Nov. 17, 1953 L. L. ANDERSON ET AL 2,659,115

MAGNETIC DOOR SEAL

Filed March 27, 1950 3 Sheets-Sheet 1

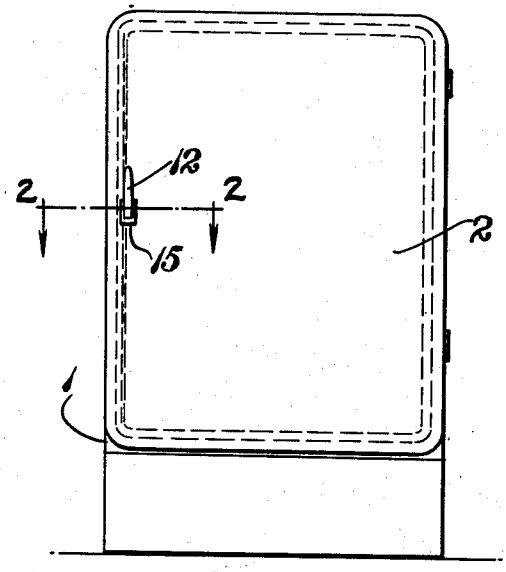

FIG. 1.

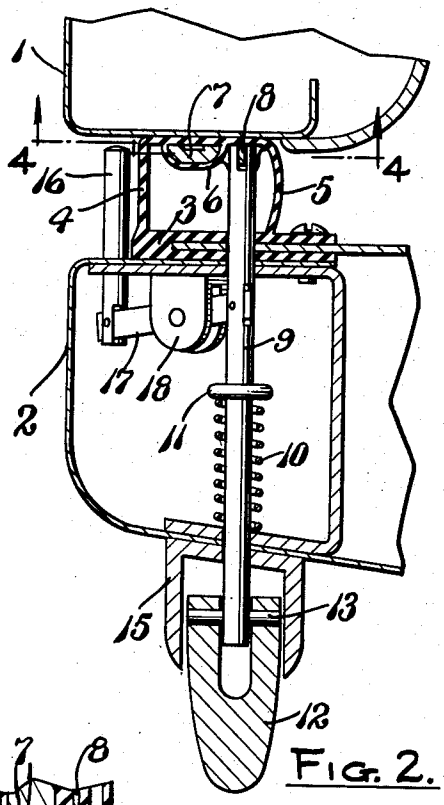

FIG. 2.

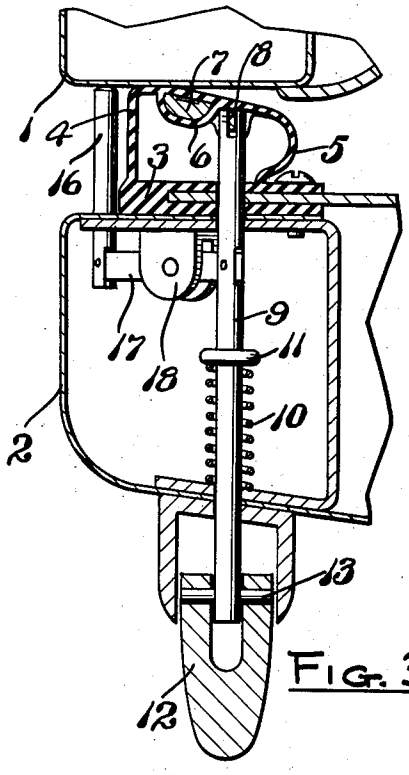

FIG. 3.

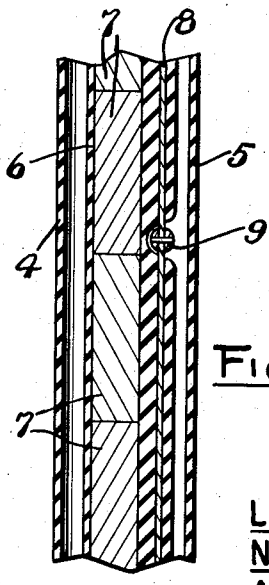

FIG. 4.

