

[54] **AUTOMATIC DOOR BOTTOM**

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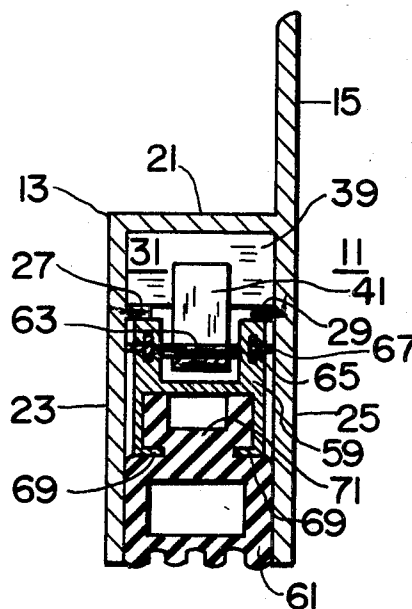
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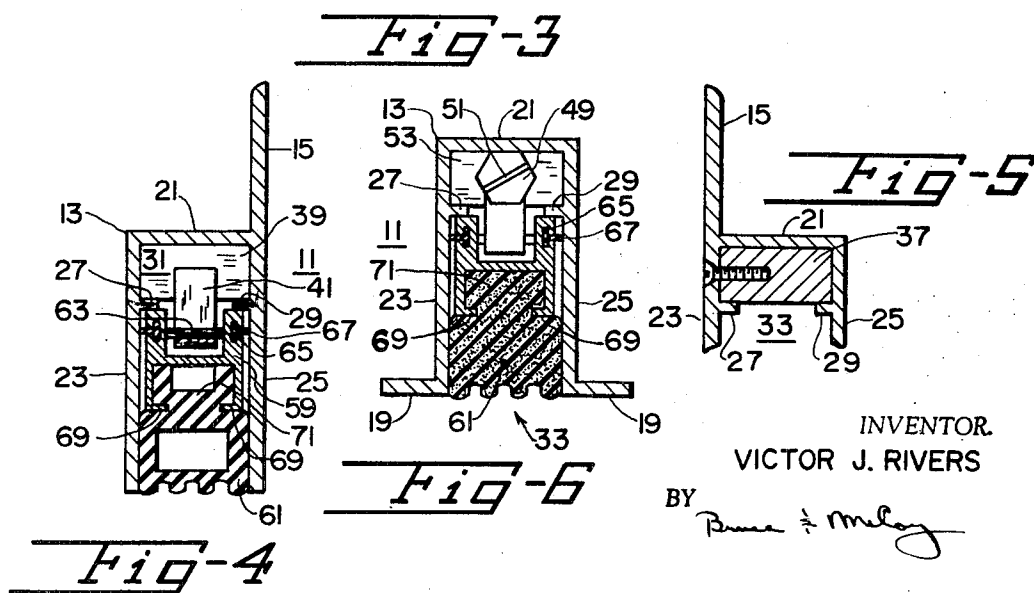
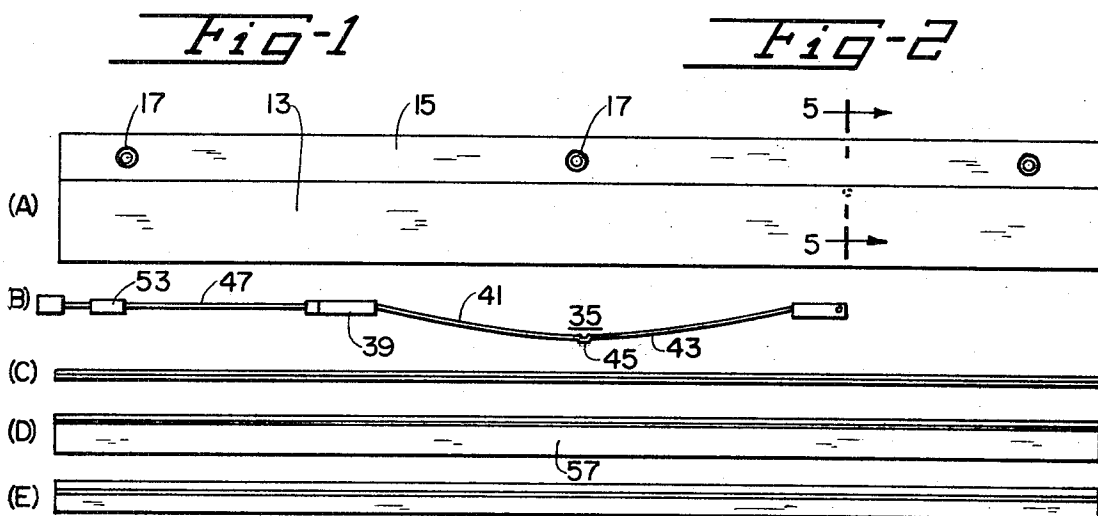
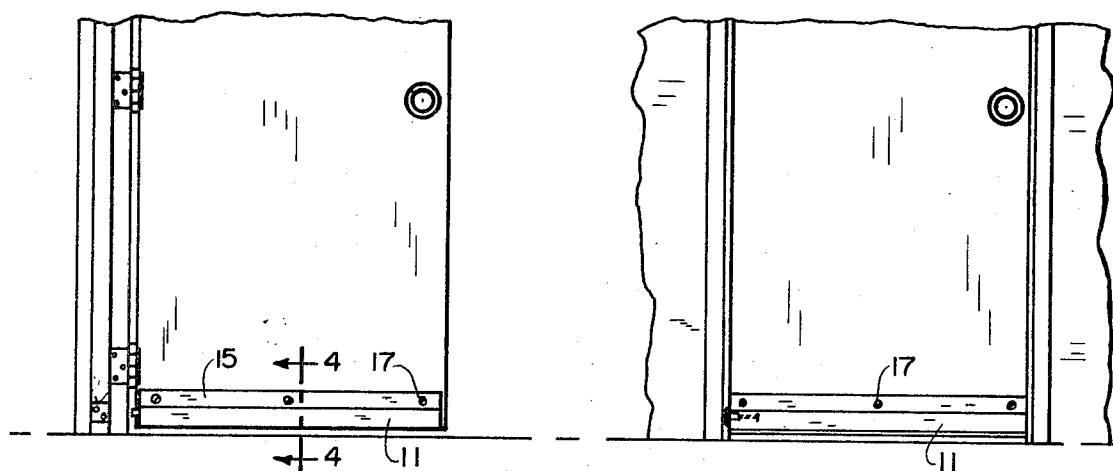
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ABSTRACT

