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Baermann

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[54] **MAGNETIC CLOSURE DEVICES**

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 100,634, Dec. 21, 1970, abandoned, which is a continuation of Ser. No. 792,533, Jan. 21, 1969, abandoned.

[30] **Foreign Application Priority Data**

Feb. 7, 1968 Germany 1678139

[52] **U.S. Cl.** 49/478, 49/479, 49/482

[51] **Int. Cl.** **E06b 7/23**

[58] **Field of Search** 49/478, 479, 485, 488, 49/492, 505, 489, 482, 493, 496, 497

[56] **References Cited**

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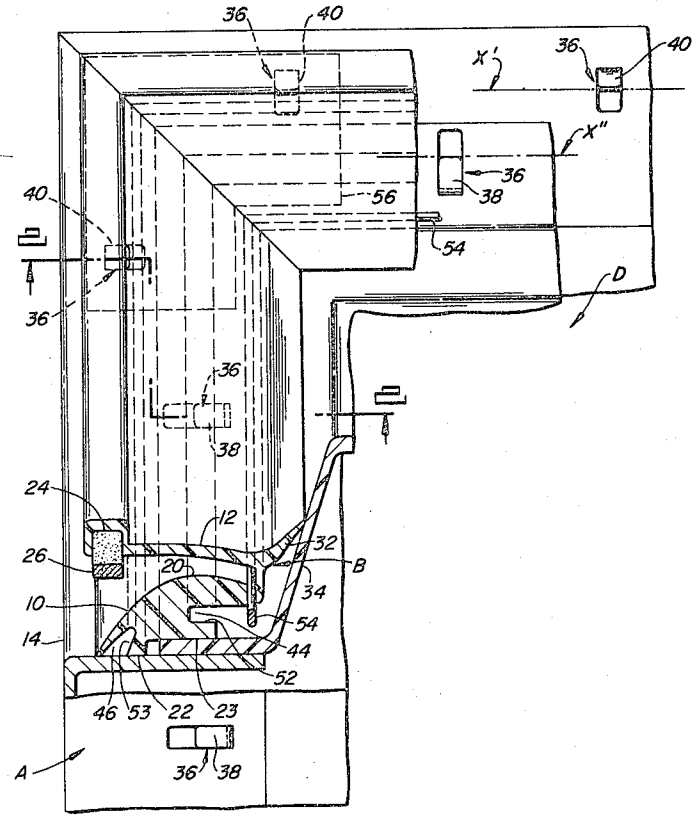
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[57] **ABSTRACT**

A self-mounting magnetic closure device for releasably holding and sealing a first element to a second magnetic element, one of the elements defining a movable door and the other of the elements defining a fixed frame having an opening, comprising in combination: an elongated, non-magnetic body member adapted to be affixed to the first element and extending substantially parallel to the edge of the first element; a flexible sealing blade extending out from the body member and having permanently magnetic material adjacent the free end thereof; the first element having a plurality of spaced tabs extending outwardly therefrom in at least one row substantially parallel to the edge of the opening; the tabs having a surface at least in part facing the first element, some of the tabs having free ends defining a line spaced laterally apart from a line defined by the free ends of the other of the tabs; the body member having at least one elongated groove extending the length thereof and a surface adapted to oppose the tab surface, the body member being semi-rigid so that it can be snapped over the tabs.

