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3,448,543

WEATHERSTRIP FOR DOOR SILL AND DOOR ASSEMBLY EMPLOYING SAME

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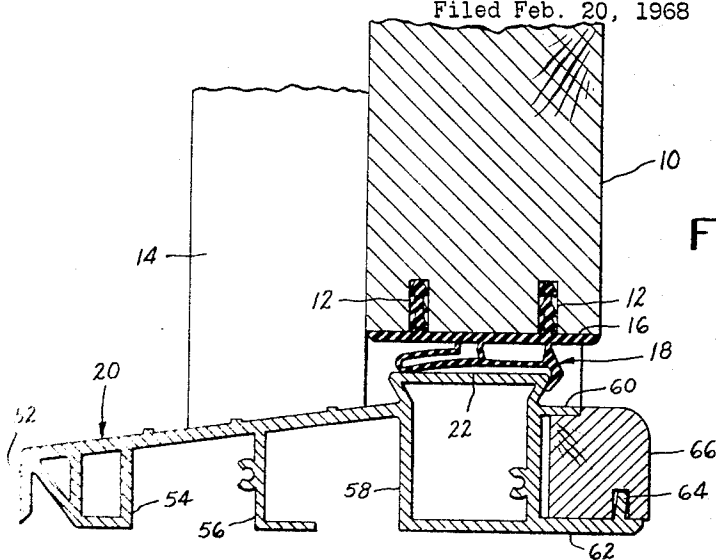


FIG. 1

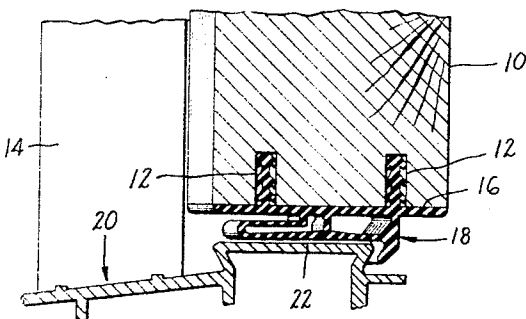


FIG. 2

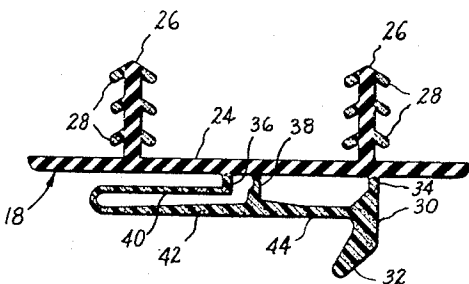


FIG. 3

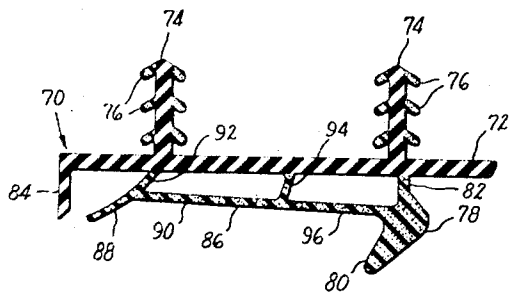


FIG. 4

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16 Claims

ABSTRACT OF THE DISCLOSURE

A weatherstrip for mounting on a door to form a seal with the platform of a sill which comprises an integrally formed member having an actuator element adapted to engage the platform of the sill, a sealing element hingedly connected to the base portion of the member and a connecting link between the sealing element and the actuator element to effect deflection of the sealing element upon deflection of the actuator element by the platform of the sill during closing movement of the door.

Background of the invention

In many building structures it is highly desirable to provide effective sealing action to prevent or limit the flow of air about the edges of doors and like members to reduce heating or cooling costs and to eliminate drafts. Relatively compressible fibrous insulation or deformable plastic or rubber insulation has been widely employed for this purpose. Because of the necessity for clearances for travel of the door and for a relatively long-lived structure, weatherstripping for use on the bottom edge of the door has often proved inefficient or has required relatively complex expensive structures. Where sills having an elevated platform are employed, it is desirable that the weatherstrip form a tight seal with the sill along the upper surface thereof and, desirably, along one side surface thereof.

It is an object of the present invention to provide a novel weatherstrip for mounting on a door to form a seal with the platform of a sill and which may be relatively easily fabricated as an integrally formed member.

It is also an object to provide such a structure which presents a neat desirable appearance in both the open and closed positions of the door and which is relatively durable and yet highly effective in sealing action.

A further object is to provide such weatherstrip wherein the relative resiliency of the material used therefor produces enhanced sealing action and wherein minor misalignment may be readily accommodated without undue impairment of the sealing action.

