Oct. 11, 1960 H. D. SQUIRE ET AL 2,955,315

REFRIGERATOR DOOR STOP

Filed March 31, 1958 2 Sheets-Sheet 1

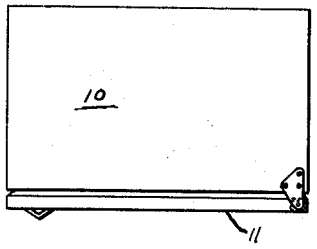


FIG. 2

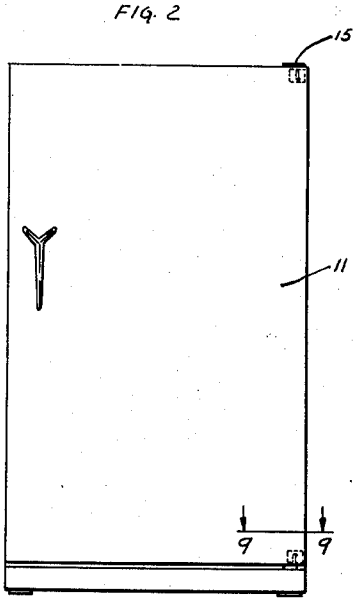


FIG. 1

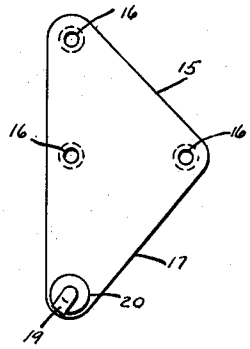


FIG. 3

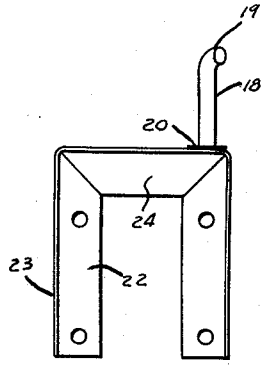


FIG. 4

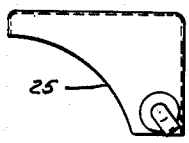


FIG. 5

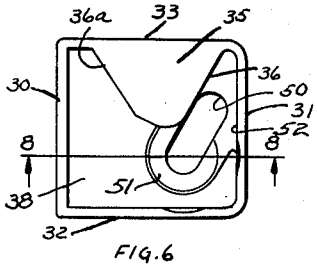


FIG. 6

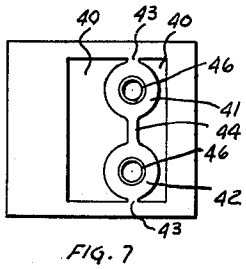


FIG. 7

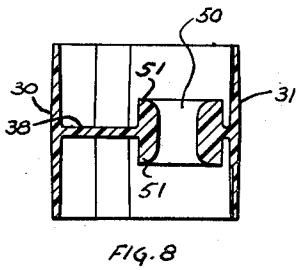


FIG. 8

INVENTOR.
HERBERT D. SQUIRE
HAROLD C. MATHER
BY J. W. Douglas
their atty.

