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H. C. MULTER

3,469,349

MAGNETIC WEATHERSTRIP AND DOOR ASSEMBLY

Filed Feb. 26, 1968

2 Sheets-Sheet 1

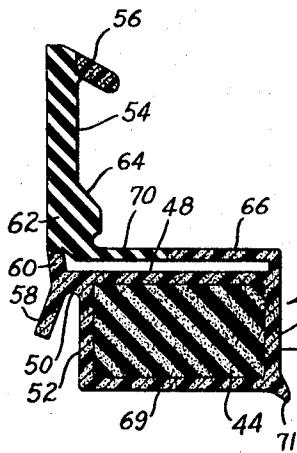


FIG. 6

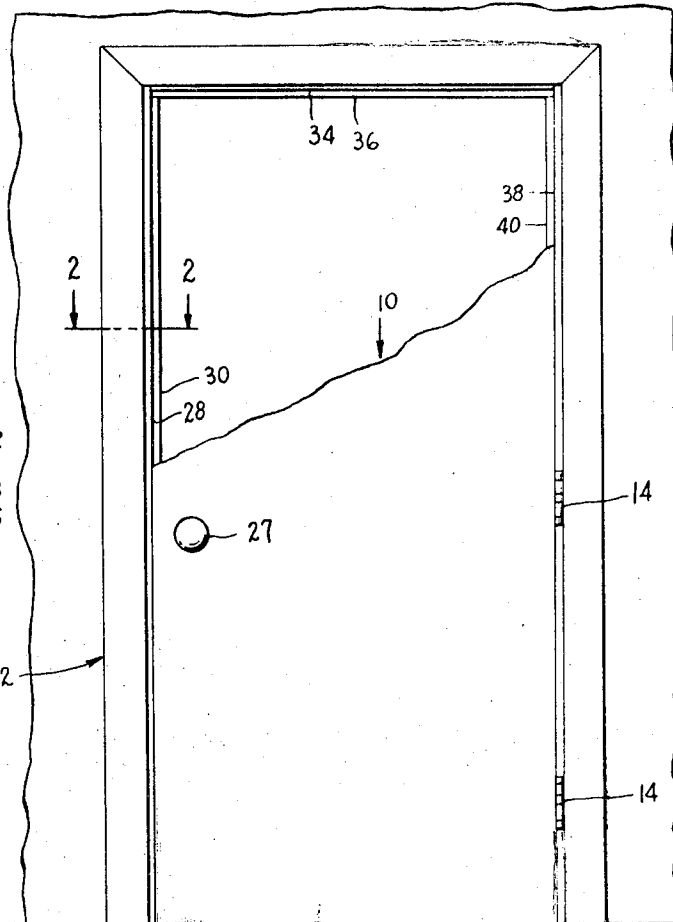


FIG. 1

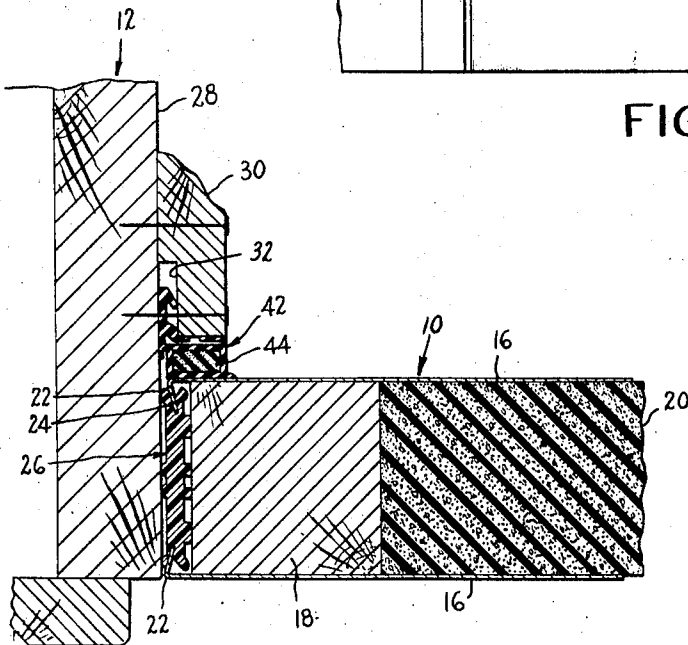


FIG. 2

INVENTOR
HOWARD C. MULTER

BY *Peter J. Costello*
ATTORNEY

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2 Sheets-Sheet 2

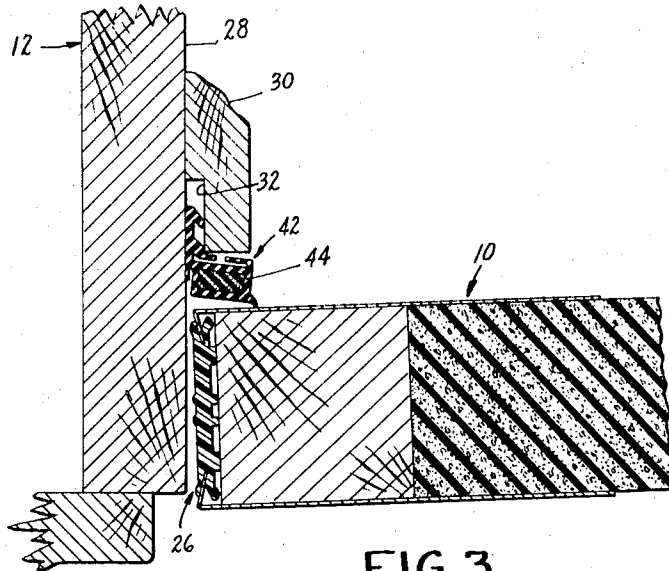


FIG. 3

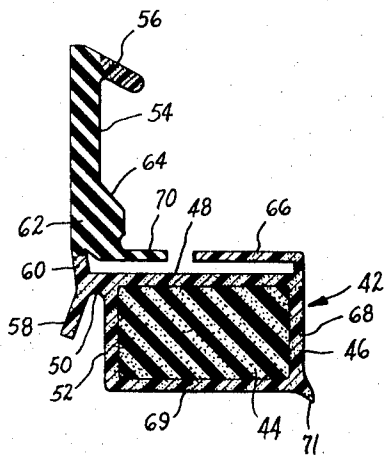


FIG. 4

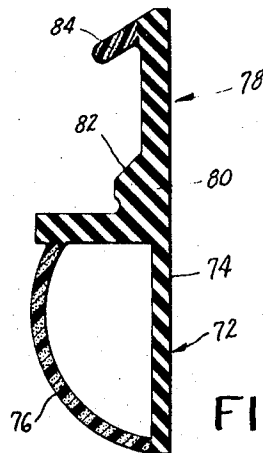


FIG. 5

INVENTOR
HOWARD C. MULTER

BY *J. L. Carter*
ATTORNEY

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MAGNETIC WEATHERSTRIP AND DOOR ASSEMBLY

Howard C. Multer, Hartford, Conn., assignor to The Stanley Works, New Britain, Conn., a corporation of Connecticut

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12 Claims

ABSTRACT OF THE DISCLOSURE

An elongated magnetic weatherstrip for use in conjunction with a door having at least a portion of a strip of magnetically attractable metal. The weatherstrip has an integrally formed elongated support member providing a hollow body portion, a hinge portion connected to one side of the body portion adjacent the inner surface thereof and a tail portion connected to the other side of the hinge portion and extending away from the body portion and generally to the side thereof. A magnetic strip in the cavity of the body portion of the support member pivots the weather-strip about the hinge portion into magnetic engagement with the door to provide the desired sealing action.

Background of the invention