Summary of the invention

It has now been found that the foregoing and related objects can be readily obtained in a weatherstrip comprising an elongated integrally formed member of substantially uniform cross section along the length thereof and which has a base portion with one surface adapted to seat against the bottom edge of the door. An actuator element extends outwardly from the other surface of the base portion adjacent one side thereof, and a sealing element extends in spaced relationship to the other surface of the base portion and towards the other side thereof from the actuator element. At least one hinge arm connects the sealing element to the base portion to provide a pivot therefor and a portion of the sealing element extends to the side of the hinge arm spaced from the actuator element to provide a deflectable sealing portion. A connecting link extending between the sealing element and the actuator element produces deflection of the sealing portion away from the base portion and towards the actu-

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ator element when the actuator element is deflected by movement against the platform of a door sill upon closing movement of the door.

The sealing element may have a variety of configurations so long as it has a free end portion which may be deflected in response to deflection of the actuator element. In one configuration which has proven particularly effective, the sealing element has a generally U-shaped configuration with the connecting web spaced remote from the actuator element and with the ends of both legs connected to the base portion by hinge arms so as to provide a pair of pivots. In another highly effective embodiment, the sealing element has a generally L-shaped configuration with one leg hingedly connected to the base portion by at least one hinge arm, and preferably two, and with the other leg extending outwardly from the first leg at the end thereof remote from the actuator element. The included angle between the two legs is greater than 90° so as to provide enhanced sealing action.

Brief description of the drawing

FIGURE 1 is a fragmentary view in partial section of a door assembly including weatherstrip embodying the present invention and showing the door in closed position;

FIGURE 2 is a similar sectional view showing the door during closing movement;

FIGURE 3 is a sectional view to an enlarged scale of the weatherstrip of the embodiment of FIGURES 1 and 2 with the synthetic plastic material of two different degrees of resiliency shown in distinctive crosshatching; and

FIGURE 4 is a view similar to FIGURE 3 of another embodiment of weatherstrip in accordance with the present invention.

Detailed description of the illustrated embodiments

Turning now in detail to FIGURES 1 and 2 of the attached drawing, therein illustrated is a door 10 having a pair of grooves or channels 12 in the bottom edge 16 thereof in which is mounted a weatherstrip embodying the present invention and generally designated by the numeral 18. The door 10 is adapted to be swung about hinges (not shown) to a closed position against the stops 14 of the frame. The weatherstrip 18 is designed to cooperate with a sill generally designated by the numeral 20 and having a platform 22 to provide a weather-tight, self-sealing system, but the particular sill construction may vary.

As best seen in the enlarged representation of FIGURE 3, the weatherstrip 18 is of uniform cross section along its length and has a base portion 24 which extends in surface contact with the bottom edge 16 of the door 10 and a pair of tails 26 extending into the grooves 12 of the door with barbs or projecting fingers 28 thereon which are resiliently deflectable to provide frictional engagement therein. Extending downwardly from the base portion 24 adjacent one side of the door 10 is an actuator element 30 with an intumed end portion 32 providing an inclined inner surface adapted to strike and press against the leading edge of the platform 22 of the sill 20. The actuator element 30 has a relatively thin hinge section 34 at its connection to the base portion 24 to facilitate flexure thereof.

Extending from the base portion 24 parallel to the actuator element 30 and spaced towards the other side of the door is a pair of hinge arms 36, 38 pivotably supporting the legs 40, 42 of the generally U-shaped sealing element in a generally parallel spaced relationship to the base portion 24 and the bottom edge 16 of the door 10. The hinge arm 38 is of greater length than the hinge arm 36 and has a section of reduced thickness adjacent the base portion 24 to facilitate flexure. A connecting link 44 extends in the plane of the leg 42 between the intersection of the leg 42 and the hinge arm 36 and the actuator ele-

ment 30 so as to produce deflection of the U-shaped sealing element when the actuating element 30 is deflected upon contact with the platform 22 of the sill 20.

To provide a long-lived structure with the necessary flexibility of the component portions, the weatherstrip 18 is extruded from two streams of molten resin having different degrees of rigidity. One stream provides a relatively rigid material for the base portion 24 and tails 26 while the other stream provides a relatively resiliently deflectable material for the U-shaped sealing element, actuator element 30, connecting link 44 and barbs 28.

The sill 20 has a rain ramp 50 inclined upwardly from the exterior of the door frame to the platform 22. In this embodiment, the sill 20 is an extruded member with an outer edge 52 and support portions 54, 56 and 58 for the ramp 50 and platform 22. The inner portion has a horizontally extending upper arm 60 and a lower arm 62 with an upstanding rib 64 to lock firmly with the wood nosing 66.