Oct. 11, 1960 H. D. SQUIRE ET AL 2,955,315

REFRIGERATOR DOOR STOP

Filed March 31, 1958 2 Sheets-Sheet 2

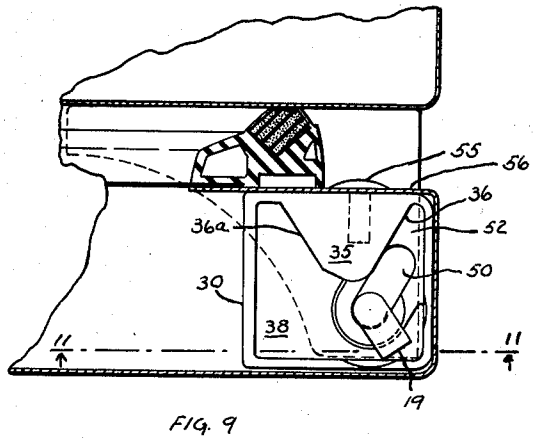


FIG. 9

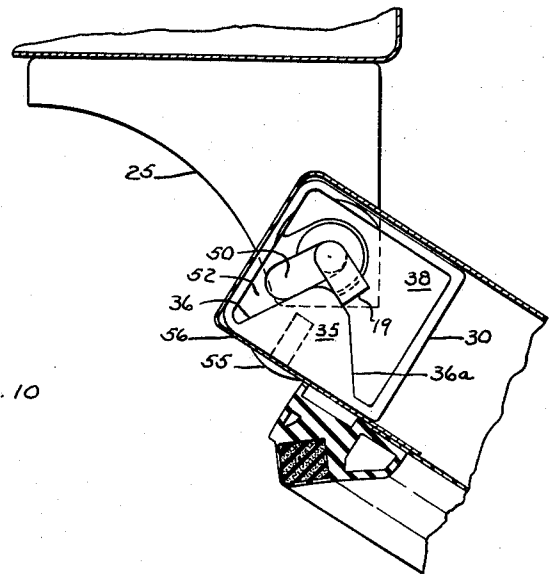


FIG. 10

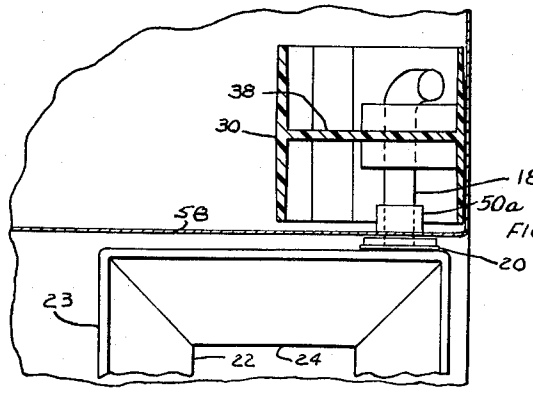


FIG. 11

INVENTOR.
HERBERT D. SQUIRE
HAROLD C. MATHER

BY

J. D. Douglas
Their atty

United States Patent Office 2,955,315
Patented Oct. 11, 1960

2,955,315

REFRIGERATOR DOOR STOP

Herbert D. Squire, Galesburg, and Harold C. Mather, Knoxville, Ill., assignors to Midwest Manufacturing Corporation, Galesburg, Ill.

Filed Mar. 31, 1958, Ser. No. 725,188

3 Claims. (Cl. 16—191)

This invention relates to combined hinges and door stops for doors such as refrigerator doors that are hinged to a cabinet.

As is well known to those versed in the art, it is common to provide refrigerator cabinets having a front door opening and a door for closing the opening, the door usually being hinged at one side of the cabinet. When the cabinet hinges are at the side of the cabinet it has not been customary to provide any kind of a stop for the door since the door could open without any undue strain on the cabinet walls.

It has been common practice, however, to provide refrigerators of modern design wherein the hinges are no longer at the sides of the cabinet, but are comprised of pintles disposed at the bottom and top of the cabinet inwardly of the side in order that the door may be opened without interference with the adjacent cabinetry. In this instance it is desirable that a suitable stop means be provided to prevent the door from hitting the adjacent cabinet when opened. It is also desirable to use such refrigerators in more open spaces where there is no interference with the door. In such instances should the door be opened too far the outer corner opposite the hinge edge is liable to contact with the adjacent cabinet. This contact results in an undue amount of strain on the hinge structure due to the fact that the door, particularly when loaded with foodstuffs, is heavy, and, the point or vertical line where the door, upon being opened too wide, contacts the cabinet would act as fulcrum, the door being a lever with the power applied outwardly and with the short end of the lever between the edge of the cabinet and the pintles can easily cause the pintles to be bent or torn loose.