Metal clad doors enjoy widespread application in cabinets, refrigerators and other structures. More recently they have seen increasing use in homes, factories and the like wherein their fire-retardant characteristics are desirably employed.

In many 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 and rubber or plastic insulation has been widely employed for this purpose. In addition, synthetic plastic gaskets containing magnetic elements have seen widespread application in effecting seals for refrigerators and like devices. Because of the widespread utilization of metal clad doors, there has been growing usage of magnetic weatherstripping in conjunction with such doors.

As will be readily appreciated, weatherstripping for metal clad doors for buildings and other structures will normally be secured to the frame about the door opening rather than to the door itself. It is also highly desirable that such weatherstripping present an attractive appearance in the open condition of the door and be located to the side of the door opening closely adjacent the frame so as to avoid injury thereto as persons or articles move through the door opening.

It is an object of the present invention to provide novel magnetic weatherstripping for use with metal doors which may be readily and economically manufactured to provide a durable and highly effective seal.

It is also an object to provide such weatherstripping which will present a neat, desirable appearance in the open condition of the door whether employed along the header or the jamb of the door frame.

A further object is to provide weatherstripping which includes means to minimize injury thereto upon slamming of the door and for holding the weatherstripping snugly against the door frame to minimize inadvertent engagement thereof by persons or objects passing through the door opening.