An automatic door bottom to seal the gap between the bottom of a door and the door sill. The seal element is held in a channel mounted on a door and includes a spring loaded slidable pushrod which upon closure of the door forces the seal from the channel and into contact with the door sill, and upon opening, the slidable pushrod is released and the spring retracts the seal back into the channel.

8 Claims, 10 Drawing Figures





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AUTOMATIC DOOR BOTTOM

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a seal or weatherstrip for a door and more particularly to a door bottom seal which is automatically actuated to seal the gap between a door bottom and its sill as the door is closed and automatically retracted when the door is opened.

2. Description of the Prior Art

Until the present invention, door bottom seals or weatherstrips have comprised a flexible sealing element held within a mounting means attached to the bottom of a door. The purpose of the weatherstrip is to block drafts, light, noise, and foreign objects from passing through the space normally provided between the bottom of the door and the door sill. However, these sealing means are subject to wear and deterioration due to the rubbing of the sealing element against the door sill and floor as the door is opened and closed. This is especially true if the sealing element is forced against the door sill to obtain a more effective seal. Moreover, if the floor near the door sill is covered with carpeting, the sealing element causes undue wear on the carpet and requires unnecessary effort to operate the door.

Different methods of overcoming the rubbing and wearing problems of these sealing means have been attempted, including the resilient supporting of the sealing element in the mounting element, and automatic door seals such as shown in U. S. Pat. No. 3,131,441 to G. W. Cornell for WEATHER STRIP, but they do not work as effectively as the present invention.

SUMMARY OF THE INVENTION

Briefly, the present invention is an automatic door bottom for sealing the gap between the bottom of a door and its adjacent sill when the door is closed. The door bottom comprises an inverted U-shaped channel for mounting along the bottom of a door. A flexible sealing element is carried within the channel. Means are provided for reciprocating the sealing element partially out of and back into the channel upon closing and opening the door respectively. The means for reciprocating the sealing element includes a pushrod actuated by bearing against the jamb of the door as the door is closed and spring means for retracting the sealing element when the door is opened.

It is therefore an important object of the present invention to provide an improved automatic door bottom for sealing the gap between the bottom of the door and the door sill while providing a more effective seal.

