July 18, 1967 C. F. PETKWITZ ETAL 3,331,648

REFRIGERATING APPARATUS

Filed May 28, 1965 2 Sheets-Sheet 1

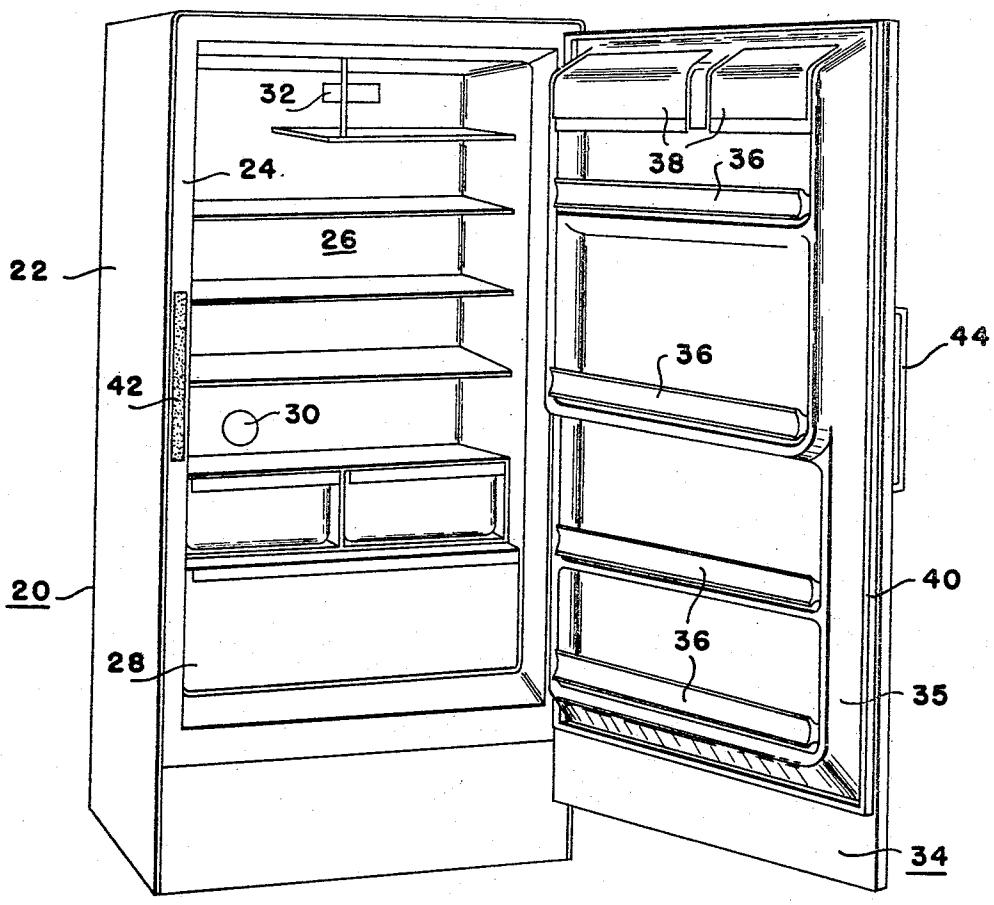


Fig. 1

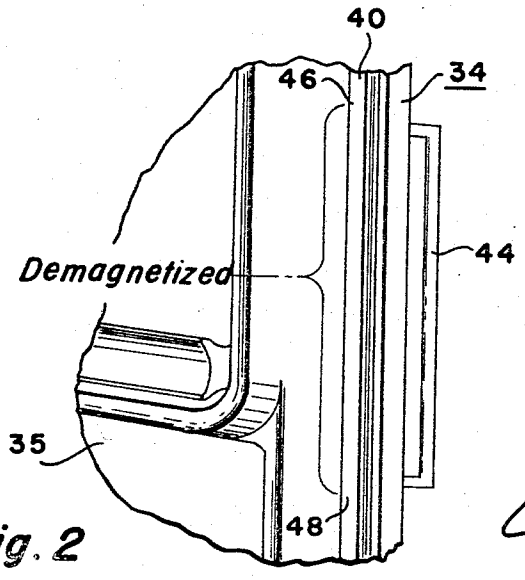


Fig. 2

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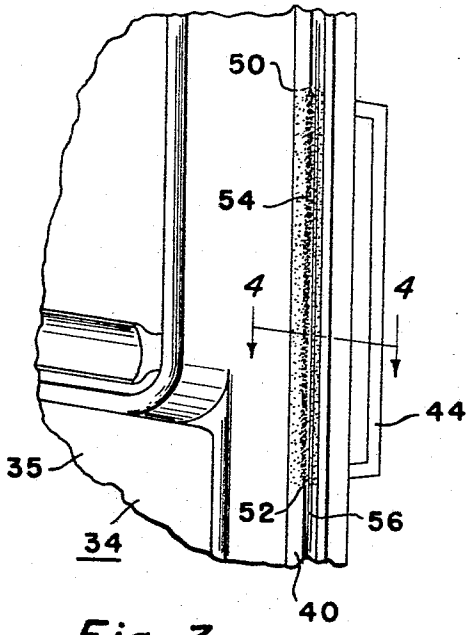