6 Claims, 3 Drawing Figures



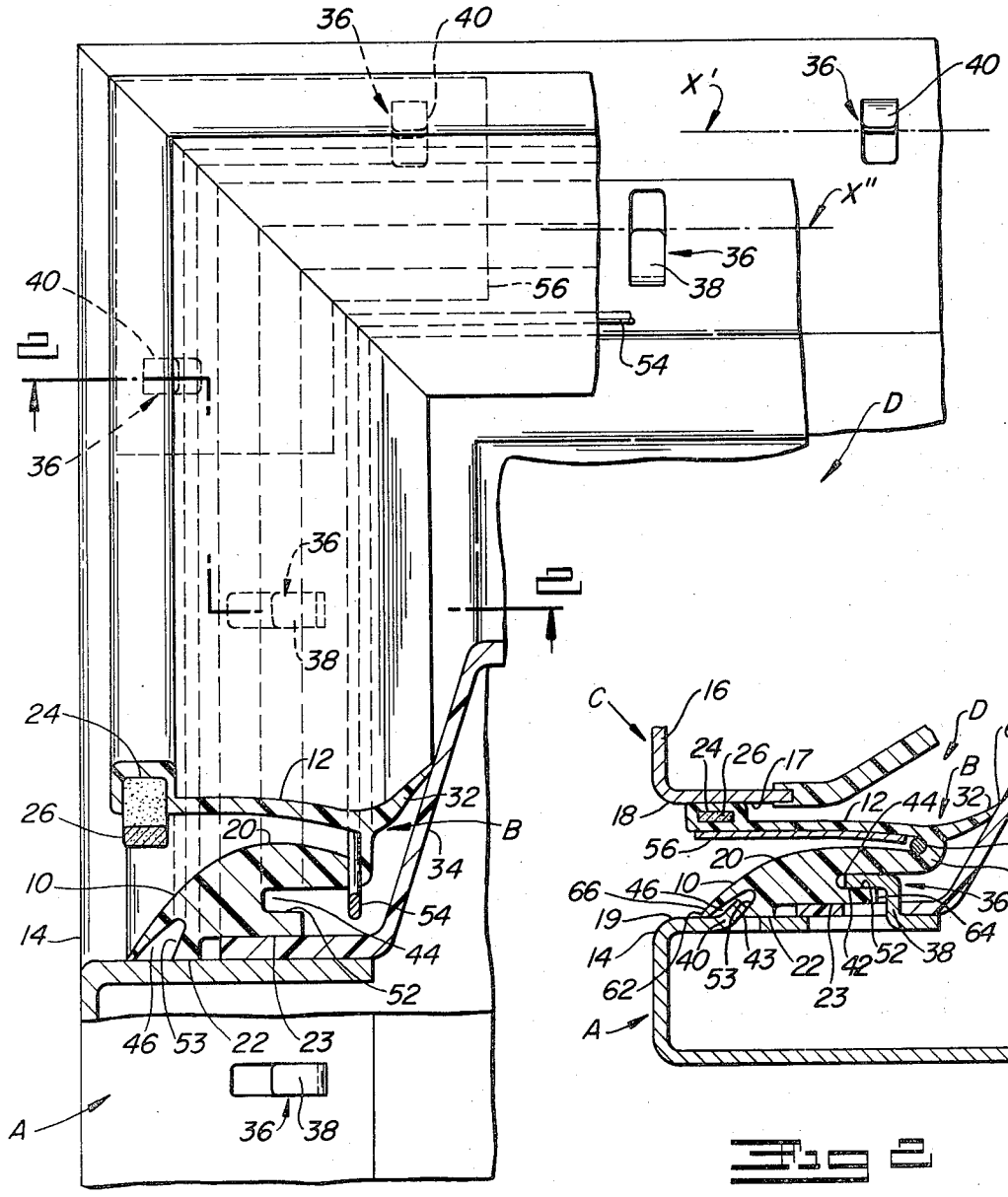


Fig 1

Fig 2

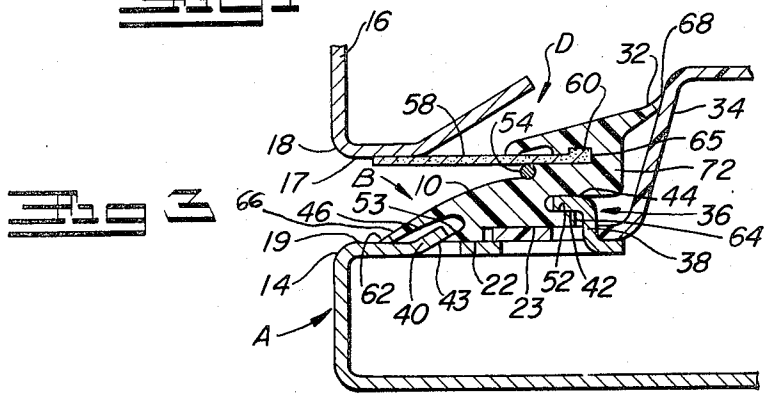


Fig 3

MAGNETIC CLOSURE DEVICES

This application is a continuation-in-part of U.S. patent application Ser. No. 100,364 filed Dec. 21, 1970 now abandoned, which in turn is a continuation of U.S. patent application Ser. No. 792,533 filed Jan. 21, 1969, and now abandoned.