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Filed March 27, 1950 3 Sheets-Sheet 2

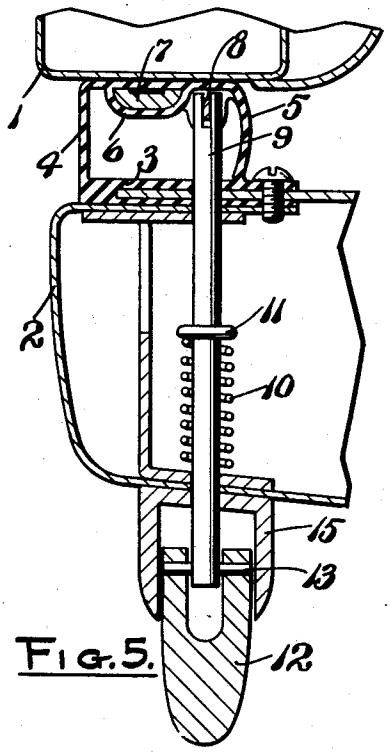

FIG. 5.

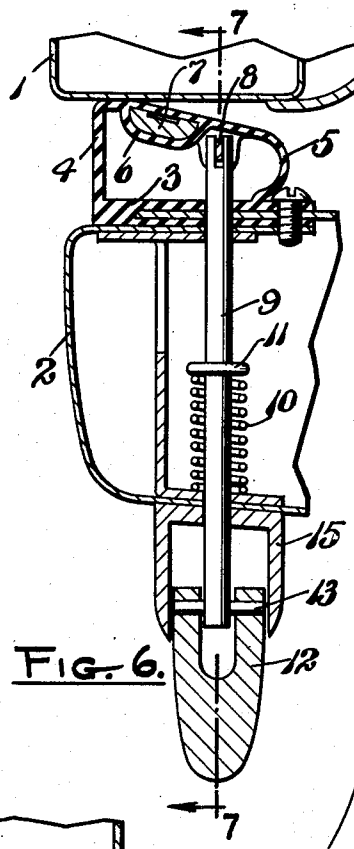

FIG. 6.

FIG. 7.

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Filed March 27, 1950 3 Sheets-Sheet 3