In operation of this embodiment, the sealing action is effected between the portion of the leg 42 most remote from the actuator element 30 and the upper surface of the platform 22 of the sill 20. In addition, some sealing action is provided by the abutment and cooperative configuration of the surface of the actuator element 30 and the inside edge surface of the platform 22 of the sill 20. This sealing action is clearly seen in FIGURE 1 of the attached drawing.

During closing movement of the door 10 as best seen in FIGURE 2 of the attached drawing, the inside surface of the actuator element 18 abuts against the inner edge of the platform 22 of the sill. As the door 10 continues to close, the restraint upon further movement of the actuator element 30 causes pivoting thereof about the hinge section 34 in a counterclockwise direction as seen in the drawing. As a result of this pivoting of the actuator element 30, the connecting link 44 is drawn to the right as seen in the drawing, and this, in turn, pivots the sealing element about a hinge arm 38. As a result of this pivoting of the sealing element, the end thereof remote from the actuator element 30 is pivoted in a counterclockwise direction so as to seal tightly against the upper surface of the platform 22.

In this particular embodiment of cooperatively designed platform 22 and actuator element 30, it will be appreciated that highly effective sealing action is obtained even though greater clearances are provided than those shown in the drawing. Moreover, the amount of movement of the actuator may be readily controlled by adjusting the design of the cooperating inner edge surface of the platform 22 and inner surface of the section 32 of the actuator element 30. It will be appreciated that the weatherstrip provides a seal not only against passage of air but also against water which might be driven through the action of wind or the like. Moreover, the weatherstrip may be reversed in its position depending upon whether the door is inward opening or outward opening.

Turning now to the embodiment of weatherstrip shown in FIGURE 4, this member is generally designated by the numeral 70 and has a base portion 72 with tails 74 having barbs 76 thereon for securing it to the bottom edge of a door (not shown). Adjacent one end thereof is an actuator element 78 which has an intumed end section 80 adapted to engage with the platform of a sill (not shown) and a thin hinge section 82. At the other end is a depending leg 84 which enhances the appearance of the outside edge when mounted on a door.

In this embodiment, the sealing element 86 is generally L-shaped with its sealing leg 88 extending downwardly and away from the actuator element 78. The other leg 90 of the sealing element 86 is hingedly connected to the base portion 72 by the hinge arms 92, 94 spaced along the length thereof and to the actuator portion 78 by the connecting link 96. As can be seen, the included angle between the legs 88, 90 is somewhat greater than 90° so as to enhance the sealing action upon deflection of the seal-

ing element in response to pivoting of the actuator element 78.

The operation of this embodiment is somewhat similar to that of FIGURES 1 through 3. As the end section 80 of the actuator element 78 abuts against the platform of the door sill (not shown), the actuator element 78 is pivoted about its hinge section 82 and this, in turn, produces pull upon the connecting link 96 and pivoting of the sealing element 86 about the hinge arms 92, 94. Since pivoting of the sealing element 86 is occurring in a counterclockwise direction as seen in the drawing, the sealing leg 88 is deflected into firm contact with the upper surface of the platform to provide a highly effective seal limiting the passage of air currents and driven water. As in the embodiment of FIGURES 1 through 3, the weatherstrip may be utilized for both outward opening and inward opening doors.

In mounting the weatherstrips 18 and 70, it can be seen that the tail portions 26, 74 are inserted into cooperating recesses 12 in the bottom edge of the door. The resiliently deflectable arms 28 and 76 on the tail portions are deformed and produce highly effective frictional engagement with the surfaces of the door defining the recesses 12. Generally, this frictional engagement will be sufficient to provide for endwise adjustment and positive location of the weatherstrip on the bottom edge of the door. However, if so desired, other means may be employed to lock the weatherstrip to the bottom edge of the door such as adhesive, brads, or the like in addition to or in place of the tail portions.

In both of the illustrated embodiments, a pair of hinge arms are shown as providing a hinged or pivotal connection for the sealing element to the base portion of the weatherstrip. Although a single hinge arm may be employed for this purpose, there is considerably greater support provided for the length of the sealing element and a tendency to return to the elevated position by the use of two hinge arms. For example, the hinge arm 38 may be omitted in the embodiment of FIGURES 1 through 3, and this will provide considerable movement for the sealing element but will tend to allow the weatherstrip to sag in the middle because of the substantial length provided by the connecting link 44 and leg 42 of the sealing element. Omission of the hinge arm 36 in this embodiment will permit additional movement of the sealing portion of the sealing lip but will limit the ability of the sealing element to return to its at rest position and tend to promote sagging. Essentially the same characteristics will occur with the embodiment of FIGURE 4 when either of the hinge arms 92 and 94 is omitted. Thus, the use of two or more hinge arms is preferred since sagging is essentially eliminated and the sealing element is readily returned to a position closely adjacent to the bottom edge of the door to prevent injury thereto.

