft 19 against the force of the spring 68.

If the door is released while the low point 65 of the cam member 58 is between the low point 52 and high point 54 of the cam member 42, the force of the spring 68 acting on the cam member 58 will cause the low point 65 to ride down the cam surface 53 toward the low point 52 of the cam member 42 and automatically close the door. Thus, the hinge assembly 10 provides an automatic self-closing action of the door 11 for opening movement through an arc of approximately 90°. If the door is opened to an extent greater than 90°, the low point 65 will ride up onto the high point 54 of the cam member 42 and drop into a detent notch 56, which detent will yieldably hold the door in open position until the door is manually moved so that the low point 65 of the cam member 58 again engages the camming surface 53 of the cam member 42. Furthermore, the low point 65 can be moved out of and beyond the detent notch 56 onto the flat surface 55 allowing greater opening movement of the door 11.

I claim:

1. A self-closing hinge assembly for the door of an enclosure, such as a refrigerator, comprising a bracket secured to the enclosure and a housing secured to the door, said housing having end walls with aligned openings therein, a stationary shaft extending through said openings and secured at one end to said bracket, said shaft having a stepped cylindrical surface with reduced ends, a stationary cam member in said housing abutting one end wall and receiving the stepped end of the shaft for rotation relative thereto, a movable cam member in said housing encompassing said shaft, means on said shaft and said movable cam member preventing relative rotation thereof but allowing axial movement of said movable cam member relative to said shaft including a pair of longitudinally extending oppositely disposed flattened surfaces on said shaft, and said movable cam member having a central passage therethrough complementary to the cross section of the shaft, a compression spring in said housing encompassing said shaft with its opposite ends engaging the opposite end wall and said movable cam member to yieldably bias said movable cam member toward said stationary cam member, and complementary camming surfaces on said stationary and movable cam members, each having a low point, diametrically opposite high points and a generally flat surface extending through an arc of approximately 180°.

2. A self-losing hinge assembly as set forth in claim 1, in which said shaft has a reduced cylindrical portion received in said stationary cam member for rotation of said cam member thereabout, said reduced cylindrical portion having a diameter substantially equal to the distance across said flattened surfaces.

3. A self-closing hinge assembly as set forth in claim 1, in which said camming surface on said stationary cam member includes a pair of detent notches formed in said flat surface, each notch removed from one of said opposite high points through an arc of approximately 30°.

4. A self-closing hinge assembly as set forth in claim 1, in which said stationary cam member has a cylindrical passage therethrough to receive said shaft, said passage being counterbored, and said movable cam member has a

camming portion and a reduced depending cylindrical portion received in said counterbore to allow rotation of the stationary cam member relative to the movable cam member.

5. A self-closing hinge assembly as set forth in claim 1, in which said stationary cam member has a rear wall and parallel sides complementary to the housing to prevent rotation therein, a semicylindrical front wall merging into said side walls, and a depending cylindrical portion received in the opening in said one end wall.

6. A self-closing hinge assembly as set forth in claim 1, in which said stationary cam member and said movable cam member are formed of dissimilar plastic materials.

References Cited

UNITED STATES PATENTS

571,133	11/1896	Hoffman	16—189
165,619	7/1875	Sanderson	16—153
976,392	11/1910	Paynter	16—153
1,034,008	7/1912	Frey	16—153

BOBBY R. GAY, Primary Examiner

D. L. TROUTMAN, Assistant Examiner

U.S. Cl. X.R.

16—50