

Oct. 16, 1956

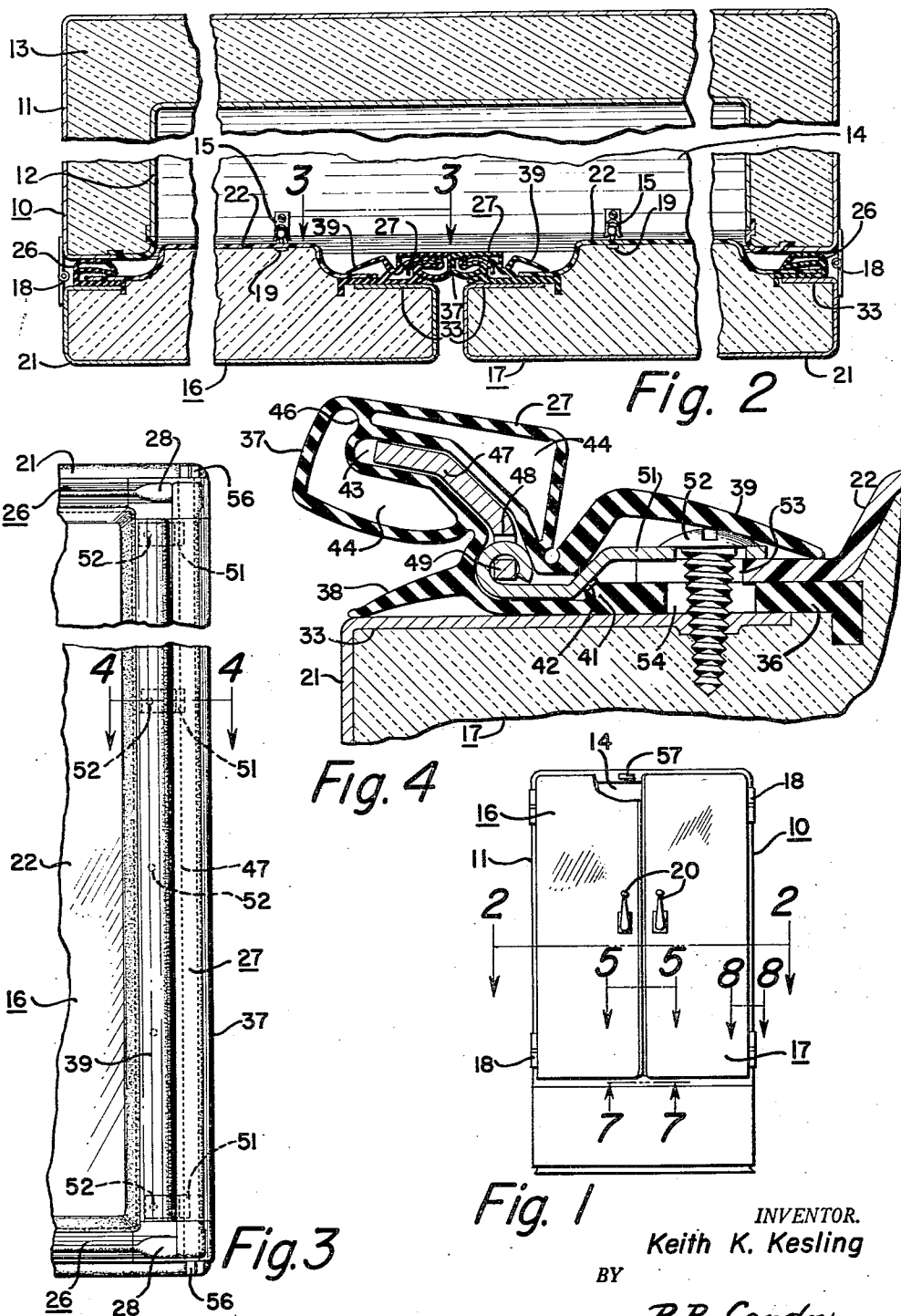
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2,767,040

