Dec. 7, 1965 J. C. LEWIS ETAL 3,221,375

SEALING MEANS

Filed Dec. 14, 1962

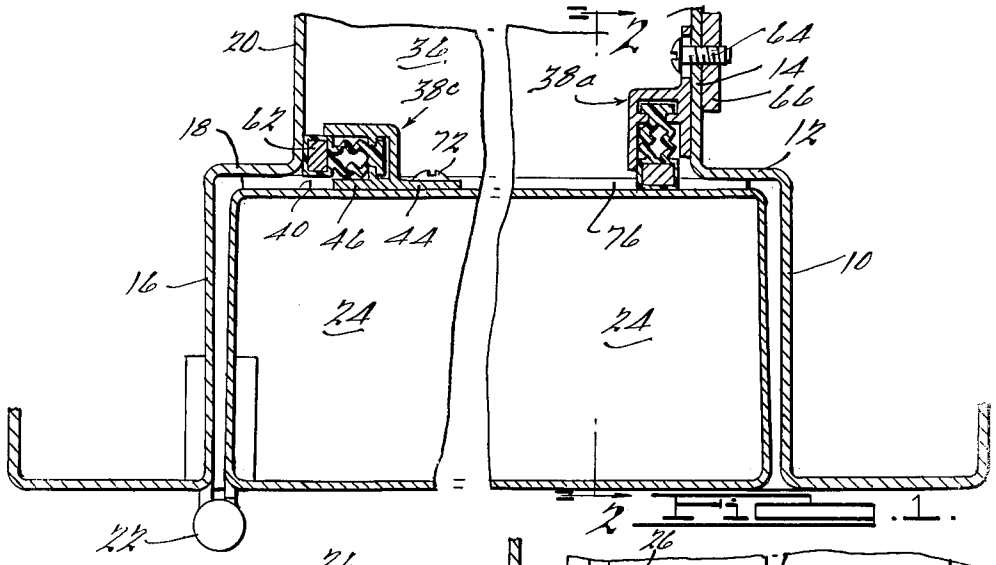

FIG. 1.

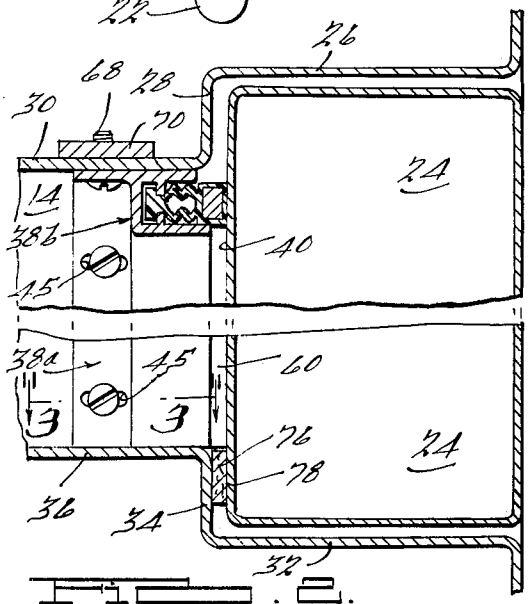

FIG. 2.

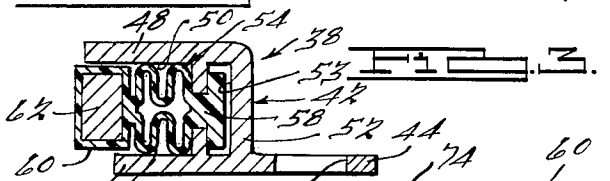

FIG. 3.

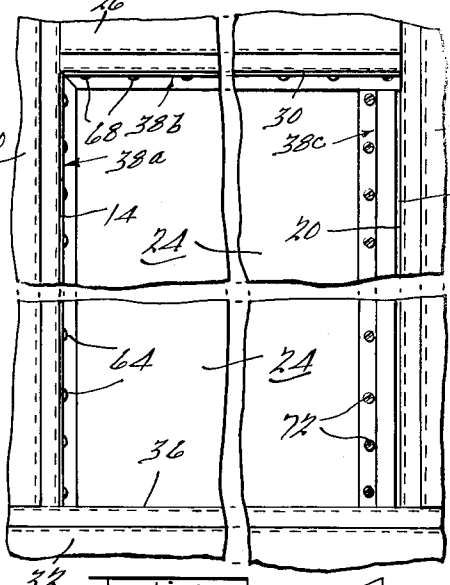

FIG. 4.

