March 31, 1959 F. L. TARLETON 2,880,049

REFRIGERATOR CABINET CONSTRUCTION

Filed June 27, 1957 2 Sheets-Sheet 1

Fig. 1.

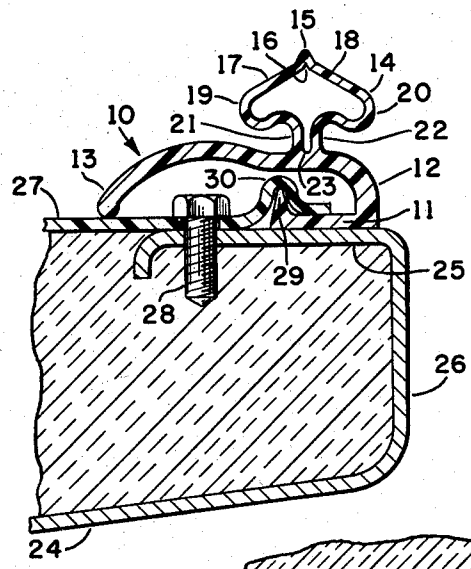


Fig. 2.

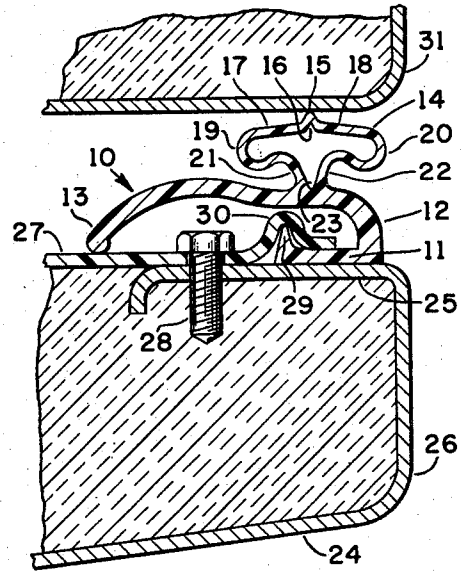
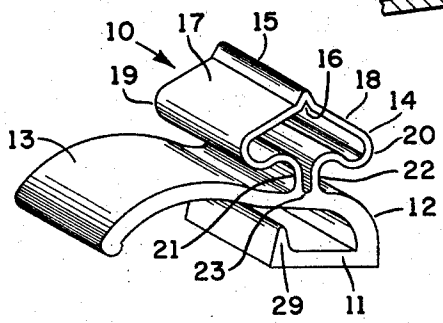


Fig. 3.



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Fig. 4.

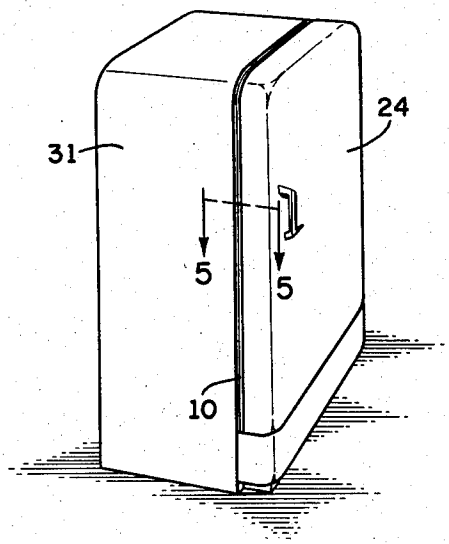


Fig. 6.