The present invention pertains to the magnetic closure device art and more particularly to a means for attaching magnetic closure devices to either a movable door element or a fixed frame element.

This invention is particularly applicable to a means for attaching magnetic closure devices to the door or frame element of a refrigerator, and it will be described with particular reference thereto, however, the invention has much broader applications and may be used whenever it is desired to attach a closure device to a variety of articles having door and frame elements.

It has become common practice to provide a refrigerator door with a magnetic closure device including a gasket extending around the periphery of the refrigerator door and including an elongated, flexible permanent magnet which creates a holding force between the door mounted gasket and the magnetic steel frame of the refrigerator, thereby maintaining the door in a closed position as well as hermetically sealing the refrigerator interior from the outside atmosphere.

This particular magnetic closure device, although widely used in the refrigerator art, has had the inherent disadvantage of being difficult, costly and time-consuming to attach to refrigerator doors. Heretofore, it has been the practice to weld the desired lengths of gasket material together to form a frame dimensionally capable of extending around the periphery of the door. This gasket frame is then attached to the interior side of the door by means of screws. Another method which has also been employed requires a groove to be milled in the frame, preferably of stepped cross-section, and a gasket having a matching configuration is pressed into the groove and held in place by the clamping effect of the groove.

These and other disadvantages of prior devices have been overcome by the present invention which is directed toward a means for attaching magnetic closure devices that is simple, economical and obviates the need for fasteners such as screws and the like.

In accordance with the present invention there is provided a self-mounting magnetic closure device for releasably holding and sealing a first element to a second magnetic element, one of the elements defining a movable door and the other of the elements defining a fixed frame having an opening, comprising in combination: an elongated, non-magnetic body member adapted to be affixed to the first element and extending substantially parallel to the edge of the first element; a flexible sealing blade extending out from the body member and having permanently magnetic material adjacent the free end thereof; the first element having a plurality of spaced tabs extending outwardly therefrom in at least one row substantially parallel to the edge of the opening; the tabs having a surface at least in part facing the first element, some of the tabs having free ends defining a line spaced laterally apart from a line defined by the free ends of the other of the tabs; the body member having at least one elongated groove extending the length thereof and a surface adapted to oppose the tab surface, the body member being semi-rigid so that it can be snapped over the tabs.

The primary object of the present invention is to provide a means for attaching magnetic closure devices which is easy, rapid and inexpensive.

Another object of the present invention is to provide a means for attaching magnetic closure devices which obviates the need for external fastening devices such as screws, bolts and the like.

Yet another object of the present invention is to provide a means for attaching magnetic closure devices which permits a tight joint at the corners of the frame element without welding.

The invention may take physical form in certain parts and arrangement of parts, a preferred embodiment of which will be described in detail in this specification and illustrated in the accompanying drawings which form a part hereof and wherein;

FIG. 1 is a fragmentary plan view of a corner of the interior side of a refrigerator door and having a portion of the magnetic closure device sliced away;

FIG. 2 is an enlarged cross-sectional view taken generally along line 2—2 of FIG. 1, the refrigerator door being closed; and,

FIG. 3 is an enlarged cross-sectional view of a modification of the preferred embodiment of the present invention.

Referring now to the drawings wherein the showings are for the purposes of illustrating the preferred embodiment of the invention only and not for the purposes of limiting same, FIGS. 1 and 2 show a portion of a refrigerator door A and a magnetic closure device, indicated generally by the reference numeral B, attached thereto and adapted to hold the door closed to a frame 16 of a container or refrigerator C having an opening D therein adapted to be selectively closed by door A.