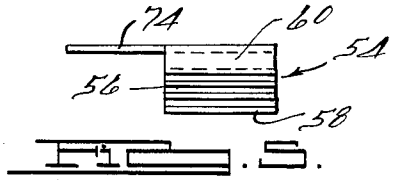

FIG. 5.

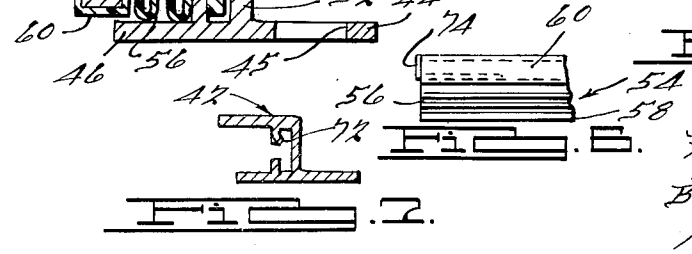

FIG. 6.

FIG. 7.

INVENTORS.
James C. Lewis
Robert M. Hockett
Rex H. Wainwright
BY Harness, Dickey & Pierce
ATTORNEYS.

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SEALING MEANS

James C. Lewis and Robert M. Hockett, Tulsa, and Rex H. Wainwright, Claremore, Okla., assignors to Braden Steel Corp., Tulsa, Okla.

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The present invention relates generally to the art of sealing and more particularly to unique means in the nature of weatherstripping for sealing doors against weather, dust, and the like.

It is a primary object of this invention to provide relatively simple and inexpensive sealing means for doors, particularly steel fire-proof and/or blast-proof doors such as those now required in so many industrial and commercial buildings, to render such doors dust-proof and weatherproof, even under conditions in which the door or its frame becomes warped, such as occurs to outside steel doors exposed on one face to the hot sun or the like, and yet not create undue resistance to the normal opening and closing of the door. A related object resides in the provision of sealing means of this type which is readily adjustable throughout its length to vary the gap between the door and frame which is to be sealed, whereby uniform and complete sealing may be achieved about the entire periphery of the door, and which is adapted for use with both new and existing conventional doors and frames of standardized construction.

Another object concerns the provision of unique mounting means for door sealing members which rely for sealing upon the magnetic attraction to one of the members to be sealed of an elongated permanent magnet secured to an elongated relatively fragile transversely expansible resilient member in turn secured to the other member to be sealed, which mounting means fully guides the fragile member, protects it from injury which might otherwise be caused by the movement of people and/or equipment through the door opening, and conceals it for purposes of appearance, without in any way limiting or restricting the operation of the sealing member, and by which such sealing members may be utilized on both new and existing doors of standardized construction.

A further object of this invention resides in the provision of sealing means having the aforesaid characteristics which may also be used with doors and frames which are not formed of steel and thus are not inherently magneto-responsive, i.e., attracted by magnetic forces.

Yet another object resides in the provision of sealing means of the aforementioned type which is so constructed and arranged that the portion thereof which seals the gap between the hinged edge of the door and the adjacent jamb is not subject to distortion or injury due to the pinching action of the jamb and this edge of the door when the latter is closed, or due to the tight arc in which that portion of the door swings.

These and other objects of the present invention will become apparent from consideration of the specification taken in conjunction with the accompanying drawings in which there is illustrated a single embodiment of the present invention, by way of example, and wherein:

FIGURE 1 is a horizontal sectional view of a portion of a door frame and the associated door, provided with sealing means incorporating the principles of the present invention;

FIGURE 2 is a vertical sectional view taken substantially along line 2—2 in FIGURE 1, but showing the sealing means in a relaxed state;

FIGURE 3 is an enlarged sectional view taken substantially along line 3—3 in FIGURE 2 and oriented 180°;

FIGURE 4 is a reduced elevational view from the inside of the door and frame shown in FIGURES 1 and 2;

FIGURES 5 and 6 illustrate one manner in which the end of a portion of the sealing means may be formed; and

FIGURE 7 is a cross-sectional view of one of the elements of the sealing means.