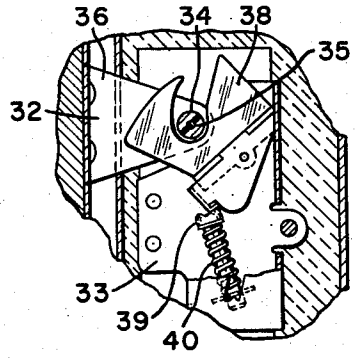
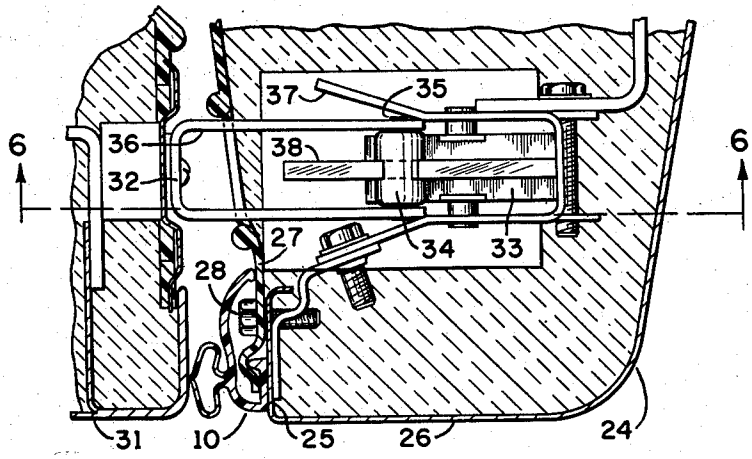


Fig. 5.



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2,880,049

REFRIGERATOR CABINET CONSTRUCTION

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Application June 27, 1957, Serial No. 668,405
9 Claims. (Cl. 312—296)

This invention relates to a household refrigerator cabinet construction and more especially to a door gasket for such a cabinet.

Door gaskets for refrigerators are required to seal the joint between the refrigerator cabinet and its door when the door is in the closed position. Most constructions used for these gaskets include a compressible, D-shaped, hollow sealing member. The sealing member generally has walls of approximately the same thickness as the relatively heavy base elements supporting the sealing member. This shape and wall thickness arrangement provides a strong, stiff sealing member. Such a sealing member will furnish an effective seal when used with a conventional door latch mechanism such as is found on most domestic refrigerator cabinets. These latch mechanisms, on engagement, will pull a refrigerator cabinet door closed with a force approximating forty pounds, ample to compress a stiff sealing member.

However, in recent years a serious problem has arisen in connection with refrigerator cabinets. Young children have climbed into refrigerators provided with the conventional door gasket and latch mechanism combination noted above and become trapped due to latching of the door behind them. The child's strength in each instance was not sufficient to release the door latch from the inside. These occurrences have brought about legislation on the subject, and effort in the domestic refrigerator industry to obtain a door latch mechanism enabling the refrigerator door to be opened easily from the inside by the application of an outwardly directed force to the inside of the door. Present legislation requires that the mechanism release the door on application of a force of not more than 15 pounds directed perpendicularly to the plane of the door and applied anywhere along the latch edge of the inside of the closed door. A mechanism having these characteristics has been described variously as a "safety release latch," a "light touch" door latch, and as a "low operating force" door latch mechanism. As a result, such mechanisms have been developed and to a large degree have answered the child entrapment problem. However, a new problem has arisen in connection with the use of these low operating force door latches. The door gaskets which were satisfactory on doors equipped with a conventional latch will not effectively seal a door having a "light touch" latch because where there was approximately forty pounds there is now only about twelve pounds acting to compress the sealing member of the gasket. In fact, the stiff conventional gasket might actually prevent a door equipped with a "light touch" latch from closing, because the force pulling the door shut supplied by latch engagement is so much less than with a conventional latch.

One object of my invention, in view of the problem outlined above, is to provide a refrigerator door sealing gasket which is resilient and easily compressible due to its shape, physical proportions, supporting structure and material, and yet provides a positive seal when used with a door latch mechanism having a low operating force.

Another object of my invention is to provide a sealing gasket which effects a positive continuous contact with the sealing surface by means of a single, highly flexible sealing ridge providing a tight seal between the inside and outside of the refrigerator.

A further object of my invention is to provide a sealing gasket which although soft and resilient, will retain its high degree of sealing efficiency for a long period of time.

A still further object of my invention is to provide a sealing gasket which has a shape and proportions which can be readily made by the extrusion process without objectionable warpage in the completed gasket.