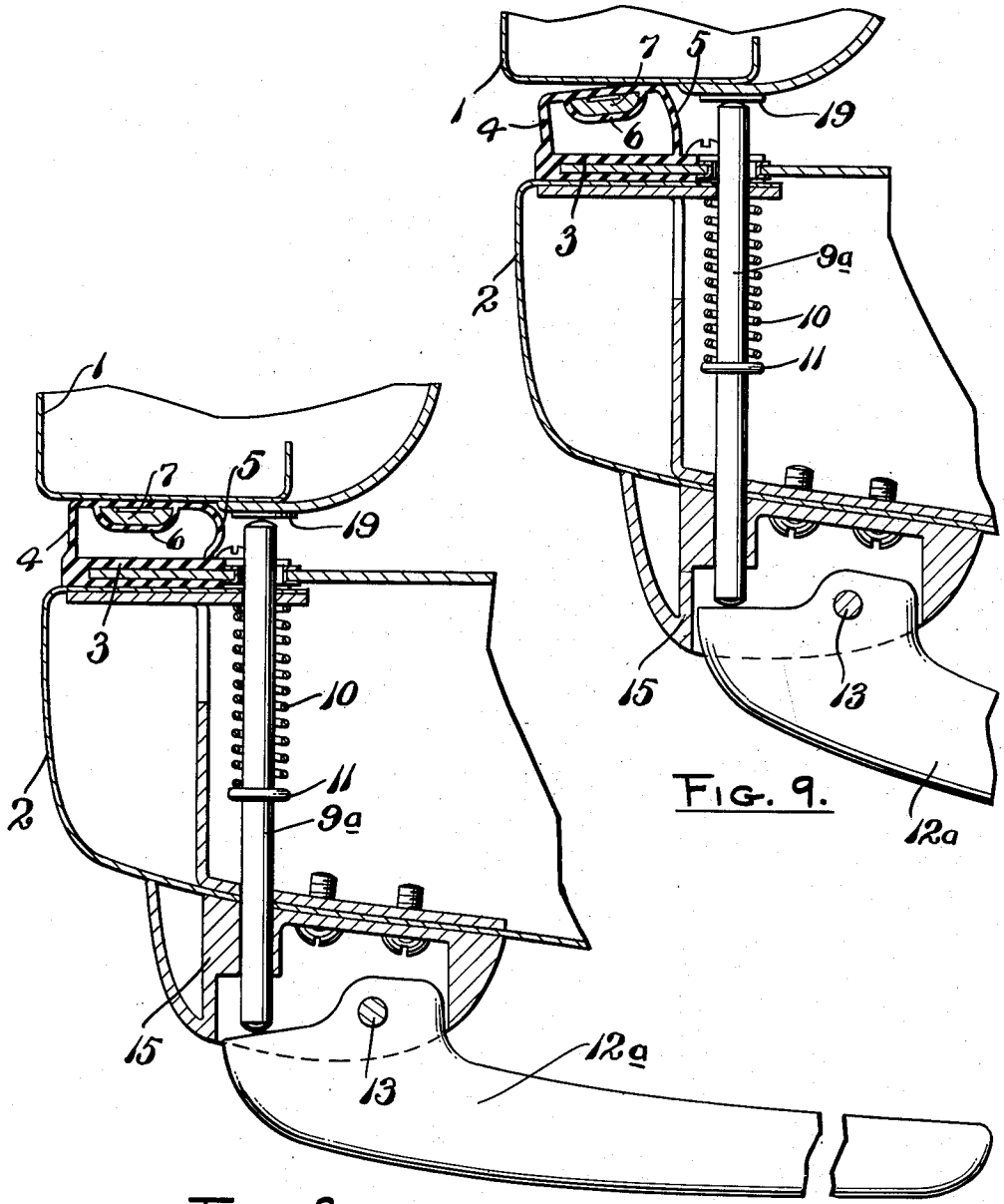

FIG. 8.

FIG. 9.

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MAGNETIC DOOR SEAL

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7 Claims. (Cl. 20—69)

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This invention relates to improvements in magnetic door closures and seals, being particularly concerned with practical means for releasing and opening a door which is held in closed and securely sealed position by magnetic attraction.

The present invention is designed for use in connection with refrigerators, in which a tight seal is required to prevent heat entrance to the interior of the refrigerator, causing loss of refrigeration efficiency, therefore, increased expense in the operation of the refrigerating mechanism associated with the refrigerator. In order to have such tight seal, a magnetic closure at all four edges of the door is needed, and the magnetic force exerted should be relatively strong in order to maintain the gasket between the door and refrigerator in tightly sealed condition. Therefore to open the door with a breaking of the force of attraction, which is exerted when the door is closed, may be greater than is practical for a direct upward pull on a fixed handle on a refrigerator door.

With our invention, manually operable means are provided for breaking the magnetic seal between the door and the refrigerator casing, first at the outer free edge of the door, and in a manner such that the manual force required is greatly reduced over what is required when a direct pull on a handle on the door is used. Through a novel lever operation which also serves as a handle to open the door, the holding or magnetic force is more easily broken with the exertion of a much less upward pull, so that undue strength is not required in the one opening the refrigerator door.

For an understanding of the invention, and novel mechanisms for accomplishing the objects and results stated, reference may be had to the following description, taken in connection with the accompanying drawings, in which,

Fig. 1 is a front elevation of a refrigerator having our invention, in one form, incorporated therein.

Fig. 2 is a fragmentary enlarged horizontal section substantially on the plane of line 2—2 of Fig. 1, looking in a downward direction, with the door closed.

Fig. 3 is a similar section illustrating the door in the first steps of being opened, and the initial breaking of the magnetic force holding the door closed.

Fig. 4 is a fragmentary vertical section substantially on the plane of line 4—4 of Fig. 2.

Fig. 5 is a fragmentary horizontal section similar to Fig. 2, taken on the plane of line 5—5 of

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Fig. 7, illustrating a structure for opening the door which is a modification of and has lesser parts in use than that shown in Figs. 2 and 3.

Fig. 6 is a section similar to Fig. 3, showing the door and release mechanism of Figs. 5 and 7 in the initial step of being opened, Fig. 5 showing it in closed position.

Fig. 7 is a fragmentary edge elevation and partial vertical section substantially on the line 7—7 of Fig. 6.

Fig. 8 is a fragmentary horizontal section similar to Fig. 2, showing a still further modified form of means incorporating the invention with the door closed, and

Fig. 9 is a like view, with the door in the act of being opened.

Like reference characters refer to like parts in the different figures of the drawings.