Considering the drawings in greater detail, there is illustrated in section in FIGURE 1 the outside portions of a conventional steel door frame, including a latch jamb **10** having a door stop portion **12** and an intermediate portion **14**, and a hinge jamb **16** having a door stop portion **18** and an intermediate portion **20**. Hingedly supported in the usual manner, as by a hinge **22**, is a standard steel door **24**. As can be seen in FIGURE 2, the door frame further includes a header **26** having a door stop portion **28** and an intermediate portion **30**, and a sill **32** having a door stop portion **34** and an intermediate portion **36**. In FIGURES 1 and 2 the center of the door and frame have been broken away for purposes of illustration.

Turning to the sealing means of the present invention, there are provided a plurality of elongated sealing devices **38**, each comprising a mounting member having an elongated channel therein, and a sealing member positioned for the most part within the channel. The details of construction of each sealing device **38** are best illustrated in FIGURE 3.

Each mounting member, indicated generally at **42**, is of elongated configuration, comprising a mounting flange **44** having a plurality of spaced transversely disposed mounting slots **45** therethrough, and an integrally formed U-shaped member including substantially parallel legs **46** and **48** defining a channel **50** having a bight portion **52**. For reasons that will be described later, leg **48** is preferably slightly wider than leg **46**. The bottom of the channel, defined by bight portion **52**, is provided with a T-shaped slot **53** opening into the channel. As can be seen, mounting member **42** is of a shape ideally suited for fabrication by extrusion. For reasons that will become apparent, it is preferable that the mounting member be formed of a relatively rigid non-magneto-responsive material, such as aluminum, or the like.

Disposed within channel **50** is the elongated flexible impervious sealing member, indicated at **54**, including a centrally disposed transversely expansible bellows portion **56** having along one edge thereof an integral T-shaped flange **58** adapted to be positioned within T-shaped slot **53** for holding the mounting member in place, and along the other edge thereof an integral bulb or tubular portion **60** of generally rectangular cross-sectional configuration. As can be seen in FIGURE 3, sealing member **54** is for the most part disposed within channel **50** when in a relaxed state, as shown. Sealing member **54** is also of a cross-sectional shape which is particularly adapted to be extruded, from a suitable resilient material such as vinyl or the like.

Positioned within tubular portion **60** is an elongated flexible strip **62** formed of a permanently magnetized material. There are commercially available materials which may be used for strip **62**, such as those currently used on magnetically sealed and latched refrigerator doors.

The fist of the sealing devices, indicated at **38***a*, is secured to intermediate portion **14** of latch jamb **10** by means of a plurality of suitable fasteners, such as screws **64** or the like, in such a way that channel **50** is positioned substantially parallel and adjacent to and facing the inside surface **40** of the door, as best illustrated in FIGURES 1 and 4. This sealing device preferably extends the full heighth of jamb **10**, from the sill to the header, as can be seen in FIGURES 2 and 4. For purposes of reinforcement, intermediate portion **14** may be provided with a reinforcing strip **66**.

The second sealing device, indicated at 38*b*, is secured to intermediate portion 30 of the header by means of a plurality of screws 68 or the like in such a way that channel 50 is positioned substantially parallel and adjacent to and facing the inside surface 40 of the door, as best seen in FIGURES 2 and 4. If desired, intermediate portion 30 may be reinforced, as at 70. Sealing devices 38*a* and 38*b* are beveled at their intersection and the sealing members thereof cemented together, in the manner illustrated in FIGURE 4, so as to form a mitered joint providing a continuous seal up the latch jamb and across the header. The opposite end of sealing device 38*b* extends to intermediate portion 20 of the hinge jamb.