Fig. 3

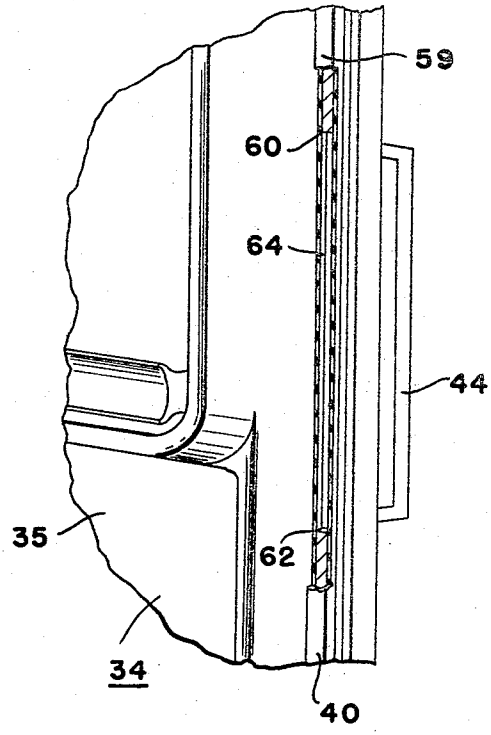


Fig. 5

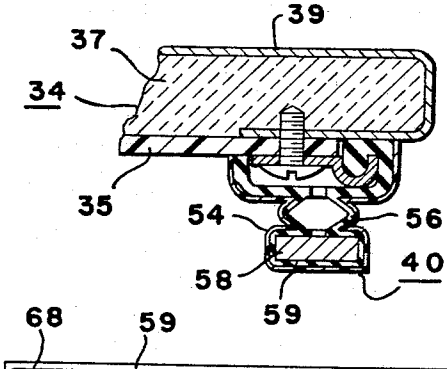


Fig. 4

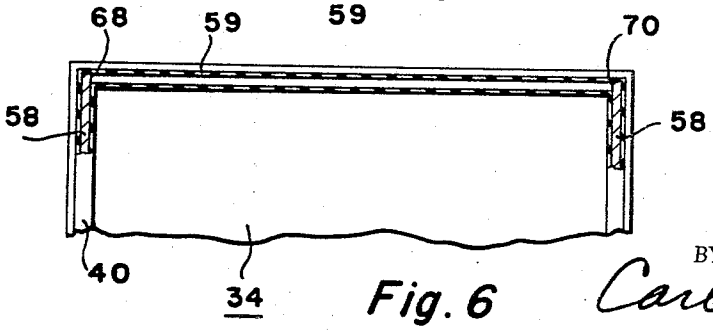


Fig. 6

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REFRIGERATING APPARATUS

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ABSTRACT OF THE DISCLOSURE

A magnetic door sealing arrangement for refrigerator cabinets which, when an opening force is applied to the door, a limited portion of the door seal will be separated from the adjacent magnetic holding surface to unseal the door and allow the separation of the seal from the magnetic holding surface in stages to reduce the peak opening force required.

This invention pertains to refrigerating apparatus and more particularly to magnetic door seal arrangements for refrigerator cabinets and other cabinets.

Because they provide simple, effective sealing arrangements which also hold the door closed with a limited force, magnetic door seals are used on most of the household refrigerator cabinets now made. However, it has been found that frequently such seals are so effective that a vacuum is created by the refrigeration and cooling of the air in the refrigerated compartment. Therefore, the air pressure on the outside of the door as well as the force of the magnetic seal must be overcome to open the door. Because of child safety regulations, the force required to open the door must be limited to 15 lbs. Therefore, some force multiplying devices and venting devices have been proposed but not adopted for commercial use since they entail added cost and complications.