Briefly stated, the above and other objects may be realized through the provision of the illustrated preferred embodiment of my invention. It consists of a highly resilient, easily compressible sealing gasket having a spade-shaped hollow cushion member with an exterior sealing ridge and a resilient arch-shaped supporting base. When the refrigerator door latch mechanism is engaged in the fully closed position of the door, the cushion member is under compression and the sealing ridge is in positive continuous contact with the refrigerator cabinet to effect a tight seal. A gasket made according to my invention is appropriate for use with a refrigerator door latch mechanism which will release the door on application of not more than a ten pound pull on the door handle or the equivalent pressure which can be applied against the inside of the door by a child trapped within the cabinet.

My invention will be better understood from the following description taken in connection with the accompanying drawings and its scope will be pointed out in the appended claims.

In the drawings,

Fig. 1 is a fragmentary section of a refrigerator door embodying the gasket of this invention;

Fig. 2 is a fragmentary section of a refrigerator cabinet and the door in closed position, with the door embodying the gasket of this invention;

Fig. 3 is a view in perspective of a portion of the refirgerator gasket of this invention;

Fig. 4 is a view in perspecive of a refrigerator cabinet embodying the gasket of this invention.

Fig. 5 is an enlarged horizontal sectional view taken substantially through lines 5—5 of Fig. 4 looking in the direction of the arrows; and

Fig. 6 is an enlarged fragmentary side elevation illustrating the latch portion of the structure of Fig. 4 with part of the refrigerator door and gasket broken away to illustrate a typical "light touch" door latch mechanism.

Referring to the drawings for a detailed description of a presently preferred form of the invention, the gasket **10** comprises a base or attachment flange **11**, a curving neck member **12** attached to and supported by the flange **11**, a lip member **13** attached to and supported by the neck member **12** and an approximately spade-shaped hollow sealing member **14** attached to and supported by lip member **13**. As indicated on the drawings, the lip member **13** overhangs the flange **11**. The gasket **10** is of one-piece construction and may be made from non-rigid vinyl chloride plastic or a rubber-like compound by the extrusion process.

Although the gasket **10** is of integral construction its various elements enumerated above are of predetermined shapes and physical proportions depending upon the function of the particular element. The base flange **11** is flat and approximately $\frac{1}{16}$ inch thick. The flat shape provides a broad supporting base for the gasket structure and prevents air leakage between the flange and the outer door panel after the flange has been secured to the door panel as described hereinafter. The thickness of approximately $\frac{1}{16}$ inch provides the requisite body strength and rigidity to mount the gasket and support its elements.

The curving neck member **12** may be slightly heavier; for example, it is approximately $\frac{5}{64}$ inch thick in the embodiment shown. Neck member **12**, and lip member

13, together constitute an arch which supports the sealing member 14. Inasmuch as sealing member 14 is not centered on the arch, but is supported closer to the neck member portion side of the arch, and because attachment to the base is through the neck member, it has been found that neck member 12 is preferably thicker than lip member 13 for uniform arch function. The shape and thickness of neck member 12 has been found most suitable to provide the necessary flexible support, strength and rigidity required for proper function of the gasket as a whole.

Lip member 13 is approximately 1/16 inch thick, and is formed with a rounded free edge which stiffens that portion of the lip and aids movement along the inner liner. The lip member 13 serves as part of the arch supporting sealing member 14, and it must therefore have some strength and rigidity. Lip member 13 must also extend so as to cover the fastening screws which fasten the inner liner, gasket and outer liner together as presently described. The free edge of lip member 13 is free to move transversely under compression of the arch formed by neck member 12 and lip member 13. Lip member shape and material and the bead on the free edge function so that the edge closely hugs the inner liner without warpage, completely concealing the fastening screws.

Hollow sealing member 14, because it functions as a sealing cushion, must be highly resilient, readily compressible, and subject to deformation under slight pressure. These requirements can be met when the sealing member walls are relatively thin as compared to the thickness of lip member 13 or neck member 12. Good results have been obtained with a wall thickness for the sealing member not more than 40% of that of the neck member 12. Specifically, the preferred embodiment has a thickness approximating 0.028".