REFRIGERATING APPARATUS

Filed Feb. 15, 1954

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

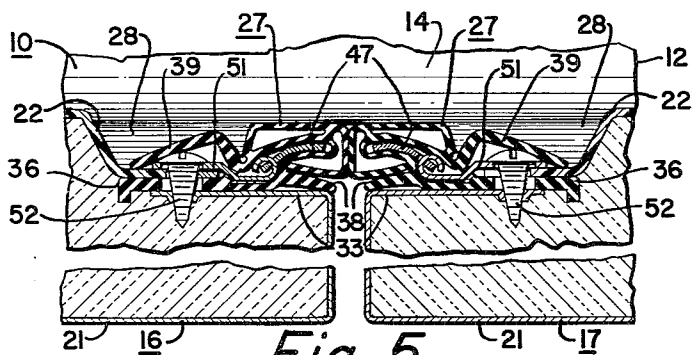


Fig. 5

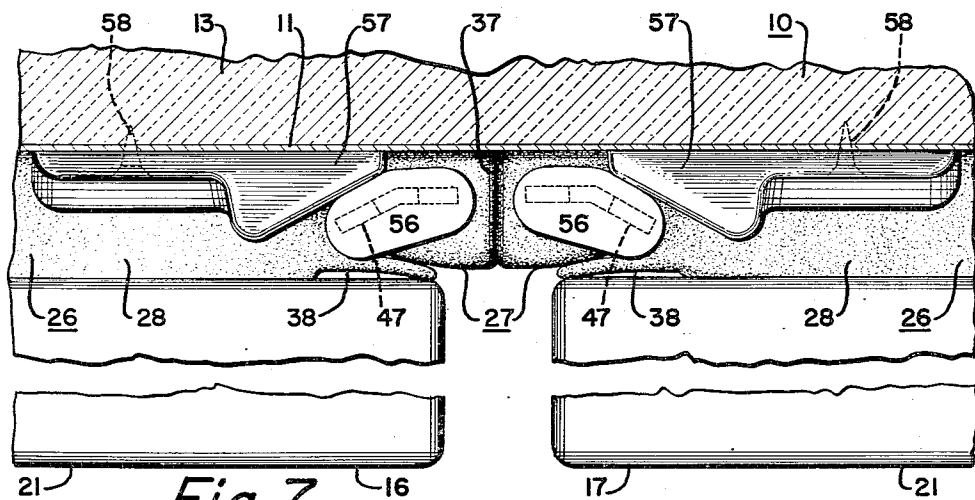


Fig. 7

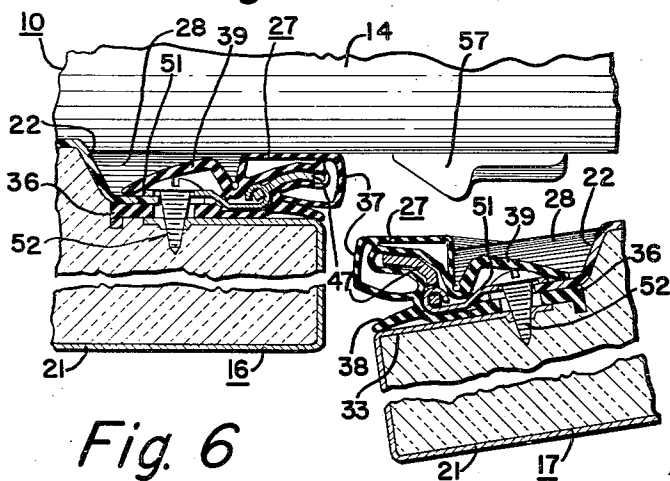


Fig. 6

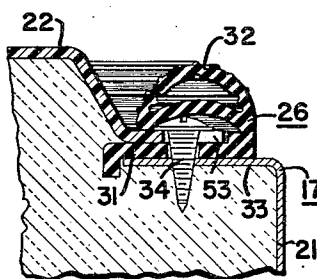


Fig. 8

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3 Sheets-Sheet 3

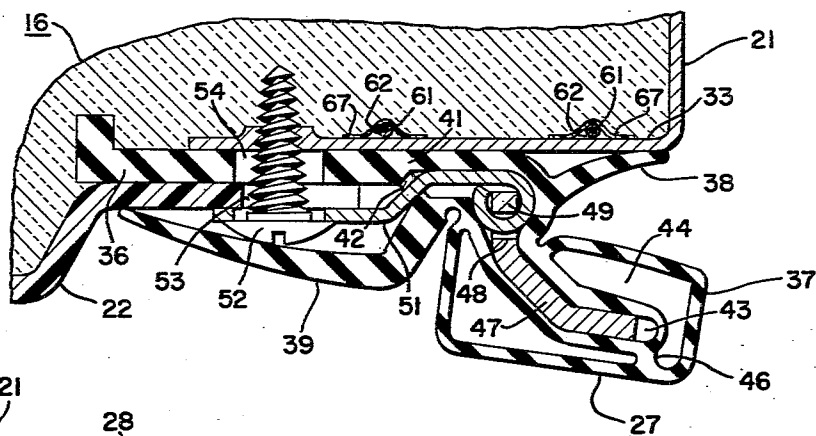


Fig. 11

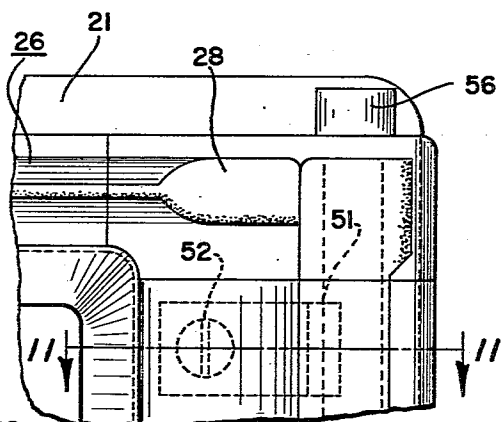


Fig. 10

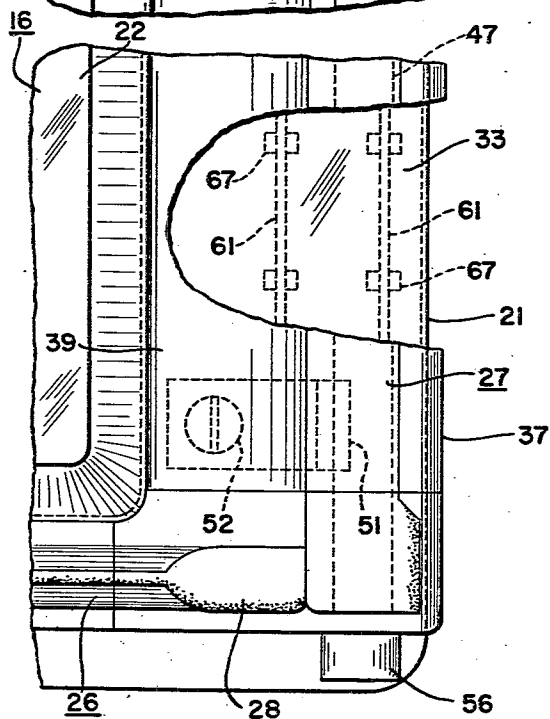
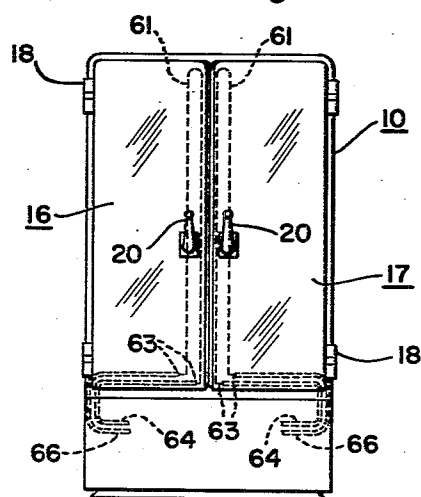


Fig. 9



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REFRIGERATING APPARATUS

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Application February 15, 1954, Serial No. 410,350

2 Claims. (Cl. 312—296)

This invention relates to refrigerator cabinets and particularly to a double door arrangement for sealing an access opening of a refrigerated compartment therein.

The present application is a continuation in part of my now abandoned application S. N. 350,181 filed April 21, 1953, entitled Refrigerating Apparatus which represented an improvement over the structure disclosed in my patent, No. 2,692,809 issued October 26, 1954 and also entitled Refrigerating Apparatus.

While the structure disclosed in my copending application referred to has met with a certain degree of success, I have found that it can be improved. In order to seal the joint between mating edges of two doors, affording access to a food storage compartment in a refrigerator cabinet of the type wherein the usual center mullion or pillar is dispensed with, by mechanically actuated resilient rubber or the like gaskets, I have discovered that the mechanical means must be rigidly hinged to the cabinet door at spaced apart points throughout the length of the mating edges of the doors. I therefore, in the present application, disclose a novel and improved arrangement for sealing a joint between mating edges of two doors employed to close the access opening of a refrigerated compartment and of warming the doors in the vicinity of their mating edges for a purpose to be hereinafter described.