It has been proposed to provide a jackknife type of hinge stop comprising a pair of links hinged to each other at one end and with their outer ends connected to the cabinet and the door respectively. Such devices, although operative, provide a sudden shock when they reach the limit of their unfolding movement, placing an undue strain at the points of attachment at their ends to the door and cabinet.

One of the advantages of the top and bottom hinge construction described is that the hinges are practically concealed from view and do not detract from the appearance of the refrigerator. The addition of a stop of the prior art involves a mechanical linkage in full view and detracts from the appearance. The older constructions are particularly noticeable on refrigerators having two doors, one of which is above the other.

By the present invention there has been provided a door stop, particularly useful in refrigerator doors, but not limited thereto, which is entirely concealed within the door. Furthermore, the construction is such that the stopping of the door is effected without sudden shock upon the door.

A still further advantage resides in the fact that should the stop become broken due to misuse or otherwise, there will not be any loose links hanging from the door which would make its appearance even worse and which might also damage the door or cabinet upon closing the door.

Still other advantages of the invention reside in the fact that the device is easy to install and that the labor costs due to installation are greatly reduced as well as the fact that fewer parts are used, resulting in a still further reduction in costs.

Still other advantages of the invention and the invention itself will become more apparent from the following description of an embodiment thereof which description is illustrated by the accompanying drawings and forms a part of this specification.

In the drawings:

Fig. 1 is a front elevational view of a refrigerator embodying the invention and illustrating in dotted lines the position of certain of the parts;

Fig. 2 is a plan view thereof;

Fig. 3 is a bottom plan view of an upper hinge bracket;

Fig. 4 is an elevational view of a bottom hinge bracket;

Fig. 5 is a top plan view of the bracket of Fig. 4;

Fig. 6 is a top plan view of a stop block;

Fig. 7 is a rear view thereof;

Fig. 8 is a section on the line 8—8 of Fig. 6;

Fig. 9 is a section on the line 9—9 of Fig. 1;

Fig. 10 is a view, the same as Fig. 9, with the door in open position; and

Fig. 11 is a fragmentary section taken on the line 11—11 of Fig. 9.

Referring now to the drawings, throughout which like parts have been designated by like reference characters, Figs. 1 and 2 illustrate a refrigerator comprising a cabinet 10 having a door opening 11 which is adapted to be closed by a suitable door hingedly connected to the cabinet.

In this instance, the door has one edge connected to the cabinet by two hinges both of which embody the invention.

It will be appreciated, however, that only one of the hinges ordinarily would be equipped with my invention and the purpose of the illustration is to simplify the disclosure and to illustrate how the invention may be applied to either a top or bottom hinge. If more than one door was used, one hinge embodying the invention would be used for each door.

In this instance the hinge plate of Fig. 3 would be used to provide a stop for the upper door and the hinge element of Fig. 4 used for the lower door.

The upper hinge includes a triangular plate 15, Fig. 3, which is secured on top of the cabinet by screws extending through holes 16. The part 17 of the plate extends outwardly beyond the front of the cabinet. The part 17 carries a torsion member such as a stem part 18 which is torsionally deflectable within substantial elastic limits throughout its length and has a laterally extending end 19. The torsion member is securely fastened to the plate by welding, staking or the like, a flange 20 on the torsion member assisting in the operation. The torsion member 18 is therefore shock responsive; i.e., it has the quality of vibrating on impact with another hard object.

The lower end of the cabinet is provided with a similar or identical torsion member, the difference being only in the type of support for the torsion member. In this instance the support comprises a bracket having legs 22 which are flanged at 23 for rigidity, and a bridge 24 provided with a gusset flange 25, also of angular construction. The torsion member is supported on the outer end of the gusset.

It should be pointed out that only one torsion member having the angular extending end 19 is necessary and that it may be carried by either the upper or lower bracket. When used at the upper edge of the door, the torsion member extends downwardly and when used at

the lower end of a door it extends upwardly. The angle at which the part **19** extends, as measured from the front of the cabinet determines, as will later more clearly appear, the place where the door is arrested in its opening movement.