Another object of the present invention is to provide a weatherstrip which can be mounted either on the surface of a door or within the bottom of the door in a mortise installation.

And a still further object of the invention is to provide a door bottom which can be easily manufactured and assembled and easily adjusted during installation to fit a range of different widths of doors and sizes of gaps between the door and its sill.

BRIEF DESCRIPTION OF THE DRAWINGS

The specific nature of the invention, as well as other objects, aspects, uses, and advantages thereof, will clearly appear from the accompanying drawings, in which:

FIG. 1 is a side elevation showing the preferred embodiment of the present invention mounted on an open door;

FIG. 2 shows the door of FIG. 1 in the closed position;

FIG. 3(A) is a side elevation of the main channel member of the present invention;

FIG. 3(B) is a side elevation of the pushrod and spring actuating mechanism of the present invention;

FIG. 3(C) is a side elevation of a sealing strip as mounted in the drop bar of FIG. 3(D);

FIG. 3(D) is a side elevation of the drop bar of the present invention;

FIG. 3(E) is a side elevation of the flexible sealing element of the present invention;

FIG. 4 is a cross-section taken along section line 4—4 of FIG. 1;

FIG. 5 is a partial cross-section taken along section line 5—5 of FIG. 3(A); and

FIG. 6 is an end view of a second embodiment of the present invention for a mortise installation in the bottom of a door.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings wherein like reference numerals designate like parts throughout the several views, there is shown the automatic door bottom 11 of the present invention. FIGS. 3—5 shown an extruded metallic channel 13, preferably made of aluminum or aluminum alloy, and having an inverted "U" shape for mounting along the bottom of a door. For installation on the lower surface of the door, it has the cross-section shape of a lower case letter "h." In the h shape, the upper 15 of the channel may be extended to form a kickplate and has a plurality of holes 17 formed therein for mounting the channel on the bottom of a door as shown in FIGS. 1 and 2. The channel may take any other convenient shape dictated by the particular mounting arrangement such as an inverted U-shape with splayed feet 19 for a mortise installation on a door as shown in FIG. 6.

The channel is shown as having an elongated, rectangular inverted U-shaped portion comprising a flat horizontal top 21 and two vertical legs 23, 25. The interior surface of each leg portion is provided with an integral longitudinal rib member 27, 29 extending toward the opposite leg. These rib members are approximately one-third of the way from the top and divide the interior of the channel into upper and lower internal sections 31, 33 connected by an opening between the ribs. The upper section is disposed along the closed portion of the U-shaped channel, adjacent the flat horizontal top 21, and the lower section is disposed along the open portion of the channel. The ribs, as shown, are formed during the extruding of the channel, but may be made from separate elements, fixed to the legs in any suitable manner.

A pushrod and spring assembly 35, shown in detail in FIG. 3(B), is slidably insertable into the upper section of the channel.

The pushrod assembly of FIG. 3(B) shows first and second slide blocks 37, 39 which are formed to be disposed within the upper internal section of the channel. In the preferred embodiment, they are rectangular blocks the first of which 37 has a drilled and tapped

hole formed therein whereby it can be removably secured in the channel in a predetermined position (see FIG. 5). The second block 39 is freely mounted within the upper internal section and slidable with respect to the first block 37.

The two blocks are connected by a curved leaf spring 41, preferably of spring steel, which is fixedly attached to the two slide blocks. The leaf spring is concave or dish-shaped and has its central portion 43 extending into the lower section of the channel. The spring has a dimpled or depressed portion 45 formed on the concave side thereof, approximately midway between the blocks for locating a pivot pin.

A pushrod 47 is connected to the slidable second block and projects away from the spring member and out of the end of the channel. The rod has screw threads formed on the outer end thereof onto which an adjustable end cap 49 may be threaded. The end cap has a multisided cross-section, preferably hexagonal in shape, with a slot 51 formed on its outer end to enable it to be adjusted on the metallic rod by a screw driver or the like. The end cap makes the pushrod adjustable in length and permits it to be locked against change of adjustment when the door bottom is assembled in operating condition. This is effected by the cap extending into the channel and being of such a size as to be captured within the channel walls and prevent from rotating. In the preferred embodiment, one flat side of the cap rests against the top of the channel (see FIG. 6).