An object of my invention is to provide a double door arrangement for the food storage compartment of a refrigerator cabinet wherein the joint between mating edges of the doors is effectively and positively sealed against heat leakage by a mechanical mechanism associated with a portion of a rubber or the like door gasket and rendered effective upon closing the doors.

Another object of my invention is to provide means within a flexible section of a rubber or the like gasket that extends continuously along one side of each of two refrigerator cabinet doors and has its ends engageable with a part of the cabinet upon closing the doors to move the flexible section of the gaskets into sealing engagement with one another which is pivotally mounted upon the door at a plurality of points intermediate its ends to prevent bowing thereof.

Another object of my invention is to hinge a substantially rigid actuating member located within a flexible sealing section of a door gasket at a plurality of points along the door and to secure the hinge parts to the door by the same means employed to fasten an inner pan or panel of the door to the outer pan or panel thereof.

A further object of my invention to provide a gasket along the mating edge of each of two doors employed to close the access opening of a food storage compartment in a refrigerator cabinet which gasket includes, in addition to a mounting section and a concealing flap, a resilient tongue section clamped to the door to compress the same whereby it normally biases an integral flexible sealing section of the gasket in a direction away from the mating edge of the door.

In carrying out the foregoing objects, it is a still further and more specific object of my invention to provide

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artificial heating means along the mating edge of two doors, at a mullionless joint therebetween, employed to close the access opening of a food storage compartment so as to prevent sweating or the accumulation of moisture on metal parts of the doors in the vicinity of the joint therebetween and to warm the door gaskets for prolonging their life.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of the present invention is clearly shown.

In the drawings:

Figure 1 is a front view of a refrigerator cabinet showing two doors closing a compartment therein and having a joint at the mating edges of the doors sealed in accordance with my invention;

Figure 2 is an enlarged broken horizontal sectional view of the refrigerator and is taken on the line 2—2 thereof;

Figure 3 is an enlarged fragmentary view taken along the line 3—3 of Figure 2 showing a gasket on one of the refrigerator cabinet doors;

Figure 4 is a fragmentary enlarged sectional view taken on the line 4—4 of Figure 3 illustrating the construction of the presently disclosed door gasket along the mating edge of one door;

Figure 5 is an enlarged fragmentary horizontal cross sectional view taken on the line 5—5 of Figure 1 showing the refrigerator cabinet doors in closed position with gaskets at the mating edges of the doors in sealing engagement with one another;

Figure 6 is a view similar to Figure 5 and shows one of the cabinet doors partially opened with the sealing section of a gasket thereon biased in a direction away from the mating edge of the one door;

Figure 7 is an enlarged view taken in the direction of line 7—7 of Figure 1 and showing in elevation the ends of rigid members extending out of the door gaskets and engaging a part of the cabinet;

Figure 8 is a fragmentary view taken in the direction of line 8—8 of Figure 1;

Figure 9 is a front view of a refrigerator cabinet similar to Figure 1 showing an electric heater along the mating edge of two doors closing the access opening of a compartment in the refrigerator;

Figure 10 is an enlarged fragmentary view similar to Figure 3 looking toward the inner surface of a door with the gasket thereon broken away to show electric heating wires on the door; and

Figure 11 is a fragmentary enlarged sectional view taken on the line 11—11 of Figure 10 showing the electric heating wires.

Referring now to the drawings I show in Figure 1 thereof a refrigerator cabinet, generally represented by the reference character 10, having my invention embodied therein. Cabinet 10 comprises a plurality of walls forming a food storage compartment therein. The walls of cabinet 10 include an outer shell or panel 11, an inner metal liner 12 and any suitable or conventional insulating material 13 disposed therebetween (see Figure 2). These walls define a food storage compartment 14 within cabinet 10. An opening in the front of cabinet 10 provides access to the interior of the food storage compartment 14. This compartment access opening is normally closed by two doors, generally represented by the reference characters 16 and 17, hingedly mounted upon cabinet 10 in side-by-side relationship for horizontal swinging movement relative thereto by suitable or conventional hinges 18. Any desired latching means may be employed to hold the doors in closed position. In the present showing of my invention this latching means