In order to provide the optimum characteristics for the weatherstrip, it is desirable to extrude it as a composite of two streams of resins having a different degree of resiliency or durometer. This is shown in FIGURES 3 and 4 of the attached drawing by the difference in crosshatching. As can be seen, the material of the tail portions 26, 74, except for the arms or barbs 28, 76 and the material of the base portion 24, 72 is a relatively rigid synthetic plastic material while the remainder of the weatherstrip is fabricated from a relatively resiliently deflectable synthetic plastic material. Illustrative of the values involved are a resin having a durometer of 65-75 on the Shore D scale for the relatively rigid material and a resin having a durometer of about 65-75 on the Shore A scale for the relatively resilient material.

Various resins may be employed for the manufacture of the support member including natural rubbers, synthetic rubbers such as butadiene and butadiene copolymers, isoprene, acrylate rubbers, silicone rubbers, polyethylene, polyvinyl chloride and vinyl chloride copolymers. Such resins may contain fillers, pigments and other

materials, particularly when variations in durometer are desired in accordance with the preferred embodiment of the present invention to provide a composite member having relatively resilient and relatively rigid portions. From the standpoint of cost, ease of fabrication and versatility in providing articles of composite durometer, polyvinyl chloride resins have proven highly satisfactory.

Moreover, by using a sill of the type illustrated wherein the face of the platform is inclined inwardly and downwardly with a weatherstrip of the type illustrated having a cooperating surface inclined towards the sealing element, the sealing action of the combination is relatively insensitive to increases in spacing between door and top surface of the sill. As the space increases, the point during closing movement of the door at which the actuator element begins to be deflected by abutment against the surface of the sill occurs earlier. Thus, greater deflection of the actuator element and thereby the sealing element occurs to prevent deterioration of the sealing action.

Thus it can be seen that the features of the present invention provide highly effective sealing action in combination with a sill having a platform portion. The weatherstrip may be used with either inward or outward opening doors and not only seals against passage of air flow but also against driven water and the like. Sealing action is relatively insensitive to increase in the clearance between the bottom edge of the door and the sill and misalignment can be readily accommodated. It will be readily appreciated that the weatherstrip may be fabricated economically and easily by normal extrusion techniques to provide a long-lived structure.

Having thus described the invention, I claim:

1. A weatherstrip for mounting on a door to form a seal with the platform of a sill comprising an elongated integrally formed member of substantially uniform cross section along the length thereof and having a base portion with one surface adapted to seat against the bottom edge of the door, an actuator element extending downwardly from the other surface of said base portion and adjacent one side thereof, a sealing element extending in spaced relationship to said other surface of said base portion and towards the other side thereof from said actuator element, at least one hinge arm connecting said sealing element to said base portion with a portion of said sealing element extending to the side of said hinge arm spaced from said actuator element to provide a deflectable sealing portion, and a connecting link extending between said sealing element and said actuator element to effect deflection of the sealing portion away from said base portion and towards said actuator element upon deflection of said actuator element by the platform of a door sill upon closing movement of the door.

2. The weatherstrip in accordance with claim 1 wherein said member includes at least one tail extending generally normally to said one surface of said base portion for engagement in a cooperating recess formed in the edge of the door.

3. The weatherstrip in accordance with claim 2 wherein said tail has at least one resiliently deflectable arm portion thereon for frictional engagement in the door recess.

4. The weatherstrip in accordance with claim 1 wherein said sealing element is of generally U-shaped configuration with the legs thereof extending in generally parallel spaced relationship to said base portion and with the connecting web thereof at the ends of said legs remote from said actuator element and with said hinge arm connecting the other end of one of said legs to said base portion, said connecting link being connected to the other end of the outer of said legs.

5. The weatherstrip in accordance with claim 4 wherein one of said legs of said U-shaped sealing element is longer than the other and wherein a pair of hinge arms connect the other ends of said legs to said base portion to provide a pair of pivots for said sealing element.

6. The weatherstrip in accordance with claim 1 wherein said sealing element is of generally L-shaped configuration with one leg extending in substantially parallel spaced relationship to said base portion and connected thereto by said hinge arm and the other of said legs extending outwardly therefrom at the end remote from said actuator element, said connecting link being connected to said one leg.