To change adjustment of the length of the pushrod, the first slide block 37 is released from its connection with the channel, and the pushrod spring assembly is slid out of the channel until the end cap is free thereof and can be turned to effect a new length of the pushrod. The assembly is then reinserted and the first slide block again secured in position. The end cap is then prevented from turning and changing adjustment.

A bearing block 53 is provided which is press fitted on the pushrod. This helps stiffen the pushrod and keeps it accurately positioned within the channel for alignment with a striker plate 55 on the door jamb, and further helps keep the end cap tight against the wall of the channel to prevent it from rotating and changing adjustment.

A drop bar assembly 57 is freely mounted within the lower section of the channel and comprises an extruded H-shaped member 59 holding a flexible sealing element 61. The drop bar is connected to the pushrod assembly by a pivot pin 63 or the like in an upper compartment formed in the bar. FIG. 3(D) shows the H-shaped drop bar having slots 65 formed on each outside edge portion for holding T-shaped sealing strips 67 as shown in FIG. 3(C). The bottom compartment includes a pair of horizontally inwardly projecting flanges 69 which coact with slots formed in a reduced size upper portion 71 of the flexible sealing element to hold the sealing element in the drop bar. The sealing element is made, for example, from neoprene and includes a hollow or sponge filled lower portion.

To assemble the door bottom, the depressed portion of the leaf spring is placed in the upper compartment of the drop bar and is held therein by the pivot pin or any equivalent fastener to form a single or unitary unit. The slide blocks of the pushrod and spring assembly are then slid into the upper section of the U-shaped chan-

nel while, at the same time the drop bar assembly attached thereto is slid into the lower section. The tapped hole in the first slide block is aligned with a hole formed in one of the legs of the channel and a retaining screw is inserted holding the block and thereby the single unit comprising the pushrod, spring, and drop bar assemblies in position. In the assembled condition of FIG. 4, the drop bar assembly rests entirely within the lower section of the U-shaped channel.

The assembled door bottom may be fixed on a door with the bottom of the channel flush with the bottom of the door, as shown in FIG. 1. Because of the adjustability of the pushrod assembly, the channel and drop bar assembly may be reduced in length by a hacksaw as much as 4 inches to fit a wide range of door widths. Furthermore, the pushrod assembly may be easily inserted from either side of the channel to allow for left hand or right hand installation. This enables one standard size door bottom to be easily cut to fit different size doors having different bottom gaps, and opening from different directions, right at the job site. In addition, this permits the door bottom to be mass produced from mainly extruded pieces of material, all the channels and the sealing elements, with the only exception being the pushrod spring assembly which is of extremely simple manufacture, for a wide variety of sizes of doors, thereby effecting great savings in manufacturing costs.

When the weatherstrip is mounted on the door of FIG. 1, a striker plate 55 is attached to the door jamb in such a position that upon closing the door (FIG. 2), the end cap contacts the plate. This causes the end cap to be driven into the channel, driving the second slide block into the first section. The movement of the second slide block causes the leaf spring to be further flexed or dished due to the retaining screw holding the first block. As the leaf spring is further dished, it is driven further into the second section and acts against the drop bar thereby forcing the entire drop bar assembly, against the frictional force of the sealing strips, partially out of the lower section of the channel until it contacts the door sill. The amount of movement or reciprocation of the drop bar assembly, and therefore the pressure of the sealing element against a door sill is, of course, dependent on the space between the bottom of the door and the amount of travel of the sealing element. This travel is adjustable up to a maximum of approximately $\frac{3}{4}$ inches by adjusting the end cap on the pushrod.

With the door bottom of the present invention installed on the door as illustrated in FIGS. 1 and 2, the sealing element will be automatically retracted, as the door is opened, entirely into the channel by the action of the leaf spring unflexing as the pressure against the end cap is removed. The door may therefore be opened more easily, without causing undue wear of the sealing element. Moreover, upon closure of the door, the sealing element is forced into contact with the door sill only after the door is completely closed. Therefore, the door bottom may be adjusted to insure maximum travel of the sealing element and thereby more effectively blocking the space between the door and the door sill. In addition, should the door or door sill become misaligned or misshapened, the adjustability feature of the weatherstrip allows the travel of the flexible element to be regulated to conform to the space to be blocked.

The invention has one other unique and important feature: the door bottom is self leveling due to the unique spring arrangement and its connection with the drop bar assembly. The pivot pin simply interconnects the drop bar with the spring, and as the pushrod forces the spring to flex, it flattens out against the sealing element in the drop bar and the sealing element conforms to the floor.