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includes spring brackets 15 mounted within compartment 14 on the top and bottom walls thereof adjacent the front of cabinet 10 for the reception of enlarged heads provided on studs 19 carried upon the inner face of doors 16 and 17. The legs of the spring brackets 15 frictionally grip the enlarged head portion of studs 19, when the doors are closed, and thus only a stationary handle, such as handles 20 (see Figure 1), are required on the doors to break the frictional engagement between brackets 15 and studs 19 when a door is to be opened. Any suitable or conventional insulating breaker strip structure may be located at the throat of the access opening of compartment 14 where the front edges of metal shell 11 and liner 12 terminate and are secured together. A closed refrigerating system (not shown) is associated with cabinet 10 and includes a refrigerant translating device or unit, usually mounted in a machine compartment below food compartment 14, and a refrigerant evaporator located within the food storage compartment 14 for cooling and causing circulation of air therein.

It is to be noted that the open front of cabinet 10 is devoid of a central pillar or mullion and that the doors 16 and 17 have adjacent mating edges respectively extending vertically across the access opening of compartment 14 and provide a joint exposed to the interior of the food storage compartment 14 which joint must be sealed to prevent heat leakage into the refrigerated food compartment. Each door 16 and 17 comprises a metal outer pan or panel 21, an inner preferably molded plastic pan or panel 22 and insulating material, similar to the cabinet wall insulation 13, disposed therebetween (see Figures 2 and 4). The doors 16 and 17 carry unitary rubber or the like gaskets each of which comprises two long portions 26 and 27 and has specially shaped portions 28 (see Figure 3) located at the corners of the mating edges of the doors. The one portion 26 of each gasket extends substantially around three sides of the door and is adapted to engage or abut against the front wall of cabinet 10 adjacent the access opening of food storage compartment 14. The other portion 27 of each gasket extends along the mating edge of one door and is adapted to be brought into sealing engagement with a part of the portion 27 of the gasket along the mating edge of the other door. Portions 26 and 27 of the rubber-like gaskets are extruded in a now well known manner to those skilled in the art and cut to the desired length. The short portion 28 of each gasket may be molded or otherwise shaped to the desired contour. The gasket of each door 16 and 17 comprises a length of the portion 26, a length of the portion 27 and two of the short portions 28 which portions are secured to one another by rubber cement or by vulcanizing one to the other to provide a unitary gasket extending around the door.

Portion 26 of each gasket includes a mounting part 31 and a sealing bead part 32 (see Figure 8). Outer door panel 21 has an inturred flange 33 provided with spaced apart tapped holes for the reception of screws. The mounting part 31 of gasket portion 26 lies along door flange 33 about three sides of the door and the inner door pan 22 overlaps this mounting part. Bead 32 is curled back and a plurality of screws 34 are passed through suitable spaced apart slots along the edges of door pan 22 and through openings provided in the mounting part 31 of portion 26 of the gasket and are then threaded into the tapped holes in flange 33 of door pan 21. Thus the inner door pan 22 is firmly secured to the outer door pan 21 with the mounting part 31 of gasket portion 26 locked therebetween. The sealing bead 32 of gasket portion 26 is then released whereupon it moves to overlap the edge of inner door pan 22 and the heads of screws 34 to thereby conceal the same. Portion 27 of each gasket, along the mating edges of the doors, is of special cross sectional contour and includes a relatively stiff flat mounting section 36, an integral

