

Nov. 9, 1965

R. J. CARBARY
REFRIGERATOR CABINET

3,216,776

Filed Oct. 22, 1963

2 Sheets-Sheet 1

FIG. 1

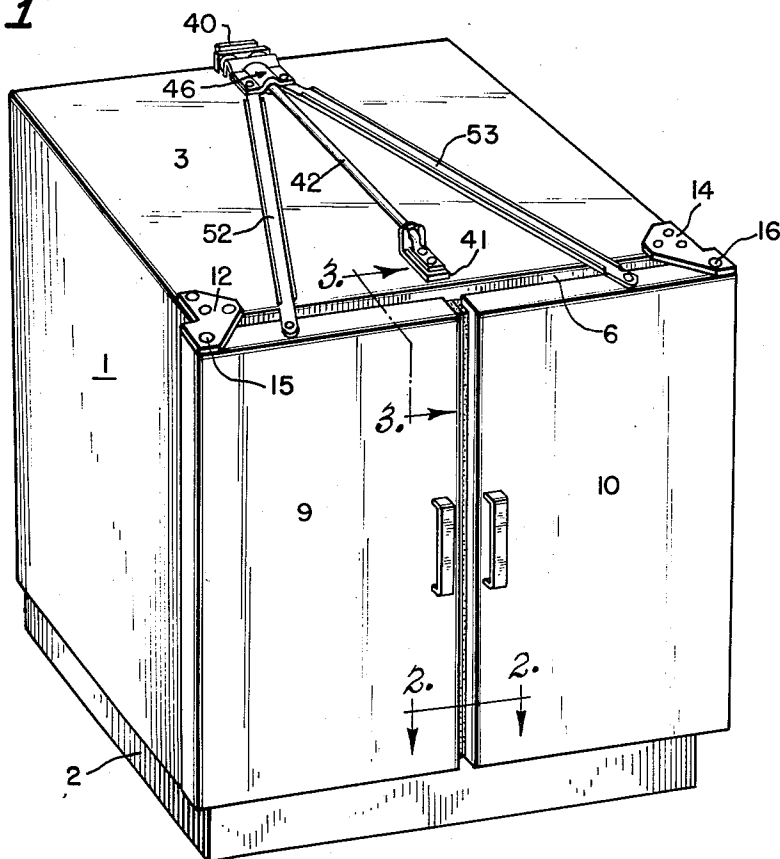


FIG. 2

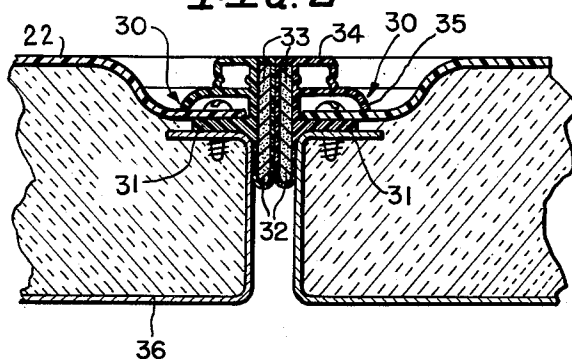
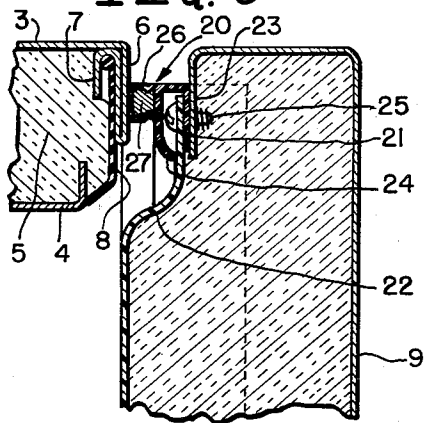