Still another object is to provide such weatherstripping having a readily pivotable magnetically attractable body portion which will pivot into engagement with the door

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although it may be fully closed and compensate for warpage and/or misalignment of the door in the door frame.

Summary of the invention

It has now been found that the foregoing and related objects can be readily attained in an elongated magnetic weatherstrip which is adapted for use along the header and the jamb of the door frame. The weatherstrip includes an integrally formed elongated support member having a cross section providing a hollow body portion defining a cavity and an outer surface defining the sealing face. A hinge portion is connected to one side of the body portion adjacent the inner surface thereof and a tail portion is connected to the other side of the hinge portion and extends generally parallel to the one side of the body portion away from the inner surface thereof and with one side surface spaced away from the plane of the one side of the body portion for seating against the surface of the door frame. The hinge portion provides for pivotable movement of the body portion relative to the tail portion and enables flexure toward a door in the door frame.

A magnetic strip is seated in the cavity of the body portion of the support member and is of sufficient magnetic strength to produce pivoting of the body portion toward the metal door as it moves into proximity therewith. The weatherstrip is mountable on the door frame with the tail portion being engaged with the door frame and extending away from the door and with the sealing face of the body portion being disposed adjacent the face of the door. When the weatherstrip is mounted on a header, gravity will pivot the body portion about the hinge portion in the direction of the tail portion and thereby against the stop in which the tail portion will normally be mounted.

In its preferred aspect, the support member also has an arm portion at the other side of the hinge portion and extending away from the hinge portion and the body portion and oppositely from the tail portion. The length and angle thereof are such that it projects beyond the plane of the side surface of the tail portion, but it should terminate inwardly from the plane of the outer or sealing surface of the body portion to permit free pivoting of the body portion in the direction away from the tail portion.

Furthermore, in accordance with the preferred aspect, the support member has a bumper strip on the body portion with a portion extending generally parallel and spaced from the inner surface of the body portion. This bumper strip acts as a resilient bumper when the door is slammed against the weatherstrip to minimize the likelihood of injury thereto and also serves to hold the body portion against the frame about the door opening when the door is open, particularly when the weatherstrip is installed at the header. The bumper strip may have an L-shaped configuration so that its leg extending parallel to the inner surface of the body portion only extends across a portion of the distance toward the tail portion. Desirably, the tail portion has a cooperating bumper strip or locating strip which abuts against the edge of the stop and extends toward the bumper strip on the body portion and in the same plane as the portion extending parallel to the inner surface of the body portion. In one highly effective embodiment, the leg of the L-shaped bumper strip on the body portion extends to and is connected with the tail portion so as to provide a second pivot for the body portion. In this latter structure, a portion of the leg extending parallel to the inner surface of the body portion is made of relatively rigid material adjacent the tail portion while the remainder of the bumper strip is comprised of relatively resilient deflectable material so that pivoting occurs at a point spaced from but adjacent to the tail portion.

To simulate a seal along the door surface, a resiliently deflectable finger portion may be provided on the body portion at the intersection of the outer surface and the side opposite that adjacent the tail portion and project at an angle thereto.

Brief description of the drawings

FIGURE 1 is a fragmentary perspective view of the wall of a building structure having a steel clad door;

FIGURE 2 is a fragmentary sectional view to an enlarged scale along the line 2—2 of FIGURE 1;

FIGURE 3 is a view similar to FIGURE 2 showing the door in partially open position;

FIGURE 4 is a cross-sectional view of the magnetic weatherstrip to a greatly enlarged scale;

FIGURE 5 is a sectional view to a greatly enlarged scale of the non-magnetic weatherstrip;

FIGURE 6 is a cross sectional view of another embodiment of magnetic weatherstrip to a greatly enlarged scale.

Detailed description of the illustrated embodiments

Turning now to FIGURES 1-3 of the attached drawings in detail, therein illustrated is a door generally designated by the numeral 10 mounted for pivotal movement in the door frame generally designated by the numeral 12 by the several hinges 14. As seen in FIGURE 2, the door 10 has a pair of metal skins or faces 16 which extend over a body provided by a wood frame 18 and foamed synthetic plastic core 20. The flanges 22 on the skins 16 extend about the side edges of the wood frame 18 and into channels 24 of the retainer and facing element 26. A conventional door knob 27 is provided adjacent the pivotable side edge of the door 10.