The means for cooperating with the torsion member includes an abutment carried by the door and arranged to engage with end **19** of the torsion member when the door has been opened to a predetermined extent.

In its preferred form, the abutment is formed of a plastic block of some shock absorbing material such as "nylon" and includes square side walls **30—31** joined by a front wall **32** and a rear wall **33**. A generally triangular abutment **35** is provided inwardly of the wall, the base being integral with the rear wall **33** and the apex extending toward the front wall **32** and terminating at approximately the center of the block. The side walls **36** and **36***a* of the abutment and the abutment itself extend flush with the top and bottom of the block and provide plane vertically extending side surfaces extending throughout the height thereof.

Midway of the sides, in a vertical direction, a horizontally extending web **38** is provided which joins with the side walls **30—31** and the front wall **32** and the sides **36—36***a* of the abutment. This strengthens and reinforces the structure.

The rear wall is provided with a recess **40** in which are disposed a pair of screw receiving bosses **41** and **42** connected to the upper and lower ends of the walls defining the top and bottom of the recess by webs **43** and to each other by a web **44**. The bosses are provided with bores **46** for the reception of holding screws.

As best shown in Figs. 6 and 9, a slot **50** is provided through the web **38**, the slot extending parallel with the abutment **36** and beyond, toward the front wall. One edge of the slot is partially coextensive with the side wall of the abutment. The portions of the web about the slot where it extends beyond the abutment are strengthened by flanges **51** that project above and below the web, the rearward portions merging with the wall **36** at **52**.

The blocks are held in the door by screws **55** which extend through the rear door panel **56** into the bores **46** of the bosses **41**. Preferably the block is of a size and shape such that the front wall **32** may seat against the front wall of the door and the side wall **31** against the edge wall, and the back **33** against the back wall or a flange extending inwardly of the door edge. As shown in Fig. 11, the bottom of the block may be spaced upwardly slightly from the bottom edge wall of the door and the center of the slot **50** lines up with a hole in the bottom edge **58** of the door. A flanged bearing bushing **50***a* of plastic may be interposed between the bottom wall **58** and the flange **20** of the torsion member and have a sleeve extending through the opening surrounding the stem to provide a bearing for the pin at the bottom of the door.

It will thus be seen that the torsion member **18** extends into the block just beyond the apex of the abutment **35**, the slot **50** providing a clearance hole therefor. This slot also permits assembly since the offset end **19** may be passed therethrough.

Ordinarily the block is secured in position during the construction of the door and the assembly is effected prior to attachment of the torsion member bracket to the door by holding the bracket with the offset projection toward the rear of the slot **50**. The torsion member bracket is then assembled with the block by passing the offset end of the torsion member through the slot, after which the bracket is rotated clockwise until the offset end takes the position shown in Fig. 9. At this time the bracket is in the proper position to be secured to the cabinet and is so secured. This is usually effected when the cabinet is laid flat but can be done in an upright position.

It will be seen that because of the symmetry of the block with the abutment extending above and below the horizontal partition, that the offset part **19** of the torsion member is positioned below the partition when the stop is in the upper part of the door and above the partition when the block is in the lower part of the door but that in each instance the relative position of the torsion member and its offset end **19** to the abutment **35** is the same. This being the position shown in Fig. 9, when the door is opened, the door pivots about the torsion member, and the block, with its abutment, is rotated with the door counterclockwise to the position shown in Fig. 10. Since the torsion member is disposed beyond the apex of the abutment, the abutment and door are free to rotate thereabout until the side **36***a* engages with the offset **19**. When this occurs the opening progress of the door is stopped resiliently. The torsion member acts as a torsion bar and permits a certain amount of twisting by the offset of the member when the offset is in pressure engagement with the abutment **35**. At the same time since the block is seated against the thin walls of the door and particularly secured to the flange **56**, a certain amount of "give" is realized at this point and the block may thus move relative to the door which affords added resiliency and decreases shock.