It is an object of this invention to provide a simple door sealing arrangement which when opening force is applied to the door there will be first separated a limited portion of the door seal from the adjacent magnetic holding surface to initially provide for the leaking of air into the storage compartment to break the vacuum therein and also to allow the separation in stages of the seal from the magnetic holding surface to reduce the peak opening force required.

It is another object of this invention to provide a simple door sealing arrangement which when an opening force is applied to the door will allow a limited amount of air to enter the storage compartment and break the vacuum therein before there takes place the major magnetic separation of the door seal from the holding surface.

These and other objects are attained in the form shown in the drawings in which the magnetic holding force of the magnetic door seal is reduced or eliminated over a short section of the seal of the door. This is done by either placing a thin strip of nonmagnetic material between the door seal and the holding surface of magnetic material or otherwise weakening the magnetic force of the magnetic material in a section or short strip of the door seal or by omitting or removing the magnetic material from the door seal throughout a portion of limited length. By such an arrangement a pull on the door will first separate the portion of the seal in which the magnetic force is weakened or eliminated so that air can leak into the storage space to break the vacuum and also so that the door seal may be peeled or removed from the holding surfaces in stages. An additional expedient is to make the portion of limited length of the door seal with a less flexible and less extensible mounting for the magnetic portion than the remainder of the door seal so that

it will be pulled away from the holding surface before the remainder of the seal. In another embodiment, the magnetic material is omitted from the seal along either the top or bottom edge of the door.

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

In the drawings:

FIGURE 1 is a perspective view of one form of refrigerator cabinet with the door open illustrating a door seal arrangement embodying one form of our invention;

FIGURE 2 is a fragmentary front view of the door showing a modified form of door seal embodying a second form of our invention;

FIGURE 3 is a fragmentary front view of the door similar to FIGURE 2 showing another modified form of our invention;

FIGURE 4 is a fragmentary horizontal sectional view taken along the lines 4—4 of FIGURE 3;

FIGURE 5 is a fragmentary front view of the door similar to FIGURES 2 and 3 showing another modified form of our invention; and

FIGURE 6 is a fragmentary front view of the top of the door showing an additional modified form of our invention.

Referring now more particularly to FIGURE 1, there is shown a refrigerator cabinet 20 having an outer sheet steel shell 22 provided with an inwardly extending flange 24 also of sheet steel forming a peripheral surface of magnetic material around the access opening to the storage compartment 26. The bottom of the refrigerator is provided with a frozen storage compartment 28 closed by an inner door which is cooled by a refrigerant evaporator. Air from the storage compartment 26 is drawn by a fan through an opening 30 into heat transfer relation with the evaporator and cooled thereby and returned to the storage compartment 26 through a top opening 32. A single large door 34 is provided for closing the access opening to the storage compartment 26. The door may be provided with an inner pan 35 of plastic sheet material having suitable storage shelves 36 and closed compartments 38. The door is completed by an outer sheet metal pan 39 which holds in the insulation 37 as shown in FIGURE 4.

According to the prevailing construction, the door 34 is provided with a magnetic seal strip 40 extending entirely around its peripheral surface. This strip, for example, may be like that shown in FIGURE 4, or in Patent No. 3,048,902 issued Aug. 14, 1962, or in Patent No. 3,075,258 issued Jan. 29, 1963. As illustrated by said patents, the magnetic seal strip 40 is flexible and is connected to the peripheral surface of the door by a bellows type arrangement somewhat similar to that shown in FIGURE 4 herein. This makes an effective seal against the peripheral surfaces 24 when the door is closed even though the surfaces 24 may not be perfectly plane. Frequently, this seal is so effective that no air can leak into the storage space 26 and a vacuum is created therein by the cooling of the air.

According to our invention, to cause the magnet seal 40 to separate from the surface 24 in stages, we bond to the surface 24 a strip 42 of nonmagnetic material such as plastic adhesive tape of a thickness of about 1/32" approximately in the vicinity of the handle 44 of the door when the door 34 is in the closed position. The strip 42 between its ends weakens the magnetic attraction between the magnetic seal 40 and the magnetic peripheral surface 24. When the door 34 is pulled to open it, because of the weakened attraction, the portion of the magnetic seal

40 in contact with the strip 42 will release prior to the releasing of the remainder of the strip from the surface 24. This provides for a stage release of the magnetic door seal 40 so that the portion in contact with the strip 42 will pull away to allow air to leak into the storage compartment 26 prior to the remainder of the strip. This will immediately break the vacuum in the storage compartment and also provide for the release of the magnetic sealing strip 40 in stages from the surface 24, thereby reducing the maximum pull required to open the door 34.