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resilient tongue or tongue-like section 38 and an integral resilient flap 39 (see Figure 4). A web 41 connects flap 39 to the mounting section 36 of gasket portion 27 and this web 41 has spaced apart elongated openings 42 cut therethrough for a purpose to be hereinafter described. The gasket portion 27 is provided with a groove 43 which extends from web 41 into the central part of the flexible sealing section 37. The part of sealing section 37 intermediate its outer surfaces and the groove 43 therein is, in the present disclosure, hollowed out as at 44 and a web 46 connects the wall of groove 43 to the outer wall of section 37. This web 46 ties the outer walls of bulbular sealing section 37 of gasket portion 27 to the inner walls thereof or to walls of groove 43 so as to more or less control the deformation of this portion of the gasket when it is brought into engagement with a companion or mating gasket sealing section. Tongue section 38 normally projects at an angle relative to and out of the plane of the integral mounting section 36 of gasket portion 27 and this portion of the gasket is constructed and arranged to cause the end of the tongue 38 to engage the inner surface of a door 16 or 17 and be bent or distorted, out of its normal angular position and into substantially the same plane with mounting section 36 when the mounting section 36 is securely attached to a door 16 or 17. This bending or compression of the resilient tongue 38 sets up and stores a force therein which normally biases the flexible sealing section 37 of gasket portion 27 in a direction away from the inner face of doors 16 and 17 and consequently away from the mating edges thereof. The groove 43 is open at the top and at the bottom of sealing section 37 and a rigid channel-like metal insert member 47 is slid into this groove. The edge part of member 47, adjacent the base of tongue section 38, is provided with elongated openings 48 spaced apart along the length of the mating edge of doors 16 and 17 (see Figure 3) which form hinge pins 49 at the edge of member 47 within the gasket portion 27. For example, there are five of the hinge pins 49 along the mating edges of the doors in the present disclosure. Each hinge pin 49 is embraced by one end of a relatively thin metal hinge butt 51 which extends through the openings 42 in web 41 and which has its other end secured to the doors 16 and 17 by a screw 52 threaded into flange 33 on outer door panel 21 to thereby pivotally mount member 47 upon a door within the gasket portion 27.

The pin embracing end of hinge butts 51 is normally of a substantial U-shape and after the insert member 47 has been slid into groove 43 of the gasket portion 27 this end of the hinge butts 51 is placed between flap 39 and mounting section 36 and forced through the openings 42 in web 41. The end of the U of each hinge part 51 is fished into the opening 48 of member 47 and hooked over a hinge pin 49. Thereafter the U ends of the hinge butts are bent over into the final substantially rounded shape as disclosed in Figure 4 of the drawings by a pair of pliers or the like so as to completely embrace a pin 49. Since the hinge butts 51 are relatively thin and readily bendable the pliers can be applied thereto through the walls of gasket portion 27 to carry out this bending operation without damaging a gasket. Portion 27 of the gasket together with the hinge member 47 and hinge butts 51 therein is laid on the surface of flange 33 on outer door pan 21 along the mating edge of a door 16 and 17. The peripheral edge of inner door pan 22 is then inserted between the mounting section 36 of gasket portion 27 and the hinge butts 51 whereupon resilient flap 39 is held back to permit the screws 52 to be passed through slots 53 provided along the edge of inner door pan 22 and through suitable spaced apart holes 54 in the mounting section 36 of the gasket. Screws 52 are tightened down or threaded into tapped holes provided in flange 33 of the outer pan of a door 16 or 17 whereby to secure hinge butts 51, inner door panel 22 and mount-

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ing section 36 of gasket portion 27 in place as is shown in Figure 4 of the drawings. Thereafter flap 39 on the gasket is released and its resiliency causes the same to spring back over the hinge butts 51 and the securing means or screws 52 in overlapping relation therewith to thereby conceal these parts from view. The tightening of screws 52 pulls the hinge butts 51 down into substantially parallel relation with the flange 33 and causes the outer tip part of resilient tongue section 38 of the gasket portion 27 to engage door pan 21 whereby the main body of tongue 38 is bent or placed under compression to force the sealing section 37 and hinge member 47 therein outwardly away from the inner face of the door and consequently in a direction away from the mating edge of the door. While I have separately described the attaching of gasket portions 26 and 27 to a door, in order to more clearly explain the biasing of the sealing section 37 thereof, it is to be understood that these assembling operations on the two portions of the gaskets are preferably carried out simultaneously since the gasket is a unitary structure. Ends of members 47 extend out of the top and bottom parts of the sealing section 37 of gasket portions 27 and have striker buttons 56 mounted in any suitable or conventional manner thereon (see Figures 3 and 7). Cam-shaped strikers 57 (see Figures 1, 6 and 7) are secured, by suitable screws or the like 58, to the front wall of cabinet 10 to form a part thereof and are adapted to be engaged by the striker buttons 56 for a purpose to hereinafter be described. The short specially shaped portions 28 of the gaskets on the doors 16 and 17 blend the enlarged door mating edge portion 27 thereof into the smaller beaded portion 26 and provide means for sealing the doors particularly at the juncture of portions 26 and 27 of the gaskets.