While the invention has been described in considerable detail, it is not to be limited thereto except as necessitated by the appended claims.

I claim:

1. An automatic door bottom comprising an inverted U-shaped channel having facing longitudinal rib members formed internally thereof dividing the channel into upper and lower internal sections, with the upper section disposed along the closed portion of the U-shaped channel and the lower section along the open portion of the channel,

a drop bar assembly including a flexible sealing element disposed within the lower of the internal sections,

an adjustable length pushrod assembly mounted within the upper section of the channel and releasably held therein by a holding block, said assembly including a pushrod having first and second ends, the second of which extends out of one end of the upper section of the channel and is capable of sliding with respect thereto, and a spring means engaged with the first end of said pushrod and interconnected with the drop bar assembly forming a unitary assembly held in the channel by said holding block, said drop bar assembly and the flexible sealing element being forced partially out of the lower section of the channel when a force is applied to the second end of the pushrod driving it into the channel to actuate the spring means.

2. The door bottom of claim 1 wherein the first end of the pushrod is engaged with one end of a flexible leaf spring, and the center portion of the leaf spring projects from the first section of the channel member into the second section and is interconnected to the drop bar, whereby upon sliding of the second end of the pushrod into the channel the leaf spring is flexed to force the flexible sealing element partially out of the channel and into contact with the door sill.

3. The door bottom of claim 2 wherein the length of the pushrod is adjustable by means of an end cap which is locked against change of adjustment when the door bottom is assembled in operating condition.

4. The door bottom of claim 3 wherein the end cap comprises a multisided end cap screw threadedly carried by the second end of the pushrod, the end cap extends into the upper internal section of the channel when the door bottom is assembled in operating condition whereby the end cap is captured between the sides of the channel and prevented from rotating.

5. The automatic door bottom of claim 1, wherein said holding block is fixed to said spring means and is fixed in position in said channel by a single retaining screw inserted through the channel and into the same.

6. An automatic door bottom for sealing the gap between the bottom of a door and its adjacent sill comprising

an inverted U-shaped channel member for mounting along the bottom of a door, said U-shaped portion

having two rib members formed on the interior surface of the channel dividing it into upper and lower internal sections,

a pushrod and spring assembly including first and second slide blocks disposed within the upper internal section, the first block being removably secured in the channel in a predetermined position, the second rectangular block being freely mounted within the upper internal section and slidable with respect to the first block, the two blocks being connected by a curved leaf spring having its central portion extending into the lower internal section of said channel,

a pushrod connected to the slidable second rectangular block projecting away from the leaf spring and out of the end of the channel,

a multisided shaped end cap threadedly carried on the pushrod and extending from the channel, said end cap being captured within the channel walls and prevented from rotating,

a drop bar slidably disposed within the second internal section of said channel and having a flexible sealing element mounted therein, the drop bar being interconnected to the pushrod through the leaf spring by a pivot pin connection between the drop bar and the leaf spring, said spring formed to flex when a force is applied against the end cap whereby the end cap is driven into the channel forcing the leaf spring to project further into the lower internal section thereby forcing the flexible sealing element partially out of the lower internal section of the channel and into contact with the door sill.

7. The door bottom of claim 6 including a bearing block mounted in the upper internal section of the channel to guide and position the pushrod.

8. An automatic door bottom comprising an inverted U-shaped channel having facing longitudinal rib members formed internally thereof dividing the channel into upper and lower internal sections with the upper section disposed along the closed portion of the U-shaped channel and the lower section along the open portion of the channel,

a drop bar assembly including a flexible sealing element disposed within the lower internal section of the channel,

a pushrod assembly mounted within the upper section of the channel, the pushrod having first and second ends the second of which extends out of one end of the upper section and capable of sliding with respect thereto,

a multisided end cap threadedly carried by the second end of the pushrod for adjusting the length of said pushrod, said end cap extending into the upper section of the channel when the door bottom is assembled in operating condition to prevent rotation of said end cap, and

a flexible leaf spring engaged with the first end of said pushrod, the center portion of the leaf spring projecting from the upper section of the channel member into the lower section where it is interconnected to the drop bar assembly, whereby upon movement of the second end of the pushrod into the channel the leaf spring is flexed downward to

force the flexible sealing element partially out of the channel and into contact with the door sill.

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