Nov. 6, 1962 J. A. WAHLFELD 3,061,896

THRESHOLD

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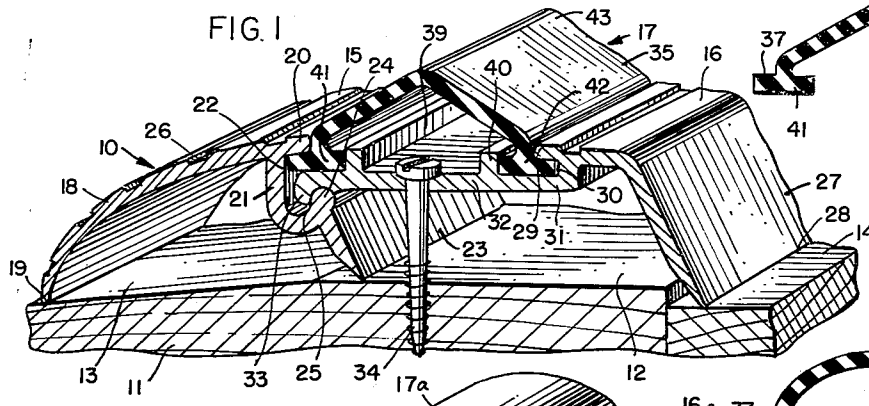
FIG. 1



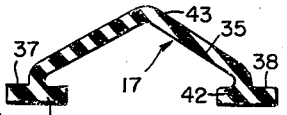


FIG. 2

FIG. 4

FIG. 3

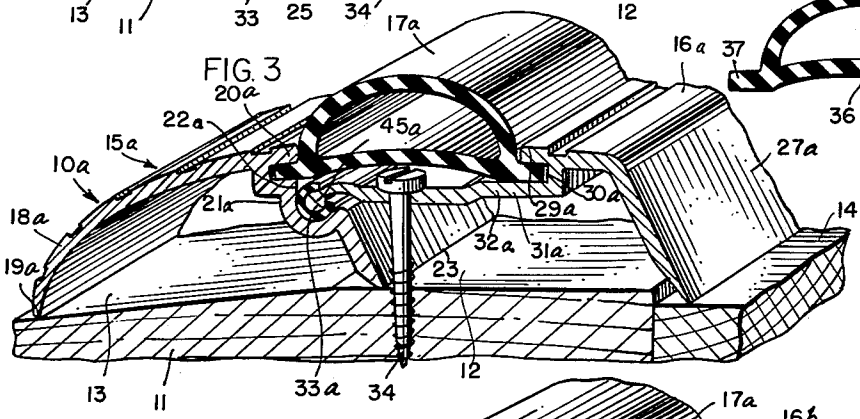


FIG. 5

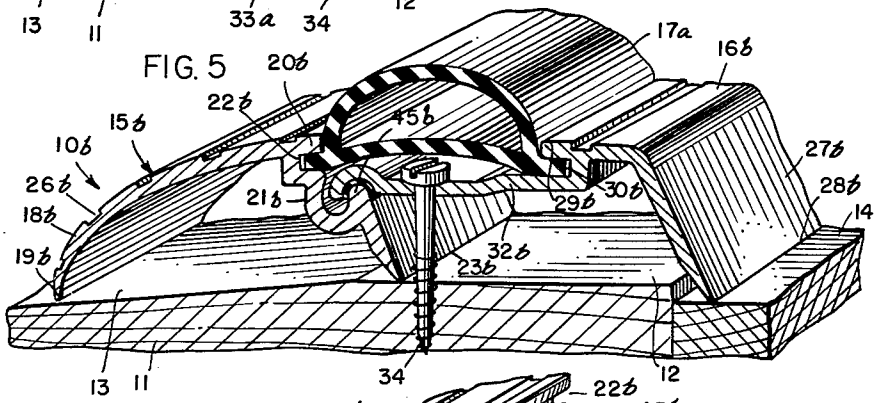
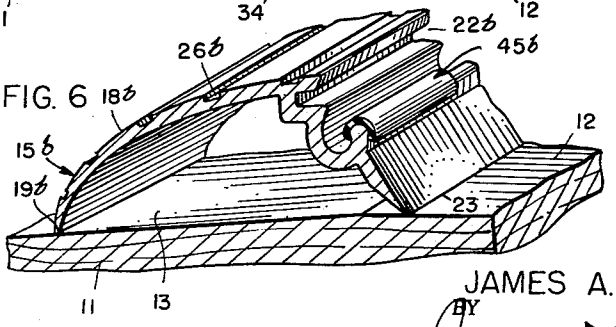