The door frame 12 on the pivotable side edge of the door 10 has a jamb strip 28 upon which is mounted a door stop 30 with a notched inside edge providing a recess 32 adjacent the surface of the jamb strip. The header strip 34 and its door stop 36 are similarly constructed as are the jamb strip 38 at the pivoted or hinge side edge of the door 10 and its door stop 40.

Mounted on the jamb strip 28 and the header strip 34 is a magnetic weatherstrip member provided by an integrally formed elongated support member generally designated by the numeral 42 and a magnetic strip 44 received therein. As best seen in FIGURE 2, the support member 42 is of generally uniform cross section throughout its length which provides a tubular body portion 46 of rectangular cross section. At one side 52 of the body portion 46 and adjacent the face 48 thereof is a hinge portion 50 which lies substantially in the plane of the face 48.

Extending generally from said hinge portion 50 and away from the face 48 generally parallel to the side 52 is an elongated tail portion 54 with an arm 56 adjacent its free end which ends at an angle therefrom towards the body portion 46.

Extending from the hinge portion 50 oppositely from the tail portion 54 and away from the side 52 is a spring arm portion 58. As can be seen, the spring arm portion 58 extends at an angle to the side 52 and beyond the plane of the tail portion 54 for a purpose to be explained fully hereinafter. The root 60 of the tail portion 54 is reduced in width to facilitate flexure and an enlarged portion 62 extending in the direction of the body portion 46 is provided adjacent thereto which is configured to provide a sloping shoulder 64 for a purpose to be explained fully hereinafter.

In this particular embodiment, the body portion 46 has a bumper strip 66 of generally L-shaped configuration extending from the side 68 towards the tail portion 54 parallel to the face 48. The tail portion 54 has a bumper strip 70 on the enlarged portion 62 aligned with and extending towards the bumper strip 66 of the body portion but terminating at a point spaced therefrom.

The face 69 of the body portion 46 is pivoted against the surface of the door 10 and may seat flush there-

against if the alignment is ideal. At the side 68 of the body portion 46 and projecting at an angle from the face 69 thereof away outwardly from both the face 69 and the side 68 is a finger 71 which tapers to a reduced thickness at its free end. The deflection of the finger 71 upon pivoting of the body portion 46 against the surface of the door 10 provides an excellent seat.

The weatherstrip is shown in operative assembly in FIGURES 2 and 3 wherein the tail portion 54 is inserted into the recess 32 between the door stop 30 and jamb strip 28. The pressure of the deflected arm 56 on the tail portion 54 against the surface of the stop 30 tends to retain the weatherstrip in position within the recess 32, and the tail portion 54 is pressed inwardly until the enlarged portion 62 thereof firmly seats in the recess 32 with the sloping shoulder 64 facilitating insertion. Although the frictional engagement thus provided may be utilized to retain the weatherstrip in position, it is generally desirable to lock the weatherstrip in adjusted position by finishing nails or brads 61 which are driven through the tail portion 54 as seen in FIGURE 2 or desirably through the root portion 60 thereof to enable facile removal.

When mounted, the spring arm portion 58 bears against the jamb strip 28 and biases the body portion 46 towards the stop 30. The bumper strips 66, 70 lie against the face of the stop and the finger 71 projects toward the face of the door 10.

Turning now to FIGURE 5, therein illustrated in detail is the non-magnetic weatherstrip at the hinge side of the door 10 and cooperating with the jamb strip 38 and stop 40. The body portion generally designated by the numeral 72 has an L-shaped section 74 and a convexly arcuate section 76 extending between the legs thereof to provide a hollow, balloon-like member. The tail portion generally designated by the numeral 78 has an enlarged root 80 providing a sloping shoulder 82 and also has an arm 84 extending from its free end at an angle towards the body portion 72, both for a purpose to be explained hereinafter.

The non-magnetic weatherstrip is mounted similarly to the magnetic weatherstrip with its tail portion 78 inserted in a recess (not shown) formed between the stop 40 and jamb strip 38. The enlarged root 80 is inserted in the recess until the base leg of the L-shaped section 74 of the body portion seats against the face of the stop 40. Brads or nails (not shown) are employed to lock the weatherstrip in position.

In operation of the illustrated embodiment of magnetic weatherstrip, the magnetic strip 44 in the body portion is attracted to the ferrous skin 16 of the door 10 as it moves adjacent thereto. This attraction produces pivoting of the body portion 46 about the hinge portion 50 against the action of the spring arm portion 58, as seen in FIGURE 3. As the body portion 46 moves against the skin 16 of the door 10, the pointed finger 71 is deflected against the face of the door and the sealing face 48 finally seats firmly against the skin 16. Even if the door does not shut tightly or even if there is some warpage or misalignment, the flexibility of the support member provided by the hinge portion 50 and its location will permit the weatherstrip to seal tightly against the surface of the door.