Hollow sealing member 14, in its expanded or door-open position, has a unique shape approximating that of a spade of the playing card suit. It includes a narrow longitudinal sealing ridge 15 at the apex of its spade-shaped periphery. Good sealing efficiency results have been obtained with the preferred sealing ridge embodiment shown in the drawings in which the ridge is approximately 3/64 inch high with a 60° included angue and a 1/64 inch radius at the top edge. Directly underneath and parallel with ridge 15 is a longitudinal groove 16 on the interior of sealing member 14.

Sealing member 14 has straight shoulder portions 17 and 18 which slope down from both sides of sealing ridge 15 at a 30° angle from a horizontal line drawn through its base. These straight portions are terminated by depending S-curve portions which form lobes 19 and 20 on either side of a line dropped from the center of ridge 15. The curve portions end in converging support members 21 and 22 separated by groove 23. Members 21 and 22 extend from member 12 and provide a firm and yet resilient base for sealing member 14.

The approximate spade shape formed by the periphery of sealing member 14 is symmetrical about a center line passing through the centers of ridge 15 and groove 23. In the preferred embodiment shown in the drawings, sealing member 14 is wider than it is high; for example, it has a height of 3/8 inch measuring from the top of neck member 12 to the top of sealing ridge 15, and a maximum width of 1/2".

The vertical portions of support members 21 and 22 extend 1/16 inch from member 12 in the preferred embodiment. This height relationship to the dimensions of the sealing member is considered important to the overall performance of the sealing member 14. Some height is required to impart the desired flexibility. However, excessive support member height would prevent the uniform deformation under compression which typifies a gasket embodying my invention, and is required for an efficient sealing member.

The shape and proportions of sealing member 14 as described, insure a resilient sealing ridge which will provide positive continuous contact in door gasket use.

The action of the sealing member 14, as the gasket is compressed during the door closing operation, is similar to an elliptic spring under compression. The longitudinal groove 16 and the groove 23 between the support members 21 and 22 cooperate in this action by providing bending axes when sealing member 14 is compressed. The spacing between members 21 and 22 provides a broader base for the sealing member with resultant stability and resistance to shifting of the sealing ridge in relation to its support members.

Members 21 and 22 have relatively thin walls like the balance of the hollow sealing member, maintaining overall sealing member flexibility. Also, during compression of the sealing member, when the door is closing against the cabinet, there is a progressive separation of the upper portions of the members 21 and 22 as the sealing member deforms. These base member characteristics impart the requisite flexibility and soft action for desired sealing efficiency.

The relative thicknesses of the various elements of the door gasket, and particularly the relationship between member 14 and lip 12, are important in order to obtain optimum sealing efficiency.

The gasket 10 is secured to the refrigerator door 24 by clamping the base attachment flange 11 between the inturned edge 25 of the outer door panel 26 and the inner door liner 27 and fastening them together by screws 28, which enter the inner liner 27 beneath the overhanging lip member 13 as shown in the drawings. In the embodiment shown, the base attachment flange 11 has a thickened portion 29 at its free end which engages with a mating groove 30 in the inner door liner 27. When the thickened portion 29 is located in the groove 30 and the screws 28 are drawn tight, the gasket is securely fastened to the door.

Only one embodiment of the base attachment flange 11 is shown; however, an equally efficient alternate construction can be obtained by increasing the length of the flange from the neck portion 12 and omitting the thickened portion 29 and adding clearance holes for the screws 28. With this latter flange construction, it is, of course, not necessary to provide the inner liner with a groove because the thickened portion of the flange which is received by the groove is no longer present.