The refrigerator casing or housing 1 and the door 2 for closing its front opening, hinged adjacent one vertical edge on the casing, are of conventional structure. At the inner side of the door 2, and entirely around it adjacent its edges, a compressible gasket is permanently secured. The gasket which is hollow lengthwise, has a base 3 fastened to the door, an outer side 4 extending therefrom, a longer inner side 5 spaced from the side 4, and an integral connection between the inner edges of the sides 4 and 5, integral with which is a generally channel-like, inside located, retainer 6 for a plurality of magnets 7 which are disposed in end to end contact relation to each other (Fig. 4) lengthwise of the gasket. This makes a compressible gasket which when the door is closed has the base 3 and the opposite side of the gasket parallel to each other, as in Fig. 2. This causes the slightly longer side 5 to take a bowed or convex form. The magnets 7, as shown in cross section in Figs. 2 and 3, preferably, are of a shallow U or horseshoe shape the opposed poles of the magnets extending lengthwise thereof.

The gasket may be extruded from suitable rubber composition in any lengths desired. Also integrally formed with the gasket in parallelism with the magnet retainer 6, and at the inner side thereof, is a longitudinal rib in which an elongated bar 8 is embodied. A rod 9 is pinned or otherwise connected with the rod 8 and extends outwardly through the door 2 at a point between the upper and lower ends of the door. The rod is normally moved inwardly by a coiled compression spring 10 around the rod, between a collar 11 thereon and the outer side of the door. A handle 12 has a pivotal connection at 13 to the

outer end of the rod 9. The handle is also pivotally connected at 14 on a holding fixture 15 therefore secured at the outer side of the door.

The handle 12, as shown in Fig. 7, is a simple lever of the second class. On pulling outwardly on the handle 12, rod 9 is pulled lengthwise outwardly and the spring 10 compressed, thereby drawing the bar 8 from the position in Fig. 2 to that in Fig. 3, with a consequent greater bowing or distortion of the side 5 of the gasket. And the poles of the magnets 7 farthest away from the edge of the door are first moved away from the adjacent face of the refrigerator casing 1, as shown in Fig. 3.

A short rod 16, normally having its inner end in proximity to such outer face of the refrigerator casing 1 that the gasket bears against, extends through the inner side of the door 2 and has a pivotal connection within the body of the door to one end of a lever 17, which is pivotally mounted between its ends on a bracket 18 secured within the body of the door 2. The other end of the lever 17 has pivotal connection to the rod 9. Thus, when the rod 9 is pulled outwardly, the rod 16 is simultaneously moved inwardly. On such inward movement its free end presses against the outer face of the refrigerator casing 1 and helps to separate the gasket, at its outer edge portions from the adjacent face of the casing 1.

The structure in Figs. 5, 6 and 7 is the same as that in Figs. 1 to 4 inclusive, except that the rod 16, lever 17 and bracket 18 are not used. Therefore, the separation of the gasket from the refrigerator through the manual operation of the handle or lever 12 is solely by pulling the bar 8 outwardly first separating one of the poles of the magnets 7 and then, on further outward movement of the door, separating the entire gasket so that the door may be opened.

It is apparent that when the door is closed the force of attraction of the magnets upon the steel material at the face of the refrigerator casing around the door, will maintain the door in a tight sealed relation to the refrigerator casing. Such door, if attempted to be opened by a direct pull upon a handle fixedly secured on the outer side of the door, requires the exertion of a force sufficient to substantially break the magnetic force of all of the magnets, at least in the gasket at the outer free edge of the door, simultaneously followed thereafter by a rapidly succeeding breaking of the force of the magnets in the gaskets at the upper and lower edges of the door and, finally, of those at the inner or hinged edge of the door. The leverage provided by the handle 12, as a lever of the second class, not only multiplies the effective force manually applied to the lever, because of the much longer arm to which the manual force is applied, but also more readily breaks the magnetic seal between the door and casing because the magnets are not pulled directly outward substantially in a line at right angles to the plane of the face of the door. But they are first detached along the inner pole of each magnet and afterward at the remaining outer poles thereby materially reducing the force necessary to release the magnets entirely from the attraction of the casing.

In Figs. 8 and 9 the invention is embodied in a modified structure, the operation of which is the reverse of that previously described.

The rod 9*a*, similar to the rod 9, is positioned farther inward and is not connected with the gasket but, when the door is closed, its inner end bears against a plate 19 when the lever or handle 12*a*, pivotally mounted upon the fixture 15 is manually operated. The handle 12*a* is mounted as a simple lever of the first class. Upon outward pull thereon it moves the rod 9*a* inwardly, instead of such rod being drawn outwardly as in the previously described structures. When the door is closed the gasket side 5 is bowed into convex form to a greater degree than in the previous structures. Thus when the door is opened by pulling outwardly on the handle 12*a*, the shorter side 4 of the gasket will be first drawn away from the face of the refrigerator casing 1, before the inner side of the gasket straightening out from the position shown in Fig. 8 to that shown in Fig. 9, i. e., the gasket is "peeled" away from the casing in such manner that a greatly reduced force is necessary fully to break the seal.