Assume now that both doors 16 and 17 are in closed position as shown in Figures 2 and 5 of the drawings. The beaded portion 26 of the gasket on each door engages the front wall of cabinet 10 to seal the access opening of food storage compartment 14 about three sides of the doors 16 and 17. The striker buttons 56 have engaged the strikers 57 (see Figure 7) to thereby overcome the biasing effect of the tongue section 38 of the gasket portions 27 and have caused movement of members 47 about their pivotal mounting or pins 49. This has moved the vertical edge portion of flexible sealing sections 37, at the mating edges of the doors, into abutting sealing engagement with one another. It is to be understood that when a member 47 moves the sealing section 37 of one gasket portion 27 into engagement with the sealing section of the other mating gasket these sections 37 will be slightly deformed against one another to thoroughly seal the joint at the mating edges of the doors 16 and 17. Pulling on handle 20 of either door 16 or 17 releases the studs 19 from their holding brackets 15 during the act of opening a door. Movement of one door independently of and relative to the other, to open a portion or one side of the access opening of food storage compartment 14, about its hinges 18 causes the striker buttons 56 to disengage the strikers 57. The biasing force stored up in tongue 38 on the gasket portion 27, along a mating edge of a door, moves the flexible sealing section 37 and consequently rigid member 47 therein about the pivots, pins 49, in an arcuate manner outwardly of the inner face of a door and away from its mating edge. Sealing section 37 of gasket portion 27 on this moved door disengages the sealing section 37 on the other door to break the sealed joint between doors 16 and 17 (see Figure 6). Separation of sections 37 of the gaskets at the mating edges of doors 16 and 17 respectively, upon initial opening movement thereof, prevents undue scraping or rubbing of the sealing sections against one another. Since the gasket arrangement along the mating edge of each door 16 and 17 is substantially the same it is to be understood that both doors may if desired be opened simul-

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taneously with one another to open the entire food compartment 14 and/or one door may be opened independently of movement of the other door to open a portion or one side only of the food compartment.

In accordance with one of the objects of the present invention I desire to warm the mating edges of doors 16 and 17 for a two-fold purpose. Since the joint between doors 16 and 17 is mullionless both the gasket seals on the doors and the mating edges of the doors become rather cold. This low temperature in addition to causing moisture from the room air to condense and collect on the metal door pan or panel 21 at or along the vertical mating edges of doors 16 and 17 and on the metal insert 47 within the door gaskets is also detrimental to the rubber-like gaskets themselves. The door gaskets are exposed to the low temperature within food storage compartment 14 and such low temperature keeps the gaskets and particularly the surfaces thereof cold whereby the gaskets become hard and stiff. This hard stiffness of the gaskets causes the contacting or sealing surfaces thereof to be easily marred or scratched whereby they soon become unsightly and must be replaced. I therefore provide means for applying artificial heat to the mating edges of doors 16 and 17 to warm elements at these mating edges for overcoming the difficulties described.

In Figure 9 of the drawings I show each of the doors 16 and 17 of cabinet 10 as having a loop of electric resistance wire 61 disposed therein along the mating edges thereof. These wires are of such material and size or diameter as to provide a predetermined resistance to the flow of electric current therethrough per foot of their length as to produce or generate a given amount of heat. The resistance wire loops 61, in doors 16 and 17, are covered with a plastic or the like material 62 (see Figure 11) and are connected, as at 63, with electric conducting and non-heat producing wires 64 and 66. Wires 64 and 66 pass out of doors 16 and 17 in the vicinity of the lower hinges 18 and extend downwardly behind the cabinet front wall or panel 11 through the horizontal lower insulated wall of food compartment 14 into the machine compartment therebelow. The wires 64 and 66 are attached to the electric wires leading to the refrigerant translating unit or device located in the machine compartment. Legs of the loops of heating elements or wires 61 are secured against the flange 33 of outer pan 21 of doors 16 and 17 in any suitable manner such, for example, as by strips of adhesive plastic tape or the like 67 (see Figures 10 and 11). Heating wire loops 61 are preferably energized at all times when the refrigerator is in use and employ approximately eight watts of electric current.