7. The weatherstrip in accordance with claim 6 wherein a pair of hinge arms connect said one leg to said base portion along the length thereof to provide a pair of pivots for said sealing element and wherein the included angle between said legs is greater than 90°.

8. The weatherstrip in accordance with claim 1 wherein the actuator element has a hinge section connected to said base portion and an outer end portion having its surface adjacent said sealing element inclined outwardly from said hinge section and towards said sealing element to enhance deflecting and sealing action.

9. The weatherstrip in accordance with claim 1 wherein said member is fabricated from a synthetic plastic material which is relatively resilient in the portions providing said actuator element, sealing element, hinge arm and connecting link.

10. The weatherstrip in accordance with claim 9 wherein said member is a composite of two streams of synthetic plastic material, one providing said relatively resilient portions and a second providing a relatively rigid base portion.

11. The weatherstrip in accordance with claim 1 wherein said member includes a leg extending outwardly from the other surface of said base portion adjacent the other end thereof to conceal said sealing element and enhance the appearance of the weatherstrip when mounted on the door.

12. The weatherstrip in accordance with claim 1 wherein said member includes at least one tail extending generally normally to said one surface of said base portion for engagement in a cooperating recess formed in the edge of the door; wherein said actuator element has a hinge section connected to said base portion and an outer end portion having its surface adjacent said sealing element inclined outwardly from said hinge section and towards said sealing element to enhance deflecting and sealing action; wherein said member is fabricated from a synthetic plastic material which is relatively resiliently in the portions providing said actuator element, sealing element, hinge arm and connecting link; and wherein said sealing element is of generally U-shaped configuration with the legs thereof extending in generally parallel spaced relationship to said base portion and with the connecting web thereof at the ends of said legs remote from said actuator element, one of said legs being of greater length and a pair of hinge arms connecting the other ends of said legs to said base portion to provide a pair of pivots for said sealing element.

13. The weatherstrip in accordance with claim 1 wherein said member includes at least one tail extending generally normally to said one surface of said base portion for engagement in a cooperating recess formed in the edge of the door; wherein said actuator element has a hinge section connected to said base portion and an outer end portion having its surface adjacent said sealing element inclined outwardly from said hinge section and towards said sealing element to enhance deflecting and sealing action; wherein said member is fabricated from a synthetic plastic material which is relatively resiliently in the portions providing said actuator element, sealing element, hinge arm and connecting link; and wherein said sealing element is of generally L-shaped configuration with one leg extending in substantially parallel spaced relationship to said base portion and connected thereto by a pair of hinge arms spaced along the length thereof to provide a pair of pivots for the sealing member and with the other leg extending outwardly therefrom at the end

remote from said actuator element at an included angle greater than 90°, said connecting link being connected to said one leg.

14. In combination, a sill having a platform portion with a top surface and a side surface inclined downwardly and inwardly therefrom; and a weatherstrip for mounting on a door to form a seal with said platform of said sill comprising an elongated integrally formed member of substantially uniform cross section along the length thereof and having a base portion with one surface adapted to seat against the bottom edge of the door, an actuator element extending downwardly from the other surface of said base portion and adjacent one side thereof, a sealing element extending in spaced relationship to said other surface of said base portion and towards the other side thereof from said actuator element, at least one hinge arm connecting said sealing element to said base portion with a portion of said sealing element extending to the side of said hinge arm spaced from said actuator element to provide a deflectable sealing portion, and a connecting link extending between said sealing element and said actuator element, said actuator element having at least the outer portion of its surface adjacent the sealing element inclined to cooperate with the inclined side surface of said sill platform, said actuator element outer surface portion abutting against said side surface of said sill platform during closing movement of the door to effect deflection of said actuator element and through said connecting link to effect deflection of the sealing portion away from said base portion and against the top surface of said sill platform.

15. The combination of claim 14 wherein said weath-

erstrip includes a sealing element of generally U-shaped configuration with the legs thereof extending in generally parallel spaced relationship to said base portion and with the connecting web thereof at the ends of said legs remote from said actuator element and with said hinge arm connecting the other end of one of said legs to said base portion, said connecting link being connected to the other end of the outer of said legs.

16. The combination of claim 14 wherein said weatherstrip includes a sealing element of generally L-shaped configuration with one leg extending in substantially parallel spaced relationship to said base portion and connected thereto by said hinge arm and the other of said legs extending outwardly therefrom at the end remote from said actuator element, said connecting link being connected to said one leg.

References Cited

UNITED STATES PATENTS

1,527,739	2/1925	Leach	49—488
2,010,609	8/1935	Shogren	49—483 X
3,273,287	9/1966	Pease	49—470 X
3,378,958	4/1968	Parks et al.	49—489

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