In FIGURE 2, a similar result is obtained by demagnetizing a section of the door seal 40 between the reference characters 46 and 48. This demagnetizing of this portion weakens or eliminates the magnetic force of the magnetic material 58 in this envelope portion of the door seal so that any pull upon the door when the door is closed will first pull this portion between the reference characters 46 and 48 of the seal 40 away from the peripheral magnetic surface 24 to allow air to leak into the storage compartment 26 and break the vacuum and peel away the magnetic seal strip 40 away from the surface 24 progressively. In this form the strip 42 is not used.

In the form shown in FIGURES 3 and 4, the magnetic door seal 40 between the reference characters 50 and 52 is provided with a coating 54 of flexible rubber or vinyl plastic. This stiffens the flexible bellows portion 56 of the seal strip 40 and coats the envelope 59 enclosing the flexible magnetic portion 58 so that its magnetic attraction for the surface 24 is reduced. The seal 40 preferably is made of vinyl plastic, but may also be made of other flexible plastics or flexible rubber. In this form the strip 42 is likewise omitted. When the handle 44 of the door 34 is pulled to open the door, the coating 54 upon the flexible bellows portion 56 of the strip 40 will stretch less and exert a force sufficient to pull the magnetic portion 58 away from the magnetic peripheral surface 24 prior to the pulling away of the uncoated portion of the strip 40 which will stretch more easily. This prior pulling away of the coated portion of the strip 40 will allow leakage into the storage compartment 26 to break the vacuum therein and also will cause the release of the seal 40 from the surface 24 in stages so as to reduce the maximum pulling force required to pull open the door 34.

In FIGURE 5, a similar result is achieved by removing the magnetic material from the envelope 59 of the magnetic door strip 40 between the reference characters 60 and 62. The nonmagnetic portion 64 between the reference characters 60 and 62 will be held in sealing engagement with the surface 24 by the attraction of the magnetic material in the remaining portions of the magnetic seal strip 40. However, when a pull is exerted on the handle 44 of the door 34, since it is not magnetically attracted, the nonmagnetized portion 64 of the strip 40 will pull away immediately from the magnetic peripheral surface 24 thereby allowing leakage of air into the storage compartment 26 to break the vacuum therein prior to the delayed releasing of the magnetized portions of the strip 40 because of the magnetic attraction. This also allows the magnetic portions of the seal 40 to be progressively peeled away from the surface 24 so that the maximum force required to pull open the door is reduced.

A similar result can also be obtained by omitting the magnetic material from the portion of the magnetic door strip 40 at the top or the bottom of the door as illustrated in FIGURE 6. As illustrated in FIGURE 6, the portion

of the door seal 40 betwen the reference characters 68 and 70 has the magnetic material omitted from the envelope 59 forming the contacting portion of the door seal 40. When a pull is made upon the door handle 44, the envelope portion 59 of the door seal 40 between the reference characters 68 and 69 at the top of the door 34 will immediately pull away from the magnetic peripheral surface 24 of the outer shell 22 to break the vacuum within the compartment 26 prior to the release of the magnetic portions 58 of the door seal 40 at the door handle side and the bottom of the door so as to reduce the maximum pull required. Further reduction in the pull is obtained since there is only magnetic force on two sides of the door, namely, the handle side and the bottom side which are magnetically attracted to the cabinet shell 22. If it is desired to further reduce the required pull, the magnetic material may be omitted from the door seal 40 on both the top and the bottom sides of the door 34.

While the embodiments of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted.

We claim:

1. A cabinet including walls enclosing a storage space provided with an access opening with said walls having a peripheral surface around said opening, a door for closing said access opening having one side hinged to said walls, said door being provided with a peripheral surface, one of said peripheral surfaces being provided with a resilient magnetic seal strip and the other peripheral surface comprising magnetic material cooperating with said magnetic seal strip to magnetically hold the door closed and to attract the seal strip in magnetic sealing relation, said seal strip having a portion thereof that is non-magnetic for assuring the unsealing of said portion of said seal strip prior to the unsealing of the remainder of the strip away from the hinged side to allow a slight leakage past the seal strip into the storage space upon an attempt to pull the door open.

2. A cabinet as defined in claim 1 in which said portion of said magnetic seal strip away from the hinged side is demagnetized.

3. A cabinet as defined in claim 1 in which said magnetic seal strip contains magnetic material and in which the magnetic material is omitted in the portion remote from said one hinged side of the door.

4. A cabinet as defined in claim 1 in which said magnetic seal strip contains magnetic material and in which one of the sides of the strip away from the hinged side has the magnetic material omitted.

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