It should be apparent from the foregoing that I have provided an improved arrangement for sealing the joint between mating edges of two doors employed to close a food storage compartment access opening of a refrigerator cabinet. By providing means on the door gaskets themselves which biases the sealing section of the gaskets, I am enabled to simplify and reduce the cost of such sealing arrangement since the use of separate biasing springs or the like is eliminated. The hinging of an insert member within a movable sealing portion of a gasket at spaced apart points along an edge of a door prevents its bowing from end to end thereof and insures a tight seal throughout the length of a joint to be sealed. By providing a refrigerator cabinet with side by side swinging doors which are tall and narrow, the doors, when swung open, occupy much less space in front of the refrigerator than a single swinging door. Thus my improved refrigerator is capable of installation and use in confined areas of so-called utility kitchens of apartments and small homes that are usually compact due to the many built-in cabinets and other kitchen accessory features. Also by heating the double doors of

the refrigerator cabinet as herein disclosed along or in the vicinity of their mating edges I prevent accumulation of moisture thereon to eliminate drippage of water therefrom. Warming of the doors along their mating edges furthermore benefits and prolongs the life of the rubber-like door gaskets by keeping them soft and pliant whereby they do not lose their flexibility and are not readily scratched or marred.

While the form of embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, as may come within the scope of the claims which follow.

What is claimed is as follows:

1. In combination, a cabinet having walls forming a compartment therein, one of said cabinet walls having an opening providing access to the interior of said compartment, doors normally closing said compartment access opening, said doors having adjacent mating edges providing a joint exposed to the interior of said compartment and extending across the access opening intermediate opposed sides thereof, a gasket carried by at least one of said doors, said gasket having a portion about three sides of said one door adapted to abut said one cabinet wall and another portion adjacent the mating edge of said one door adapted to engage a part of the other of said doors, said another portion of said gasket including a mounting section, an integral flexible sealing section projecting from said mounting section and an integral resilient tongue section intermediate said mounting section and said sealing section thereof, means for securing said mounting section of said gasket to said one door, the projection of said tongue section being such as to cause the same to be compressed against the one door by said gasket mounting section securing means whereby to normally bias said gasket sealing section away from the mating edge of said one door, a substantially rigid member within the flexible sealing section of said gasket and having a part thereof located adjacent the base of said tongue section, said part of said member having an opening therein forming a hinge pin, a hinge butt secured to said one door and having an end thereof embracing said pin, said rigid member having its ends extending out of the sealing section of said another portion of said gasket, said ends of said rigid member being engageable with a part of said cabinet upon closing the doors to overcome the biasing effect of said tongue section of the gasket and move said flexible section thereof into engagement with a mating edge portion of said other door to seal the joint between said doors, and each of said doors being movable independently of the other to break the seal at said joint and open a portion of said compartment access opening.

2. In combination, a cabinet having walls forming a compartment therein, one of said cabinet walls having an opening providing access to the interior of said compartment, doors normally closing said compartment access opening, said doors having adjacent mating edges providing a joint exposed to the interior of said compartment and extending across the access opening thereof, a gasket on the inner face of each of said doors, said gaskets having a portion about three sides of the doors adapted to abut said one cabinet wall and another portion adjacent the mating edge of the doors adapted to engage one another, said another portion of each gasket including a mounting section, an integral flexible sealing section projecting from said mounting section and an integral resilient tongue section intermediate said mounting section and said sealing section thereof, means for securing said mounting section of said gasket to said door, the projection of said tongue section being such as to cause the same to be compressed against the door by said gasket mounting section securing means whereby to normally bias said gasket sealing section away from the mating edge of the door, a substantially rigid member within the flexible sealing section of said gasket and having a part thereof located adjacent the base of said tongue section, said part of said member having an opening therein forming a hinge pin, a hinge butt secured to said door and having an end thereof embracing said pin, said rigid member having its ends extending out of the sealing section of said another portion of said gaskets, said ends of said rigid member being engageable with a part of said cabinet upon closing the doors to overcome the biasing effect of said tongue section of the gaskets and move the flexible section thereof into engagement with one another to seal the joint between said doors, at least the sealing section of each of said gaskets overlappingly engaging said one cabinet wall above and below the said joint between said doors, when the doors are closed, to form a continuous seal throughout the height of said compartment access opening, each of said doors being movable independently of the other to break the seal at said joint and open a portion of said compartment access opening, and said another portion of each gasket also including an integral resilient flap overlapping said gasket securing means and said hinge butt to conceal the same.

References Cited in the file of this patent

UNITED STATES PATENTS

1,918,911	Hull	July 18, 1933
2,095,668	Konkel	Oct. 12, 1937
2,135,091	Newill	Nov. 1, 1938
2,460,469	Rifkin	Feb. 1, 1949