Thus one of the poles of the magnets will first be pulled away from the face of the refrigerator casing before the opposite poles of such magnets, and the resultant lessening of force required to open the door will be substantially the same in degree. The spring 10 likewise is reversed in position and in its action, so as to normally tend to return the handle 12*a* to a position substantially parallel to the outer side of the door 2 when it is released, after having been pulled upon to open the door.

By reason of the structures described, the magnetic closure of the refrigerator door, wherein sealing the door is of greater importance than with many other doors, is effectively accomplished, with the necessary magnetic force furnished so that the door sealing to a required degree is obtained; yet at the same time, the door may be readily and easily opened without the necessity of undue manual force being exerted.

The invention is defined in the appended claims and is to be considered comprehensive of all forms of structure coming within their scope.

We claim:

1. In a structure as described, a casing having an entrance opening, a door hingedly mounted on said casing at one edge of the door for closing said opening, an elongated gasket secured at the inner side of the door having inner and outer spaced walls and spaced sides connecting said walls and providing a gasket hollow lengthwise thereof, one of said walls being secured to the door, magnetic means carried by the other of said walls to exert magnetic attraction upon the casing when the door is closed, a handle pivotally mounted at the outer side of the door, a rod operably associated with said handle, the distance from the association of said rod to the pivot of the handle being appreciably less than the distance from said pivot to the end of the lever farthest away from said pivot, and means associated with the inwardly extending portion of said rod for forcing the door outwardly upon outward operation of said handle to break the magnetic attraction of the magnets with said casing.

2. In a structure as described, a casing having an entrance opening, a door hingedly mounted at one edge on said casing to close said opening, an elongated gasket of resilient material secured at the inner side of the door adjacent its edges and adapted to bear against the casing around said entrance opening when the door is closed, magnetic means carried by said gasket at the side thereof nearest the casing for holding the door in closed sealed position, a movably mounted rod passing through the door adjacent the free edge thereof opposite its hinged

edge, a handle pivotally mounted on the door, the outer end of said rod having operative connection to said handle at its outer end and means for connecting said rod at its inner end to said gasket whereby, when the handle is pulled outwardly about its pivot, the gasket is pulled away from the casing adjacent the point of connection of the rod to the gasket.

3. A structure as defined in claim 2, and a bar extending lengthwise of and connected with said gasket to which the inner end of said rod is connected between the ends of the bar, to thereby pull a greater length of the gasket away from the casing.

4. A structure as defined in claim 3, a second and shorter rod having an end adapted to be located in close proximity to the casing when the door is closed, said second rod extending outwardly into said door, and a lever pivotally connected at opposite ends to said rods, combined with means carried by the door for pivotally mounting said lever between its ends.

5. In a structure of the class described, a casing member having an entrance opening, a door member hingedly mounted adjacent one of its edges on said casing at a side of the opening for closing the opening when the door is closed, a compressible gasket between the door and casing when the door is closed and secured to one of them, magnetic means carried by said gasket lengthwise thereof at its outer side to magnetically releasably connect the gasket at its outer side to the member upon which it is not mounted, a rod connected to the gasket extending outwardly through the door, and means secured to the outer end of the rod to move said rod longitudinally to separate said magnetic means from the member with which it is magnetically connected to open the door.

6. In a structure as described, a casing having an entrance opening, a door hingedly mounted adjacent one edge at one side of the opening for closing the opening, a gasket secured around the door adjacent its edges, said gasket having a wall secured to the door, a wall spaced therefrom and two sides spaced from each other integral with and connecting said walls, magnet means carried by the gasket lengthwise thereof on the wall of the gasket not connected to the door, a rod secured to said last mentioned wall of the gasket extending outwardly through the door, said rod being secured to the gasket at one side of said magnetic means for moving the magnetic means at one pole first away from the casing on outward pull on said rod, before the opposite pole of said magnetic means is pulled away.

7. A structure as defined in claim 6, combined with means movably connected to said rod and forced inwardly by the outward movement of the rod to bear against said casing and aid in moving the gasket outwardly from the casing, said means being mounted upon the door.

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