FIG. 3



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FIG. 4

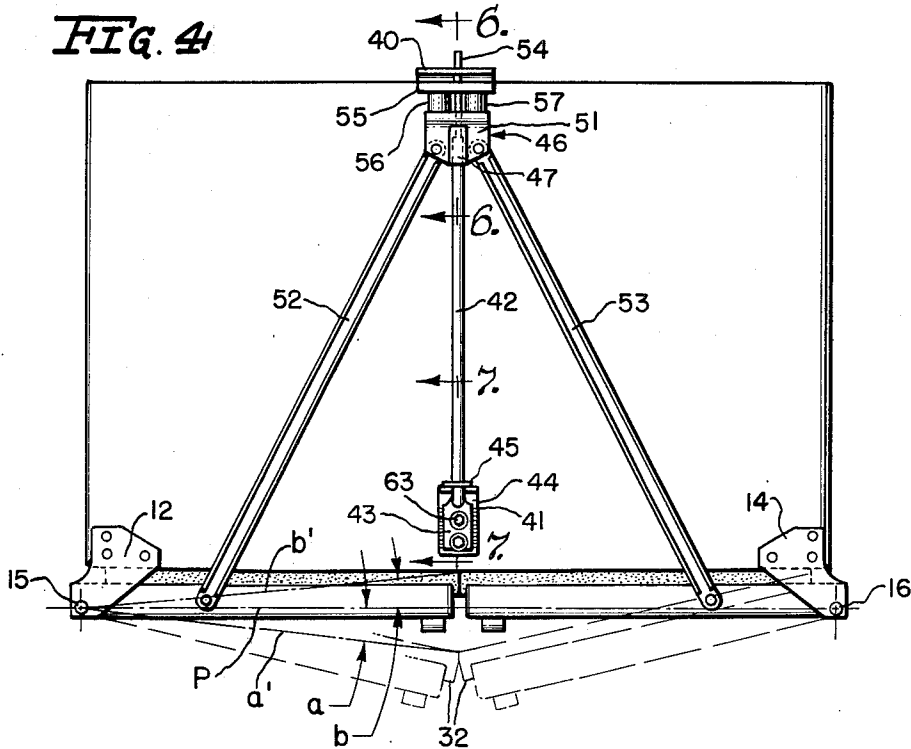


FIG. 5

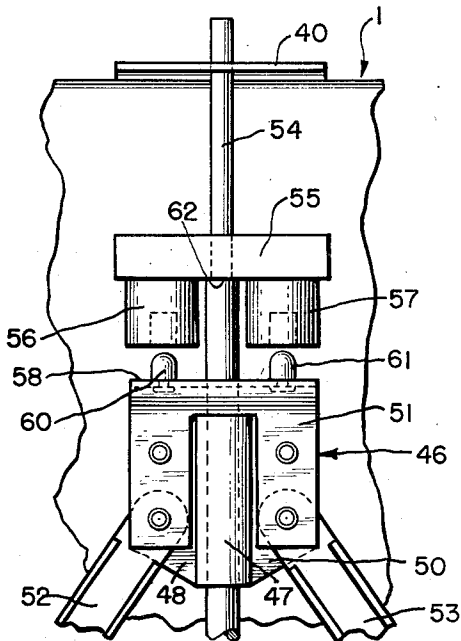


FIG. 6

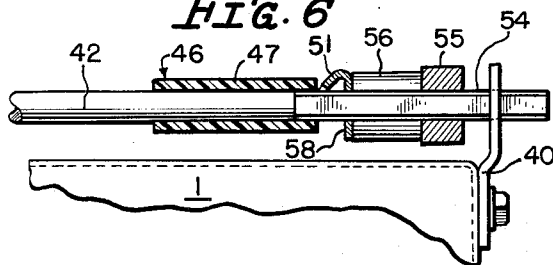
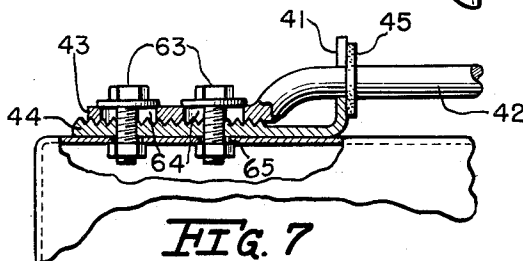


FIG. 7



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REFRIGERATOR CABINET

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4 Claims. (Cl. 312-296)

This invention relates to refrigerator cabinets, and in particular to a front opening cabinet having a pair of doors swingable on vertical axes. In further particular, the invention is featured by a door gasketing and hinging arrangement which insures proper sealing of the doors against heat loss even though the cabinet has no center post against which the free edges of the doors can close.