Contrary to the first two sealing devices, the third sealing device, indicated at 38*c*, is secured to the inside surface 40 of the door, rather than to the hinge jamb, such as by means of screws 72 or the like. Sealing device 38*c* is positioned so that channel 50 is substantially parallel and adjacent to and faces intermediate portion 20 of hinge jamb 16, in the manner best shown in FIGURES 1 and 4. It has been found that by positioning sealing device 38*c* in this manner it is possible to avoid the pinching, distorting and wearing of sealing member 54, particularly the bellows portion thereof, which would occur when the door was repeatedly closed if it was secured to the hinge jamb itself. Sealing device 38*c* preferably extends as much of the distance as possible between sealing device 38*b* and intermediate portion 36 of sill 32 for maximum sealing.

In the disclosed embodiment, door 24 is shown as being of all-metal steel construction, and hence the entire surface 40 is magneto-responsive. Of course, if desired, non-steel doors may be used so long as they are provided on their inside surfaces with a magneto-responsive material in the portions thereof facing sealing devices 38*a* and 38*b*. Similarly, in the disclosed embodiment the hinge jam is of all-metal steel construction, and thus is magneto-responsive. In the event it is desired to use non-magneto-responsive materials to form the hinge jam, it is only necessary that the portions thereof facing sealing device 38*c* be provided with a magneto-responsive material.

As will be appreciated, when the door is closed, the magnetic attraction of the permanently magnetized strips 62 in sealing devices 38*a* and 38*b* to the inside surface of the door will cause the associated bellows portions to expand transversely to allow the magnetic strips to tightly seat along their full lengths upon the inside surface 40 of the door, thus effecting a weather-proof and dust-proof seal. The magnetic strip forming a part of sealing device 38*c* will similarly be attracted into sealing engagement with hinge jam 16. When the door is subsequently opened the respective bellows portions will extend somewhat until the tension therein is enough to pull the magnetic strips away from the surface of the door and jam, respectively, at which time each of the sealing members will retract to their relaxed positions illustrated in FIGURE 3. Because of the flexible nature of each of the magnetic strips, they are able to effect a good seal throughout their lengths even though the doors may have become warped, such warpage freqeuntly occurring to seel doors which have a relatively large temperature gradient across them, such as an outside door which receives direct sunlight on its outside surface but is relatively cool on its inside surface. Initial setting of the sealing devices is readily accomplished by means of transverse slots 45 which enable the person assembling the sealing devices to position them accurately with respect to the hinge jam and the inside surface of the door, respectively, when the latter is closed, so that the gap to be sealed is small enough and of uniform enough width for magnetic attraction to take place.

The mounting members and sealing members should not be magneto-responsive so that they will not in any way interefere with the magnetic attraction of strips 62 with the door and jam, respectively. In addition, the mounting members should be relatively rigid in order to provide the desired degree of protection. In this regard, leg 48 thereof is slightly wider than leg 46 so as to provide an increased measure of protection and support, particularly in the sealing device extending across the header.

In order to tightly secure each of the sealing members 54 within its associated channel the inside of bight portion 52 thereof may be punched at spaced intervals in the manner indicated at 72 in FIGURE 7 in order to pinch T-shaped flange 58 in place. The bottom end of sealing member 54 forming a part of sealing device 38*c* may be assembled in the manner illustrated in FIGURES 5 and 6 in order to prevent the strip of magnetic material from dropping out of its tubular portion 60. As shown in FIGURE 5, the end of the sealing member is cut away so that all that remains is an extension 74 of the outermost face of tubular portion 60. Extension 74 is then folded back into the tubular member in the manner illustrated in FIGURE 6 and is affixed to the bottom inside surface thereof by means of a suitable adhesive. In addition, to increase the effectiveness of the seals a strip of caulking material may be provided between the mounting members and the door or jam to which they are permanently secured.

Across the bottom of the door a different type of seal may be utilized in applications where the provision of a sealing device 38 might create an obstruction on which a person might trip when passing through the door opening. This seal is created by a strip of conventional rubber-like weatherstripping 76 which is affixed to the lower edge of the inside surface of the door by means of a suitable adhesive 78. As is clearly illustrated in FIGURE 2, when the door is closed weatherstripping 76 contacts door stop portion 34 of the sill to effect a seal. Preferably, the top edge of weatherstripping 76 is located flush with the upper surface of intermediate portion 36 of the sill so that there is a minimum gap between it and the lower ends of sealing devices 38*a* and 38*c*.