The magnetic closure device B comprises an elongated, non-magnetic, semi-rigid body member 10, to be defined in more detail later, and a flexible sealing blade 12 extending out from the body and coextensive therewith. The body member 10 is adapted to be affixed to the refrigerator door and extend about the periphery of it, being substantially parallel to the edge 14 of the refrigerator door A. However, it is to be appreciated that the body member 10, and hence the magnetic closure device B, could also be attached to the refrigerator frame 16 which defines an opening, the body member extending about the periphery of the frame and substantially parallel to the edge 18 of the opening, thereby achieving the same closing and sealing characteristics as when the closure device is mounted on the door A.

Opening D in container C has a plane peripheral surface 17 terminating at peripheral edge 18. Door A has a plane peripheral surface 19 parallel to surface 17 and terminating at outer peripheral edge 14. Container C may be considered as defining a first structure and door or closure A as defining a second structure.

The semi-rigid body member 10 may assume a variety of shapes, however in the preferred embodiment it is shown as having a generally arcuate upper surface 20 and a generally flat lower surface 22 which is upwardly stepped at 23. A flexible sealing blade 12 extends out from the upper surface 20 and constitutes an extension thereof. The sealing blade 12 terminates in an enclosure-like formation or pocket 24 which extends longi-

tudinally for the length of the sealing blade. A flexible permanent magnetic strip 26 is contained within the cavity defined by the pocket 24 for closing and sealing the door A to the frame 16. A prestressed elastic guard or sealing lip 32 projects outwardly from the body member 10 adjacent the point where the sealing blade 12 extends out from the body member and due to its prestressing tends to be in contact with the inclined interior lining 34 of the door A, thereby preventing dirt and liquids from penetrating into the interior part of the closure device B.

In order to fasten the closure device B to the door A, there is provided a plurality of spaced tabs, referred to generally by the numeral 36, extending outwardly from the door. The tabs 36 are punched and bent out of the door A thereby eliminating the need for external attaching devices, although it is to be appreciated that the tabs could also be arranged on a separate strip which would then be fastened to the door by any variety of means such as welding. The tabs 36 can be arranged in any number of rows which are substantially parallel to the edge 14 of the door A, however in the preferred embodiment they are shown as being disposed in two rows. Although the configuration of the tabs 36 may vary greatly, in the preferred embodiment they are illustrated as comprising a row of fastening tabs 38 and an opposed row of holding tabs 40. Each tab 36 defining tabs 38 and 40 has a surface 42 and 43 which at least in part faces the door A. Surfaces 42 on tabs 38 extend substantially parallel to door surface 19, while surfaces 43 on tabs 40 are inclined to door surface 19 at an acute included angle. The holding tabs 40 have free ends which define a line x' spaced laterally apart from a line x'' defined by the free ends of the fastening tabs 38.

The body member 10 has first and second elongated grooves 44, 46 which are coextensive therewith. The first elongated groove 44 is so configured as to receive the fastening tabs 38 and has a surface 52 opposed to the tab surface 42. The second elongated groove 46 is so configured as to receive the holding tabs 40 and similarly has a surface 53 opposed to the tab surface 43. Being more specific, the first groove 44 extends into the body member 10 in a transverse direction generally parallel to the door A inwardly of sealing lip 32, and the second groove 46 extends angularly into the body member toward the first groove to define another sealing lip outwardly thereof opposite lip 32. It is to be appreciated that the configuration heretofore described is only one of many conceivable tab and groove arrangements which could successfully be employed to attach the magnetic closure device B to the refrigerator door A; various arrangements having at least one tab and one groove could be used to accomplish the desired results.

Attaching the magnetic closure device B to the door A is easily, rapidly and inexpensively perfected by performing the following operations. From a strip of magnetic closure material B a segment is cut to the desired length. The material is then located on the door and locked in place by snapping the first groove 44 over the holding tabs 38 such that the tab surface 42 is opposed to the groove surface 52 (see FIG 2). The body member 10, due to its semi-rigid state, may be slightly deformed in order to allow the second groove 46 to snap over the holding tabs 40, again making sure that the tab surface 43 is opposed to the groove surface 53. In this position the magnetic closure device B is securely fastened to the refrigerator door A for closing and sealing same.