In the design of domestic electric refrigerators it is now becoming popular to provide a fresh food storage cabinet of more than usual width, and less than usual depth, mounted on a freezer cabinet having the conventional 36" height and 25" depth of a kitchen counter. The depth of the fresh food cabinet may be of the order of 16", whereupon its rearward offset relative to the front of the freezer cabinet provides a shelf space which is a convenient repository for articles which are being removed from or loaded into the refrigerator. The single door which has characterized domestic refrigerators is disadvantageous in these new constructions; for not only would the door be cumbersome because of the increased cabinet width necessary to make up for the decreased depth, but the single door would sweep across the shelf during opening and would reduce the utility of the shelf as a loading area.

The seemingly obvious solution is to use a pair of doors, each comprehending one half of the open front of the cabinet. However, in order to obtain proper gasketing to prevent heat leakage into the cabinet, double-door cabinets have used a vertical center mullion or post. Gaskets at the free edge portions of the door—"free edge" being a term used to distinguish over the hinged edge portions—seal against this vertical mullion. This center post is objectionable to the user, for it interferes with the placement of articles into the cabinet and establishes a loading pattern of the cabinet shelves which may not be to the liking of the user.

It has been proposed in Korodi U.S. Patent 3,004,309 of October 17, 1961 to seal the facing edges of the doors of double-door, mullionless, cabinets by using collapsible bellows type gaskets having magnetic inserts so arranged that the magnets repel each other if one door is being closed slightly ahead of the other, thus preventing an interference engagement of one gasket with the other. This is mechanically satisfactory. However, the gaskets must be of substantial width in the plane of the associated door in order to have the necessary freedom of movement, and therefore the gaskets collectively provide a substantial area in which the thermal insulation is limited solely to the trapped air within the gaskets themselves. In view of the fact that this substantial area faces directly into the refrigerated space, the insulating effect of the gaskets is somewhat inadequate.

I have found that improved door sealing, with minimum heat loss, can be provided with door-edge gaskets of a simple resilient type by so arranging the gaskets relative to a plane taken through the four pivot pins of the doors that the gaskets meet in an edge contact as the doors approach a closed position, gradually increase the surface contact with each other until they are in full surface contact as the doors pass through said plane, and are wholly within the area between such plane and the peripheral wall defining the cabinet opening as the doors attain a fully closed position thereagainst. In this arrangement the plane occupied by the hinge pins defines the point at which the doors pass through an overcenter

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position as they close, whereupon when they are in this overcenter position, the resilient reaction of the door edge gaskets tend to maintain the doors closed against accidental opening. To further enhance the seal of the doors against the adjacent cabinet wall, I provide magnetic gaskets along the top and bottom, and along the hinge side, of the inner panel of each door. These magnetic gaskets seal against the said peripheral wall.

It is advantageous to provide mechanism by means of which the doors will open and close together even though only one of them is provided with a handle; and it is also advantageous to provide said mechanism with some sort of homing means operative to draw the doors through the overthrow plane.

It is therefore an object of the present invention to provide a double-door, mullionless, refrigerator cabinet having an improved hinging and gasketing structure.

Other features and advantages will be understood from the following detailed description of a presently preferred embodiment of the invention, read in connection with the accompanying drawings in which:

FIG. 1 is a front perspective view of a refrigerator cabinet having doors embodying the present invention;

FIG. 2 is a plan section taken on lines 2-2 of FIG. 1;

FIG. 3 is a vertical section taken on lines 3-3 of FIG. 1;

FIG. 4 is a plan view of the cabinet to show the overcentering operation of the doors as they come to closed position;

FIG. 5 is a fragmentary plan view of portions of the homing mechanism of the door operator;

FIG. 6 is a vertical section of the homing mechanism of FIG. 5; and

FIG. 7 is a partially sectioned elevation of the front portion of the homing mechanism, to show means for providing for adjustment thereof.