Should the door be slammed, the bumper strips 66, 70 will initially contact the edge of the stops 30, 36 and collapse to absorb a significant portion of the impact force and thus minimize the likelihood of damage to the weatherstrip. In the closed condition of the door, shown in FIGURE 2, the bumper strips 66, 70 abut against the edge surface of the stops 30, 36 and provide a squared-off appearance to the assembly.

Upon opening of the door, the magnetic attraction of the magnetic strip 44 will tend to hold the support member 42 against the surface of the skin 16 of the door 10. However, as the body portion 46 pivots about the hinge portion 50, the side 52 of the body portion 46 will strike jamb strip 28 or header strip 34 as the case may be and

separate from the door 10 as it continues to move outwardly. At this point, the spring arm portion 58 will apply a biasing pressure to pivot the body portion 46 about the hinge portion 50 and against the edge surface of the stops 30, 36. As will be appreciated, the center of gravity of the magnetic strip 44 and body portion 46 is outwardly of the hinge portion 50 when the weatherstrip is mounted on the header strip 34. As a result, gravity assists the spring arm portion 58 in returning the body portion against the door stop 36. In the open position of the door, a squared-off appearance is presented by reason of the bumper strip 66 which seats closely against the surface of the stops 30, 36.

On the hinge side of the door, closing action of the door 10 will produce deformation of the convexly arcuate section 76 of the body portion 72 of the weatherstrip along the jamb strip 38. It can be seen that the convexly arcuate section 76 will tend to form itself about the edge of the door to provide a weather-tight seal by reason of its resilient character.

In mounting the magnetic weatherstrip, the tail portion 42 is inserted into the recess 32 of the stops 30, 36 until the bumper strip 70 seats against the outside edge surface thereof. The deformation of the arm or barb 56 on the tail portion 54 and the width of the tail portion provided by the enlarged portion 62 at the mouth of the recess 32 provides reasonably firm seating of the support member 42 in the recess 32. Thus, the weatherstrip may be adjusted over its entire length and finally secured in place by nails or brads 61 driven through the stops 30, 36 and through the tail portion 54 into the wood of the strips 28, 34. Similarly, the weatherstrip at the hinge side is mounted with the base leg of the L-shaped section 74 seating against the outside edge-surface of the jamb strip 38.

In the illustrated embodiment, the bumper strips 66, 70 have been shown as discontinuous. If so desired, the bumper strip may extend as a continuous member from the side 46 of the body portion to the tail portion 54 which will have the effect of providing a second pivot point or hinge for the body portion 46. In such a structure, it is generally desirable that the portion of the bumper strip adjacent the tail portion 54 be of relatively rigid material so as to space the pivot point at a distance from the tail portion 54. This double pivot structure also cooperates with the action of the spring arm portion 58 to help in returning the body portion 46 against the outside edge surface of the stops 30, 36.

In order to provide the optimum characteristics for the weatherstrip, it is desirable to extrude the support member 42 as a composite of two streams of resins having a different degree of resiliency or durometer. This is shown in FIGURE 4 by the difference in cross-hatching with the material of the tail portion 54 except for the arm or barb 56 and the material of the bumper strip 70 being of a relatively rigid synthetic plastic material while the remainder of the support member 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.

The weatherstrip is secured to the door stop by means

of the engagement of the tail portion in the recess. Although a plurality of resiliently deformable arms or barbs may be provided on the tail portion in an effort to enhance frictional engagement, generally it is desirable to secure positively the tail portion in adjusted position by use of brads, nails or the like. However, such positive fastening means may be omitted if so desired, albeit with some tendency for the weatherstrip to ride longitudinally in the recess of the door opening and at times to move outwardly or inwardly thereof.

The magnetic strip which is received within the cavity of the support member may be any relatively flexible member providing the desired magnetic properties. Generally, the most useful materials are synthetic plastic resins which contain as a filler ferrous metal particles that are subsequently subjected to magnetic stress to produce the desired magnetic property. In particular, vinyl chloride resins containing iron particles are widely employed for producing a highly satisfactory magnetic strip.