If for purposes of construction or assembly it is not desired to use holding tabs 40, an alternative approach may be employed. After the closure device B has been secured to the door A by means of fastening tabs 38, a fastening cord 54 may be inserted intermediate the upper surface 20 of the body member 10 and the sealing blade 12 at the junction where the sealing blade extends out from the upper surface. By being so located, the fastening cord 54 retains the body member 10 on the fastening tab 38 and holds the whole frame together.

In order to assure that the mitered ends of the sealing blade 12, which meet at the corners of the refrigerator door A, are securely fastened to one another, a foil 56 having an adhesive backing is secured to the underside of the sealing blade. Furthermore, it should be noted that the use of a fastening cord 54 will provide additional support for the closure device B at the corners.

Referring now to FIG. 3 wherein there is shown a modified arrangement of the preferred embodiment. In this modification the magnetic sealing blade 58 is comprised of a flexible plastic material having embedded therein permanent magnetic particles of high coercive force and in high concentration. Although the rate of concentration may vary, it is preferred that it be equal to or greater than 80 percent by weight. It can readily be seen that the entire sealing blade 58 has magnetic properties rather than merely its end portion. In this arrangement the body member 10 is provided with a longitudinal slot 60 in which the fixed end of the magnetic sealing blade 58 is inserted and is restrained therein by the clamping effect of the body member. The fixed end of the sealing blade 58 is additionally provided with a projection 65 which extends longitudinally throughout the length of the blade for engagement in the slot 60. This projection 65 further assures that the sealing blade 58 is securely restrained by the body member 10.

In operation the permanent magnetic strip 26 contained in the pocket 24 of the flexible sealing blade 12 (see FIG. 2) or the permanent magnetic sealing blade 58 (see FIG. 3), depending upon the embodiment employed, adheres to the entire periphery of the frame of the refrigerator when the door A is closed. This adhesion is due to the magnetic characteristics of the sealing blade 12 or 58 and the composition of the frame 16 which is either entirely ferromagnetic or is provided with ferromagnetic material. The adhesion therefore keeps the door A closed and simultaneously seals the refrigerator interior.

It will be recognized that body portion 10 of magnetic closure device B includes opposite spaced-apart side edges 62 and 64. Lateral groove 44 is formed in side edge 64 above stepped bottom portion 23. Angled groove 46 is formed in bottom portion 22 inwardly of side edge 62. Side edge 62 also defines the terminal edge of an outer sealing lip 66 which is located outwardly of angled groove 46. Terminal edge 62 of sealing lip 66 firmly engages peripheral surface 19 when magnetic closure device B is installed in position. Opposite sealing lip 32 also has an elongated terminal edge 68 which firmly engages the surface of interior lining 34. When magnetic closure device B is extruded to the shape shown, terminal edge 62 of sealing lip 66 nor-

mally extends downwardly below bottom surface 22. Likewise, terminal edge 68 of sealing lip 32 is below the position shown in FIGS. 1–3. When magnetic closure device B is installed on the tabs as shown in the drawing, sealing lips 32 and 66 are stressed upwardly so that terminal edges 62 and 68 thereof firmly engage the surfaces of door A outwardly of tabs 38 and 40. This completely conceals and covers tabs 38 and 40, and also seals so that dirt and liquids cannot become entrapped beneath body member 10. Sealing lips 32 and 66 also insulate against transfer of heat from the exterior of the container through the joint between door A and container C. Sealing lips 32 and 66 are very important, particularly when tabs 38 and 40 are bent and punched from the frame itself for door A. Punching of tabs 38 and 40 from the frame of door A itself leaves holes in the door frame. Such holes must be completely sealed so that the door will remain insulated. However, it will be recognized that tabs 38 and 40 may be punched and bent from a separate sheet metal strip bonded or welded to peripheral surface 19 of door A. Even then, it is highly desirable to completely cover and conceal such strip with sealing lips 66 and 68.