FIG. 1 shows a refrigerator cabinet 1 having a base 2 which may in turn rest upon a freezer cabinet (not shown) or other appropriate structure. The cabinet is a conventional double-wall structure between the inner and outer walls 3, 4, or which there is suitable thermal insulation 5, as shown in FIG. 3. Pursuant to conventional practice, the outer wall 3 has a double-rolled flange 6 having a wall portion 7 cooperating therewith to form a pocket within which is confined one edge portion of a plastic breaker strip 8 which serves as a heat break to minimize heat flow from the outer to the inner cabinet walls. It will be understood that the flange 6 and breaker strip 8 extend about the four sides of the cabinet and collectively provide a forwardly facing wall which defines the open front of the cabinet.

The cabinet 1 is provided with two doors 9, 10, each carried by hinge structure so as to swing about a vertical axis. Said hinge structure may include the hinge plates 12, 14 securely fastened adjacent the side walls at the top and bottom of the cabinet, the bottom hinge plates not being shown. Each of said hinge plates carries a suitable hinge pin, such as the pins 15, 16 which pass vertically into suitable bearing sockets (not shown) in the doors adjacent the outermost side wall portions thereof. The precise arrangement of hinge pins and bearings is not important to the present invention except as to the disposition of the hinge pins relative to the thickness of the doors and associated gaskets, as presently explained.

It will be apparent from FIG. 1 that the doors 9 and 10 have a total area substantially equal to that defined by the four outer walls of the cabinet and that each door comprehends one half of that area. It has previously been noted that the cabinet is without a center vertical post or mullion against which double doors of contemporary cabinets are arranged to close.

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Each of the doors is provided with gaskets which seal against the cabinet flange portions 6 as the doors are closed. The gaskets which extend across the top and bottom of each door and along the vertical edge of the door at which the door is hinged are advantageously of the magnetic type commonly used in the industry. As best shown in FIG. 3, in which the gasket 20 is that which extends about the said three sides of the door, the gasket has a base 21 which is confined between the plastic inner liner 22 of the door and a flange portion 23 of the outer sheet metal wall thereof. A lip 24 extends inwardly to cover the screw or other fastening means 25, and a rectangular tubular portion 26 which accommodates a magnetic strip 27 completes the gasket structure. As is well known, such gaskets are formed by the extrusion of polyvinylchloride materials or the like. Usually the magnetic strips comprise powdered or granular barium-ferrite disposed within a rubber-like bonding substance. After this mixture is molded to desired shape, the barium-ferrite particles are magnetized by conventional means. When the doors are closed the flat faces of the gasket portion 26 tightly adhere to the metallic flange 6 by the magnetic attraction of the filler 27.

It is, of course, necessary to complete the sealing of the doors along the vertical division line between them. I have provided along the inside or "free" edges of the doors, gaskets which have a substantial depth in relation to the depth or thickness of the door, an appropriate thickness considered in the plane of the door, and a non-magnetic filling which imparts resiliency to the gasket.

As best shown in FIG. 2, which illustrates the door edge gaskets in their closed-door relationship, each gasket 30 has a web 31 by which it is secured, as shown, and an elongated tubular body portion 32 which has a filling 33 of cellular rubber, or equivalent, which imparts resiliency and thermal insulation. Further, the gasket has a rectangular tubular portion 34 which is devoid of any filling. The base 35 of the portion 34 corresponds in contour and function to the portion 24 of the gaskets 20; in fact, it will be observed from a comparison of FIGS. 2 and 3 that the gasket 30 is actually the gasket 20 with the addition of the elongated rectangular portion 32. The desirability of this construction is that portions 34, 35 of the gasket 30 can be connected to the gasket 20 by a mitred joint (not shown) pursuant to regular refrigerator gasket construction. The gasket portions 32 are closed at their upper and lower ends.

It will be noted from FIG. 2 that the length of the gasket portions 32—the length dimension being considered to be that normal to the principal plane of the door—is substantially one half of the total thickness of the door as measured between the door liner 22 and the outer wall surface 36; and that there is only a small area of each gasket portion 32 which is directly facing into the cabinet and thus exposed to the low temperature therein. The relatively long side walls of the gasket portions 32 which are within the cabinet space are themselves insulated by the dead air within the portions 34 and the blanketing effect of the base portion 35. This gasket construction minimizes heat flow into the cabinet.