The door 24 is suitably hinged to the refrigerator cabinet 31. The cabinet 31 is provided with a door strike assembly 32 and the door 24 has a co-operating latch assembly 33. The door strike assembly consists of a horizontal cylindrical roller 34 mounted on a pin 35, the pin being secured at its ends in a frame 36 secured to the refrigerator door jamb by threaded fasteners. The latch assembly consists of a housing 37, a latch 38, with an opening shaped to mate with the door strike roller pivotally mounted within the housing, the latch having a pivotally fastened, depending cylindrical pin 39, the pin being attached at its lower end to the housing 37 and provided with a coil spring 40 positioned around it, the latch housing 37 being secured to the refrigerator door by threaded fasteners. The latch mounting, the depending pin 39 and the coil spring 40 co-operate to impart a toggle action to the latch. The door strike assembly 32 and the latch assembly 33 together constitute the refrigerator door latch mechanism. This latch mechanism is constructed to release the door by application of a ten pound force directed perpendicularly to the plane of the door and applied anywhere along the latch edge of the inside of the closed door. These characteristics define a refrigerator door latch mechanism of the safety release,

low operating force type. The details of the typical low operating force door latch mechanism of Figures 5 and 6 are shown only for purposes of illustration; other safety release door latch mechanisms or devices will work equally well with the refrigerator door gasket constituting my invention.

When the door 24 is closed against the cabinet 31, the sealing member 14 is compressed against the cabinet 31. The first part of the sealing member 14 to contact the cabinet 31 is the longitudinal sealing ridge 15 at the apex of the sealing member 14. As the door continues toward the closed position, the sealing member is compressed so that it assumes a shape approximating that of an ellipse with sealing ridge 15 on the outer periphery in positive sealing relationship with the cabinet. The deformation of hollow sealing member 14 progresses uniformly to the desired final shape due to the co-operation of the various sub-elements of element 14 with the other elements of the gasket. This co-operation is brought about through the unique shape of the various sub-elements and their relative wall thicknesses.

In summary, when the door is fully closed, we have a positive, continuous resilient ridge extending longitudinally around the refrigerator door periphery in the fully closed position of the door. There is complete contact between the sealing member on the door and the sealing surface of the cabinet providing an efficient seal between the inside and outside of the refrigerator when the door is fully closed.

The sealing gasket 10 may be formed from one or more pieces, but I prefer to form it in one continuous single length, co-extensive with the door perimeter, with the gasket ends butted together and spliced at a lower corner of the door.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes and modifications without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

I claim:

1. As an article of manufacture, a refrigerator door gasket comprising an elongated resilient unit including: a flat base attachment flange; a curving neck member approximately 5/64 inch thick attached along one edge to an edge of the flange; a lip member attached along one edge to the curving neck member and over-hanging the flange at its free edge; a hollow sealing member with a uniform wall, thin in relation to lip member and neck member thickness, the sealing member wall approximating 50% of lip member thickness and 36% of neck member thickness, said sealing member having a shape approximating that of a spade of the playing card suit in cross-section, with a longitudinal ridge at the apex on the exterior substantially midway between the lateral edges, a longitudinal groove on the interior of said member underlying said ridge, and straight shoulder portions extending downwardly on either side from said ridge, said portions terminating in lobar portions, and mutually spaced upstanding support members extending from the respective lobar portions in symmetrical relationship to said groove, said support members being attached to and supported by said neck member, whereby said gasket is easily compressible so as to be adapted for use with refrigerators having door latch mechanisms of the low operating force type.

2. A refrigerator door gasket element comprising a longitudinal hollow sealing member of resilient material and of a shape approximating that of a spade of the playing card suit in cross-section, said member having walls of uniform thickness, said member having a longitudinal centrally located external ridge and an internal groove under said ridge, said ridge having depending straight shoulder portions extending from said ridge, said shoulder portions having depending S-curve portions forming lobar projections, said projections terminating in curved support members coextensive with said sealing member, said support members being mutually spaced and integral with an arched base member, said base member having a thickness greater than that of the wall thickness of said sealing member, and flange means extending beneath said arched base member for securing said gasket element to a refrigerator door, said groove and the space between said support members providing bending axes on the compression of said sealing member facilitating a controlled deformation thereof, whereby said sealing member is adapted for use with refrigerators having door latch mechanisms of the low operating force type.