It will be thus apparent that one abutment block may be used at the top or the bottom and on either the right or left hand sides for right or left hand opening doors.

It is also apparent that the stop is completely hidden from view, has no parts that need lubrication, cannot squeak and does not shock the door or its controls when it stops the door opening. In addition, the parts are inexpensive to manufacture and install, thus reducing the cost.

Having thus described the invention in an embodiment thereof, it will be apparent to those versed in the art that departures may be made from the construction described without departing from the spirit of the invention as defined by the appended claims.

We claim:

1. A door stop and hinge, for use with a cabinet having a door opening and a door for closing the opening, including an outwardly extending projection rigidly carried by the cabinet and rigidly supporting a torsion member including a stem portion extending vertically with respect to the cabinet in spaced relation thereto and being formed with a laterally extending arm at its end, said door including edge and end walls between inner and outer walls, one of the end walls being formed with an opening the walls thereof being in pivotal engagement with said stem, bushing means disposed between the stem and said opening, a stop block secured to said inner wall and in close fitting engagement with the outer and edge walls, said block having a horizontally extending center partition and an elongated opening formed therein extending from near the corner of the block toward the mid-section thereof and arranged to allow passage of the laterally extending end and stem, the end of said opening at the mid-portion of the block being opposite to the opening in the end wall, an abutment extending above and below said partition and being generally triangular in horizontal section with the base disposed at said inner wall and formed with screw receiving portions for the reception of a holding screw extending through the inner wall into said screw receiving portions, the side of said abutment arranged to engage with said laterally extending portion of said stem upon a predetermined amount of door opening to provide a resilient stop for the door.

2. The combination with a cabinet having an access opening and a swingable door for closing the opening, of means to couple the door to said cabinet and provide a stop to limit opening movement of the door past an extreme outward position comprising a shock-responsive vertical torsion member beside the access opening, said torsion member being fixed at one of its ends to said cabinet, a shock absorbent abutment block secured on the inside of said door, said abutment block being formed with a bearing receiving said torsion member for a

hinged association of said door with said cabinet, an arm laterally of the other end of said torsion member, said abutment block being formed with an abutment arranged to engage said arm when said door is swung to its outer extreme position, said torsion member being minutely twistable within its elastic limits by engagement of said arm by said abutment at the end of movement of said door to its outermost extreme position to decelerate movement of said door to its extreme outward position from the point where said arm is initially engaged by said abutment.

3. In a refrigerator including a cabinet having an access opening formed with spaced corners thereof at one side of said opening and a door having spaced corners at one side of a vertical edge thereof, in combination, a torsion mechanism comprising a stem support, a shock responsive stem having one end thereof fixed to said stem support, said stem support being fixed to said cabinet at one of the corners of said access opening to support said stem vertically and in spaced relation to said cabinet from beside said access opening, a shock-absorbent box-like structure having pairs of opposed walls fixed in said door at one of the corners of said door, said box-like structure being formed with a transverse web formed with an aperture therein to receive said stem, said web being of increased thickness at said aperture to

provide a bearing for said stem, said box-like structure being also formed with an abutment at said aperture tapering from one of the walls of said structure, a lateral arm on said other end of said stem, said arm being formed to engage said abutment by swinging of said door to an extreme open position thereof, said stem being minutely twistable within its elastic limits by cooperative engagement of said arm with said abutment to decelerate movement of said door to its extreme outward position from the point where said arm is initially engaged by said abutment, said box-like structure also eliminating noise of impact during initial engagement of said abutment with said arm by absorbing the shock of impact with said arm as said door is opened to said extreme open position thereof.

References Cited in the file of this patent

UNITED STATES PATENTS

964,801	Martin	July 19, 1910
2,174,986	Lickteig	Oct. 3, 1939
2,700,139	Jewell	Jan. 18, 1955
2,799,891	Ragsdale	July 23, 1957

FOREIGN PATENTS

678,208	Great Britain	Aug. 27, 1952