It is to be understood that FIG. 2 shows the gasket portions 32 in the compressed state characteristic of the closed-door condition; FIG. 4 indicates by broken line the first meeting of the door gaskets as they approach closed position and shows that the disengaged gasket portions 32 are somewhat thicker than said portions in full engagement.

The resiliency of the gasket portions 32 and the relaxed thickness thereof is utilized in relation to the pivot-pin location to provide an overcentering operation which is a substantial factor in holding the doors closed. In FIG. 4 the line extending between the pivots 15 and 16 represents a plane P passing through all four of the pivots (the lower pivots not being shown). The angle a is the angle between said plane and a line a' drawn between the

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inner face of a gasket portion 32 and pivot 15 as the respective gasket portions meet as the doors are closing. The angle b is the angle between said plane P and a line b' between the pivot and the inner face of a gasket portion 32 in the closed door position. In a presently preferred arrangement the angles a and b are substantially equal, but the angular relationship is essentially influenced by the relaxed thickness of the gasket portions 32 and the resiliency thereof. It is most desirable for the angle b to be at least a substantial fraction of the angle a . In this overcenter relationship to the hinge pins, the doors will come to a closed position as they are propelled through the plane P, and the reactive resiliency of the door edge gaskets will restrain the doors against accidental opening.

It is, of course, necessary for the doors to move together between closed and open positions. Although this can be done manually, it is desirable to provide an operating mechanism whereby the movement of either door brings about the identical movement of the other. Basically, these mechanisms are well known, but I include means for drawing the doors toward the cabinet as they approach the closed or "home" position.

Looking now at FIGS. 4, 5, 6 and 7, it is seen that there is mounted on the rear wall of the cabinet 1 an upwardly extending guide bracket 40, and adjacent the front end of the cabinet a bracket 41 having a slotted upright portion to receive an end of the guide rod 42. Said guide rod has a flattened offset portion 43, the lower surface of which is serrated to cooperate with the serrated upper surface of the base 44 of bracket 41, as best shown in FIG. 7. A resilient bumper washer 45 is mounted on the rod 42. A slider 46 may be molded from nylon or other suitable synthetic plastic and comprise a central barrel 47 from which extend wing portions 48, 50. The barrel is sized to slide freely on rod 42. A metallic plate 51 is arranged to straddle the barrel portion. By means of suitable spacers (not shown) formed in the wing portions 48, 50, the plate 51 is spaced above said wing portions to provide for pivotally receiving an end of the respective links 52, 53, the other ends of which are pivoted to the respective doors 9 and 10. Opening either of the doors will therefore draw the associated link forwardly and the slider 46 will push the other link to cause an equal opening of the other door. Similarly, the doors will close uniformly as either of them is moved to closed position.

Although a spring latching device may be used as a homing device for the doors, I prefer to use magnetic means because of the freedom from mechanical complexity. As best shown in FIGS. 5 and 6, the rod portion 54 of rod 42 is given a noncircular shape so as to slidably but nonrotatably receive a support block 55 on which are mounted the permanent magnets 56 and 57. Cover plate 51 of the slider 46 is shaped to provide an armature portion 58 which will span the magnets; advantageously, the armature is fitted with magnetic pilot pins 60, 61 which enter the axial magnet openings shown in FIG. 5. FIG. 6 shows the relationship of the magnets and slider to the rear support bracket 40 with the doors in closed position; FIG. 5 shows the relation as the doors pass through the plane P. When the doors are opened the forward motion of the slide 46 draws the magnets forwardly until the block 55 strikes the shoulder 62 delineating between the circular and noncircular portions of rod 42, whereupon the armature 58 will separate from the magnets as the door-opening operation continues. The engagement of the slider 46 with the cushion 45 establishes the fully open position of the doors. As the doors pass through the plane P in the closing direction, the armature 58 comes into the field of the magnets 56 and 57 which helps to draw the doors through the overcenter point in the attainment of their closed or home position. It should be noted that the magnets have no door-securing function, for in the fully closed condition of the doors the

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magnetic assembly is free to slide on the portion 54 of the rod 42.