3. As an article of manufacture, a closure gasket comprising an elongated cushion member of resilient material including: a base attachment flange; a neck member attached along one edge to an edge of the flange; a lip member attached along one edge to the neck member; a hollow sealing member with a uniform wall, thin in relation to neck member thickness, of an approximate spade shape in cross-section, said sealing member having at least one longitudinal ridge on the exterior, at least one groove on the interior of said member under said ridge, shoulder portions extending downwardly from said ridge, said portions terminating in rounded projections, and support members separated by a groove and depending from said projections, said support members being attached to said neck member, the thin walls and the grooves of said sealing member cooperating to facilitate a ready deformation thereof under a relatively small compressive force.

4. As an article of manufacture, a refrigerator door gasket comprising an elongated resilient cushion member of predetermined shape and proportions including: a flat base attachment flange; a curving neck member attached along one edge of the flange; a lip member attached along one edge to the curving neck member and over-hanging the flange at its free edge; a hollow sealing member with a uniform wall, thin in relation to lip member and neck member thickness, the sealing member wall approximating one-third of neck member thickness, of a shape approximating that of a spade of the playing card suit in cross-section, said sealing member having a height equal to three-fourths of its maximum width dimension, a longitudinal ridge at the apex on the exterior substantially midway between the lateral edges, a longitudinal groove on the interior of said member in the vicinity of said ridge, straight shoulder portions extending downwardly on either side from said ridge, said portions terminating in lobar projections, and having curved converging base portions depending from said projections and attached to and supported by said neck member, the predetermined shape and proportions of said gasket providing appropriate, uniform deformation under relatively light compressive force, whereby the gasket is adapted for sealing refrigerators provided with door latch mechanisms of the low operating force type.

5. A door gasket element comprising an elongated hollow sealing member of resilient material and of a shape approximating that of a spade of the playing card suit in cross-section, said member having walls of uniform thickness, said member having a longitudinal centrally located external ridge projecting therefrom and an internal groove under said ridge, said ridge having angularly depending shoulder portions extending from said ridge, said shoulder portions having depending S-curve portions forming lobar projections, said projections terminating in curved converging support members, said support members being mutually spaced and integral with a resilient arch-like supporting base attached to and carrying said support members, said base having a conformation appropriate for securement to the inside panel of a refrigerator door adjacent its periphery, the ridge on said member providing a positive sealing edge and its

shape and proportions assuring easy compressibility, whereby said member is adapted for sealing refrigerators provided with door latch mechanisms of the low operating force type.

6. A door gasket element comprising an elongated hollow sealing member of resilient material and of a shape approximating that of a spade of the playing card suit in cross-section, said sealing member having an overall height equal to three-fourths of its maximum width dimension, a longitudinal centrally located external sealing ridge, and an internal groove under said ridge, said ridge having angularly depending shoulder portions, said shoulder portions having depending S curve portions forming lobar projections, said projections terminating in curved converging support members, said support members being mutually spaced and symmetrically disposed relative to said sealing ridge, said support members, further, being integral with a resilient arch-like supporting base extending at right angles to said support members, said support members having a height equal to one-sixth of the overall height of said sealing member, the space between said support members cooperating with said groove in providing bending axes effective on the compression of said sealing member, and the height of said support members imparting a predetermined degree of flexibility to said sealing member, whereby said sealing member is adapted for use in sealing a refrigerator having a door latch mechanism of the low operating force type.