In the arrangement shown and described, it will be recognized that angled tab 40 provides a sloping surface 43 for cooperation with a similar sloping surface 53 of groove 46 to provide somewhat of a camming action which firmly holds magnetic closure device B in position.

It will be recognized that sealing blade 12 is connected with body member 10 by a connecting area generally designated by numeral 70. Connecting area 70 is located adjacent groove 44 and also adjacent side edge 64. Connecting area 70 extends upwardly above the upper surface of body member 10, and sealing blade 12 extends laterally from connecting area 70 across body member 10 in a position spaced vertically thereabove. Sealing blade 12 terminates substantially vertically above opposite groove 46 so that substantially all bending action of sealing blade 12 takes place adjacent connecting area 70. Sealing blade 32 extends outwardly from connecting area 70 in a direction substantially opposite to sealing blade 12.

The magnetic closure device of FIG. 3 also has a connecting area 72 located generally adjacent lateral groove 44 and side edge 64. Sealing blade 58 is connected with connecting area 72 above the upper surface of body member 10 and extends laterally thereacross in a location spaced vertically thereabove. Sealing blade 58 also terminates substantially vertically above opposite terminal edge 62 of body member 10. In this arrangement also, sealing lip 32 extends outwardly from connecting area 72 in a direction substantially opposite to sealing blade 58.

It will be recognized that fastening tab 38 is provided with surfaces extending generally parallel to surface 19 to insure a firm locking action against displacement of magnetic closure device B when vertical pulling forces are applied to sealing blades 12 or 58. Angled tab 40 makes it very simple to install magnetic closure device B because exact tolerances do not have to be maintained and the distance between the terminal edges of the two rows of tabs can be greater than if both rows of tabs had surfaces parallel to peripheral surface 19. This requires less transverse bending of body member 10 in order to install magnetic closure device B. When door A is open, a pulling force is exerted on sealing blades 12 and 58 until the force of magnetic attraction is overcome. This pulling force is transmitted to body member 10 through connecting areas 70 or 72. Having such connecting areas located adjacent groove 44 is highly desirable because tab 38 and groove 44 provide a secure locking action to prevent displacement of magnetic closure device B under action of such pulling force. If the position of tabs 38 and 40 were reversed it will readily be seen that such a pulling force applied to body member 10 directly adjacent groove 46 would be more likely to cause displacement of body member 10 from the tabs. It is evident that sealing blades 12 and 58 each have first and second spaced-apart opposite edges. One of such edges is connected with connecting area 70 or 72, while the other edge is located above opposite terminal edge 62 of body member 10. In the embodiment of FIG. 2, the edge of sealing blade 12 which is connected with connecting area 70 is formed integrally therewith. In the embodiment of FIG. 3, the edge of sealing blade 58 which is connected with connecting area 72 is received in a groove 60 formed therein.

In all embodiments, it is important that magnet 26 or the magnetic portion of sealing blade 58 be firmly secured against rotation or longitudinal movement relative to magnetic closure device B. It is also highly desirable that the magnetic portion of sealing blades 12 and 58 define a plane surface so that a substantial area of contact will be made wtih surface 17 of container C. Grooves 44 and 46 are formed in body member 10 inwardly of terminal edges 62 and 68 on sealing lips 32 and 66 so that a good sealing action is provided.

With the arrangement described, it is possible to extrude magnetic closure device B from a semi-rigid non-magnetic plastic material so that it will be firmly held by tabs 38 and 40 against displacement. A highly resilient material would allow easy bending of portions of body member 10 and might displace magnetic closure device B from engagement with the tabs. However, forming sealing blade 12 in a very thin section provides extremely good bending action. The long length of sealing blades 12 and 58 also enhances this bending action.

Although the invention has been shown and described with respect to certain preferred embodiments, it is obvious that equivalent alterations and modifications will occur to others skilled in the art upon the reading and understanding of this specification. The present invention includes all such equivalent alterations and modifications and is limited only by the scope of the claims.