Adjustment of the rod 42 so as to place its shoulder 62 in the most advantageous position is readily accomplished by loosening the fastenings 63 sufficiently to permit the end portion 43 of the rod to be moved to the right or left (as viewed in FIG. 7) as required. As indicated, the bolts 63 pass through elongated openings 64. The openings 65 through which the fastenings 63 pass are oversized, to permit a suitable lateral and rotational displacement of the bracket 41 on the cabinet. By similar appropriate enlargement of the openings (not shown) through which pass the fastenings for the bracket 40, said bracket may also have any desired degree of vertical and lateral adjustment. By the adjustments thereby permitted at the front and rear of the cabinets, the rod 42 may be positioned for the proper coordination of the doors 9 and 10 in their opening and closing movements.

While there has been described what is at present thought to be a preferred embodiment of the invention, it will be understood that various modifications may be made therein, and it is intended to cover in the appended claims all such modifications which fall within the true spirit and scope of the invention.

I claim:

1. A refrigerator cabinet including wall structure providing an open-front cabinet having a flange portion defining the top, bottom and side walls of said opening; a pair of doors, each having an area equal to substantially one-half of that bounded by the outermost edges of said flange, means secured adjacent the side wall portions of said cabinet for hinging said doors; a flat resilient gasket secured along the free edge of each said door, each of the respective gaskets being of such thickness that common edge portions thereof come into engagement prior to the closure of said doors and said gaskets come into full surface engagement with each other upon said doors jointly attaining a fully closed position; the axes of the respective hinge means occupying a common plane parallel to said flange and outwardly of said door gaskets in the closed-door position thereof, whereby the said gaskets and the said hinge means axes are in an over-center relationship in which the resiliency of said gaskets restrains said doors against opening; and means secured between said doors and said cabinet whereby movement of either door in either direction effects an identical movement of the other, said means secured between said doors and said cabinet comprising a trackway mounted on said cabinet, a slider on said trackway, a link pivotally mounted on each door and pivotally attached to said slider, a magnetic armature on said slider, and magnet means movably carried by said trackway and becoming effective to exert magnetic attraction on said armature substantially as the doors come into the position in which said gaskets come into initial engagement.

2. A refrigerator cabinet according to claim 1, in which said magnet means are mounted on a carrier slidably mounted on said trackway for limited movement relative to the doors.

3. In a refrigerator cabinet having front wall means defining an opening providing access to the interior of said cabinet and two doors pivoted respectively at opposite side walls of the cabinet, said doors being arranged to close against said cabinet front wall with side edges of the doors in mutually facing relation; the improvement in gasket means for said door side edges comprising a narrow rectangular body member of which the side wall

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dimension is substantially greater than the end wall dimension, said side wall dimension extending substantially perpendicular to the plane of said doors when they are closed and said end wall dimension being substantially parallel to the plane of said doors when they are closed, a substantially square tubular member extending laterally from one side wall of said body member at the end thereof, and a web member extending laterally from said one side wall in spaced relation to said tubular member, said rectangular body member having a filling of resilient material, each said door gasket being adapted to be secured to one of said doors by said web member with one of the side edges of said rectangular body member partly in contact with the surface of the end of said door and partly extending inwardly of said door beyond the end surface thereof, said substantially square tubular member being positioned inwardly of the end surface of said door, each said door gasket being disposed to come into side-wall to side-wall engagement compressing the respective body members when said doors are in closed position.

4. A refrigerator cabinet including wall structure providing an open-front cabinet having a flange portion defining the top, bottom and side walls of said opening; a pair of doors, each having an area equal to substantially one-half of that bounded by the outermost edges of said flange, means secured adjacent the side wall portions of said cabinet for hinging said doors; a resilient gasket secured along the free edge of each said door, each of the respective gaskets being of such thickness that common edge portions thereof come into engagement prior to the closure of said doors and said gaskets come into full surface engagement with each other upon the doors jointly attaining a fully closed position; the axes of the respective hinge means occupying a common plane parallel to said flange and outwardly of said door gaskets in the closed door position thereof, whereby the said gaskets and the said hinge means axes are in an over-center relationship in which the resiliency of said gaskets restrains said doors against opening; means secured between said doors and said cabinet whereby movement of either door in either direction effects an identical movement of the other; and means arranged to become effective substantially when said common edge portions of said gaskets come into engagement prior to passage of said doors through said common plane for providing a biasing force in the direction for effecting a complete closure of said doors.

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