7. A gasket for a door or the like comprising a resilient arch-like supporting base, means for securing said supporting base to a door, a hollow sealing member of resilient material coextensive with said base, said sealing member having a cross-sectional shape approximating that of a spade of the playing card suit, and having an overall height, measured relative to said supporting base, equal to three-fourths of its maximum width; said sealing member having a sealing ridge comprising the apex of symmetrical shoulder portions extending outwardly and downwardly therefrom, said shoulder portions respectively terminating in lobar projections; and flexible, resilient, support means integral with said arch-like base and said lobar projections for effecting continuous support of said sealing member in uniform space relation to said base, said support means being symmetrically disposed relative to said ridge and said lobar projections and having a height approximating one-sixth of the said overall height of said sealing member, the shape of said sealing member and its proportion providing an unusually flexible construction which is adapted for sealing the door opening of refrigerators provided with door latch mechanisms of the low operating force type.

8. In a household refrigerator of the type including a cabinet, an exterior door attached to said cabinet by hinging means, a latch mechanism attached to said cabinet and said door opposite said hinging means, said mechanism releasing said door from its closed position on the application of a force not in excess of fifteen pounds, directed perpendicularly to the plane of said door and applied anywhere along the latch edge of the inside of said closed door, the improvement comprising: a door gasket consisting of an elongated resilient unit including a flat base flange, said flange having a conformation adapting it for attachment to a door; a curving neck support member attached along one edge to an edge of the flange; a lip support member attached along one edge to the curving neck member and overhanging the flange, at its free edge; a hollow spade-shaped sealing member with a uniform wall having a thickness substantially less than the neck support member thickness, whereby the walls of said sealing member are substantially more flexible than said support members, the apex of said sealing member comprising a longitudinal, centrally disposed, external ridge adapted for sealing engagement with a door jamb; a longitudinal groove on the interior of said member underlying said ridge, said groove providing a bending axis facilitating a controlled deformation of said sealing member; straight shoulder portions extending angularly downwardly on either side from said ridge to terminate in lobar portions; and mutually spaced support members extending inwardly from said lobar portions into close spaced relation said support members then turning downward in substantially parallel closed spaced relationship into engagement with said neck member for the support of the sealing member in uniform space relation to said neck member, the close spaced relation of said support members providing a relatively narrow base for said sealing member, whereby said sealing member lobar portions are permitted a relatively large degree of lateral movement facilitating a substantial deformation of said sealing member under a relatively light compressive force.

9. In a household refrigerator of the type including a cabinet with an access opening in a wall thereof, an exterior door in covering relation with said access opening, said door being attached to said cabinet by hinging means, a low operating force door latch mechanism consisting of a strike attached to said cabinet, and a latch engageable with said strike mounted on said door opposite said hinging means, said mechanism pulling the door to a closed position against the cabinet with a relatively small force approximating twelve pounds on the engagement of said strike and said latch, and releasing said door from its closed position on the application of a similar force which need not exceed fifteen pounds directed perpendicularly to the plane of said door and applied anywhere along the latch edge of the inside of said closed door, an elongated, resilient door sealing gasket comprising: a flat base attachment flange for securement to the inside of a refrigerator door about the periphery thereof; a curving neck member attached along one edge to an edge of the flange; a lip member attached along one edge to the curving neck member and over-hanging the flange at its free edge; and a hollow spade-shaped sealing member with a uniform wall having a thickness of the order of one-third of the neck member thickness, said sealing member having a longitudinal ridge at the apex on the exterior substantially midway between the lateral edges, a longitudinal groove on the interior of said member in underlying parallel relation with said ridge, straight shoulder portions extending angularly downwardly on either side from said ridge to terminate in lobar portions, and mutually spaced support members extending inwardly from said lobar portions into relatively close proximity, and then turning downward in substantially parallel relationship into engagement with said neck member for the support of the sealing member in uniform space relation to said neck member, the close proximity of said support members providing a relatively narrow base for said sealing member, a longitudinal groove within said sealing member defined by the engagement of said support members and said neck member, said groove and the groove underlying said ridge providing bending axes which cooperate on the compression of said sealing member to facilitate a controlled deformation thereof, said sealing member symmetrically deforming from its original shape to a shape approximating an ellipse with a projecting exterior ridge, whereby said gasket is adapted to provide a positive, continuous sealed relationship between the door and the cabinet of a refrigerator provided with a door latch mechanism of the low operating force type.

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