Having thus described my invention, I claim:

1. A self-mounting magnetic closure device for releasably holding and sealing a first element to a magnetic element, one of said elements defining a movable door and the other of said elements defining a fixed frame having an opening, comprising in combination:

a. an elongated, non-magnetic body member adapted to be affixed to said first element and extending substantially parallel to the edge of said first element; a flexible sealing blade integral with said body member and extending outwardly from said body member from a point adjacent its inner edge, said blade having permanently magnetic material coextensive with said body member at least adjacent the free end of said blade;

b. said first element being of sheet metal and having a plurality of spaced tabs integral therewith and extending outwardly therefrom in two spaced rows substantially parallel to the edge of said first element; said tabs in one of said rows having a surface generally parallel to and facing said first element and having free ends defining a line spaced laterally apart from a line defined by the free ends of the other of said rows of tabs; said tabs in the other of said rows having a surface inclined with respect to the first element and facing toward said line defined by the free ends of said tabs in said one row;

c. said body member having a first elongated groove extending the length thereof on the side opposite from said blade to receive said one row of tabs and a surface adapted to oppose said surface of said tabs in said one row, said body member further having a second elongated groove extending angularly into said body member toward said first groove to receive said second row of tabs, and said body member being semi-rigid so that it can be snapped over said tabs, said body member including a pair of sealing lips and said first and second grooves are located in said body member inwardly of said sealing lips, and on the side of said body member opposite from said blade and said tabs being concealed and completely covered by said sealing lips.

2. In a magnetic closure device of the type particularly useful in sealing first and second surfaces which are frequently moved between a sealing and non-sealing position relative to each other wherein an elongated semi-rigid gasket body member having two spaced edges is affixed to said first surface and a magnetic material associated with said body member is adapted to sealingly engage the said second surface, the improvement comprising: a flexible sealing blade having two edges, the first of said edges being affixed to one edge of said body member with said blade being spaced from said body member and extending generally transversely across the width thereof in a generally parallel spaced-apart relationship with said first surface, said blade further including a receiving pocket disposed to extend longitudinally therealong adjacent the second of said edges, said pocket being dimensioned to closely receive an elongated flexible magnetic strip therein, said blade being arcuately movable about said one edge at least as said second surface is moved away from said first surface, and a fastening cord disposed intermediate said first edge of said sealing blade and said one edge of said body member, whereby said body member may be further secured to said first surface.

3. A self-mounting magnetic closure device for releasably holding and sealing a first element to a magnetic element, one of said elements defining a movable door and the other of said elements defining a fixed frame having an opening, comprising in combination: an elongated, non-magnetic body member adapted to be affixed to said first element and extending substantially parallel to the edge of said first element; a flexible sealing blade extending out from said body member and having permanently magnetic material coextensive with said body member at least adjacent the free end of said blade; said first element having a plurality of spaced tabs integral therewith and extending outwardly thereform in tow rows substantially parallel to the edge of said first element; said tabs in one row having a surface generally parallel to said first element, and having free ends defining a line spaced laterally apart from a line defined by the free ends of the other of said rows of tabs; said tabs in said other row having a surface inclined with respect to the first element and toward said line defined by the free ends of said tabs in said one row; said body member having a first elongated groove extending the length thereof to receive said one row of tabs and a surface adapted to oppose said surface of said tabs in said one row, said body member further having a second elongated groove extending angularly into said body member toward said first groove to receive said second row or tabs, and said body member being semi-rigid so that it can be snapped over said tabs; and, a fastening cord disposed intermediate said semi-rigid body member and sealing blade and coextensive therewith, whereby said magnetic closure device is further secured to said first element.

4. The device defined in claim **3,** wherein the fixed end of said flexible sealing blade is integral with said semi-rigid body member and the free end carries a flexible permanent magnetic strip.

5. The device defined in claim **3,** wherein said flexible sealing blade comprises permanent magnetic material, said fixed end being retained in a slot in said semi-rigid body member.

6. The device defined in claim **3,** including a foil mounted on the underside of said sealing blade when said blade approaches the corners of said first member, said foil having an adhesive backing for providing additional support to said magnetic closure device at the corners of said first element.

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