Thus, it can be seen that the present invention provides a novel magnetic weatherstripping for use with metal doors which may be readily and economically manufactured to provide a durable and highly effective seal. When mounted it presents a neat, desirable appearance in the open condition of the door whether employed along the header or the jamb of the door frame. In its preferred aspect, the weatherstrip includes a bumper for minimizing injury to the weatherstrip assembly upon slamming of the door and for holding the weatherstrip snugly against the door stop to minimize inadvertent engagement thereof as persons or objects pass through the door opening.

Having thus described the invention, I claim:

1. An elongated magnetic weatherstrip for a door having a portion of magnetically attractable metal and adapted to use along the header and jamb of a door frame comprising: an integrally formed elongated support member having a cross section providing a hollow body portion defining a cavity and an outer surface defining the sealing face, a hinge portion connected to one side of said body portion spaced from said outer surface and closely adjacent the inner surface thereof so that the center of gravity of said body portion is outwardly of said hinge portion and a tail portion connected to the other side of said hinge portion extending generally parallel to said one side away from said inner surface and with one side surface thereof spaced away from the plane of said one side of said body portion, said hinge portion providing for pivotal movement of said body portion relative to said tail portion; and a magnetic strip in said cavity of said support member, said weatherstrip being mountable on a door frame with said tail portion being engaged with the door frame and extending away from the door and with the sealing face of the body portion being disposed adjacent the face of the door, the weight of said body portion and magnetic strip producing pivoting of the body portion towards the tail portion when disposed along the header of a door frame.

2. The magnetic weatherstrip in accordance with claim 1 wherein said support member has a spring arm portion extending at an angle from the side of said hinge portion opposite that connected to said body portion and beyond the plane of the tail portion, said hinge portion biasing said body portion about said hinge portion towards said tail portion when said weatherstrip is mounted on a door frame.

3. The magnetic weatherstrip in accordance with claim 1 wherein said support member has a bumper strip on the side of said body portion opposite to that connected to said hinge portion, said bumper strip having a base leg extending from said opposite side in spaced relationship to the inner surface of said body portion towards said tail portion, said bumper strip serving to absorb impact forces upon closing of the door.

4. The magnetic weatherstrip in accordance with claim 3 wherein said base leg is continuous and joins to said tail

portion, said continuous base leg having at least a portion thereof resiliently deflectable to provide a second pivot for said body portion.

5 5. The magnetic weatherstrip in accordance with claim 3 wherein said tail portion has a bumper strip extending toward the bumper strip on said body portion in substantially the same plane and terminating inwardly from the end thereof.

10 6. The magnetic weatherstrip in accordance with claim 1 wherein said body portion has a finger thereon at the intersection between said sealing face and the side of said body portion opposite that connected to said hinge portion, said finger portion deflecting against the surface of the door to provide enhanced sealing action.

15 7. The magnetic weatherstrip in accordance with claim 1 wherein said tail portion has at least one arm portion of resiliently deflectable material extending at an angle thereto in the direction of said body portion and an enlarged portion at its end adjacent said hinge portion to provide for adjustable seating of said tail portion in a recess defined by a door stop of the door frame.

20 8. The magnetic weatherstrip in accordance with claim 1 wherein said support member is integrally formed from at least two streams of synthetic plastic material to form a composite article, one stream providing a relatively resilient material for said body portion and hinge portion and another stream providing a relatively rigid material for said tail portion.

25 9. The magnetic weatherstrip in accordance with claim 1 wherein said support member has a spring arm portion extending at an angle to the side of said hinge portion opposite that connected to said body portion and oppositely from said tail portion, said spring arm portion extending beyond the plane of the tail portion and biasing said body portion toward said tail portion when said weatherstrip is mounted on a door frame; and wherein

said support member has a bumper strip on the side of said body portion opposite to that connected to said hinge portion, said bumper strip having a base leg extending from said opposite side in spaced relationship to the inner surface of said body portion toward said tail portion, said bumper strip serving to absorb impact forces upon said weatherstrip during closing movement of the door.

10 10. The magnetic weatherstrip in accordance with claim 9 wherein said tail portion has a bumper strip extending toward the bumper strip on said body portion in substantially the same plane and terminating inwardly from the end thereof.

15 11. The magnetic weatherstrip in accordance with claim 9 wherein said hinge portion lies in substantially the same plane as the section of the body portion providing said inner surface thereof.

20 12. The magnetic weatherstrip in accordance with claim 9 wherein said body portion has a finger thereon at the intersection between said sealing face and the side of said body portion opposite that connected to said hinge portion, said finger portion deflecting against the surface of the door to provide enhanced sealing action.

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DAVID J. WILLIAMOWSKY, Primary Examiner

U.S. Cl. X.R.

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