As will be appreciated, sealing means embodying the principles of the present invention have utility in a great many applications, although they are particularly adapted for use with conventional or special steel door and frame constructions. For example, the present sealing means has been found to give excellent results when applied to the doors of micro-relay stations and long lines equipment buildings. It, of course, has utility wherever such doors are used, regardless of whether they are inside doors or outside doors, where it is important that efficient sealing be provided, such as in many industrial commercial buildings, laboratories, and so on. In addition, the mounting means of the present invention has independent utility in that is facilitates the use of magnetic-type seals in almost any type of application, including doors, drawers, windows, and so on. In certain applications the present sealing means may also be used as a latching or holding means to maintain the door, etc., in a closed position yet openable by the application of a reasonable force.

Thus, there is disclosed in the above description and in the drawings, an exemplary embodiment of the invention which fully and effectively accomplishes the objects thereof. However, it will be apparent that variations in the details of construction may be indulged in without departing from the sphere of the invention herein described or the scope of the appended claims.

What is claimed is:

1. Means for protecting and mounting an elongated transversely expansible bellows having a permanent magnet along one edge thereof and a T-shaped flange along the opposite edge thereof on the periphery of a door frame or a door for sealing purposes, including an elongated mounting flange having a plurality of spaced parallel transverse slots therethrough for receiving mounting screws or the like to adjustably mount said flange, an

elongated non-magneto-responsive member formed integrally with said flange and defining an elongated channel having spaced inside surfaces each parallel to said flange, the one of said inside surfaces furthest spaced from said flange being of a greater width than the other of said surfaces, and means defining an elongated T-shaped slot in the bottom of said channel extending longitudinally the length thereof adapted to receive the T-shaped flange on the elongated bellows.

2. Means for sealing a steel hinged door mounted within a steel door frame having a hinge jam, a latch jam, a header and a sill, comprising: means defining first and second relatively rigid elongated non-magneto-responsive channels secured to and extending substantially the full length of the latch jam and header, respectively, adjacent and facing the door when closed; means defining a similar third channel secured to and extending substantially the full length of the door, adjacent and facing the hinge jam; means defining an elongated T-shaped slot in the bottom of each of said channels; a resilient impervious transversely extensible sealing member having an integral T-shaped flange disposed within each of said slots, said sealing member being normally positioned for the most part within its associated channel; and an elongated strip of permanently magnetized flexible material secured to each of said sealing members and adapted to move transversely out from said first and second channels to sealingly engage the door and from said third channel to sealingly engage the hinge jam, when the door is closed.

3. Means for sealing a door mounted within a door frame, comprising: means defining an elongated channel secured to one of said door or frame adjacent and facing the other thereof when said door is closed; means defining a slot in the bottom of said channel, said slot having a narrowed neck; a resilient impervious transversely extensible sealing member having a flange mounted within said channel with said flange disposed in said slot, said sealing member being normally positioned for the most part within said channel; an elongated strip of permanently magnetized material secured to said sealing member and adapted to move transversely out of said channel to sealingly engage the other of said door or frame when said door is closed; and means defining a magneto-responsive surface on the other of said door or frame facing said channel when said door is closed.

4. Means as claimed in claim 3, wherein said sealing member is elongated and wherein said sealing member flange and channel slot have complementary shaped surfaces defining an interlocking connection between the two.

5. Means for sealing a door mounted within a door frame, comprising: means defining an elongated channel secured to one of said door or frame adjacent and facing the other thereof when said door is closed; means defining a T-shaped slot in the bottom of said channel; a resilient impervious transversely extensible sealing member having a T-shaped flange mounted within said channel with said flange disposed in said slot, said sealing member being normally positioned for the most part within said channel; an elongated strip of permanently magnetized material secured to said sealing member and adapted to move transversely out of said channel to sealingly engage the other of said door or frame when said door is closed; and means defining a magneto-responsive surface on the other of said door or frame facing said channel when said door is closed.

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HARRISON R. MOSELEY, *Primary Examiner.*