FIG. 6



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THRESHOLD

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FIG. 7

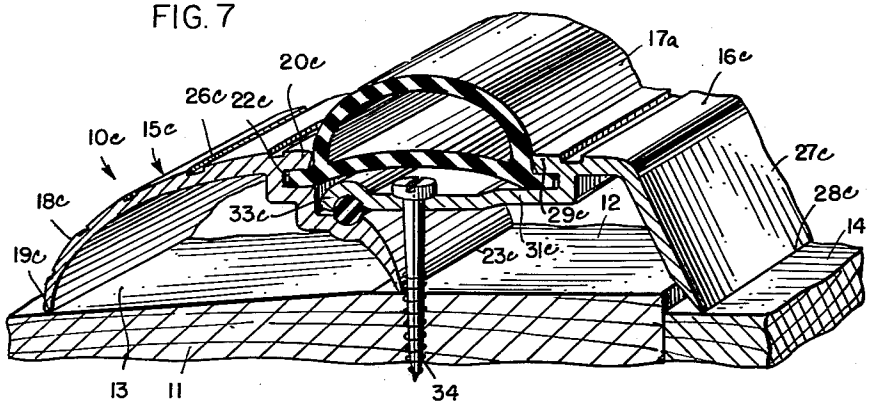

FIG. 8

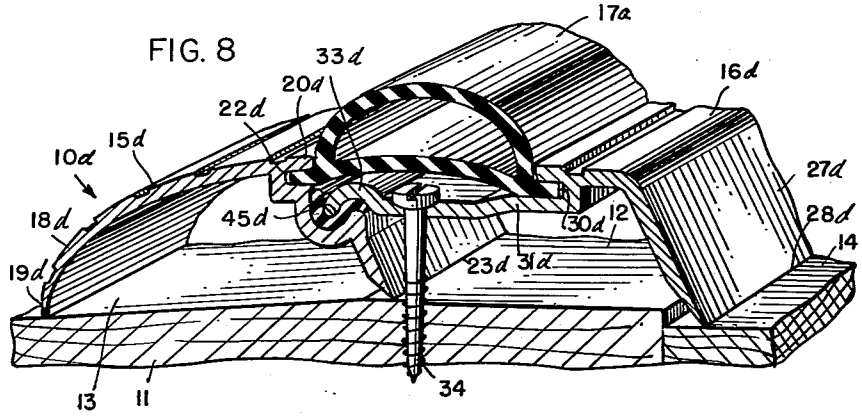

FIG. 9

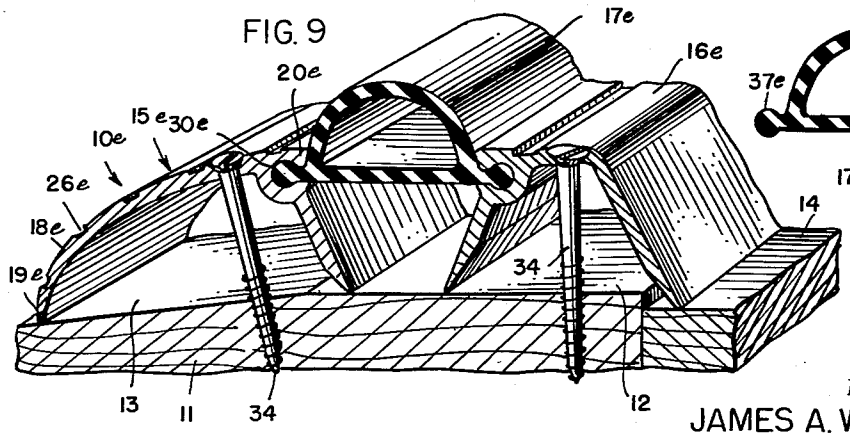

FIG. 10

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FIG. 11

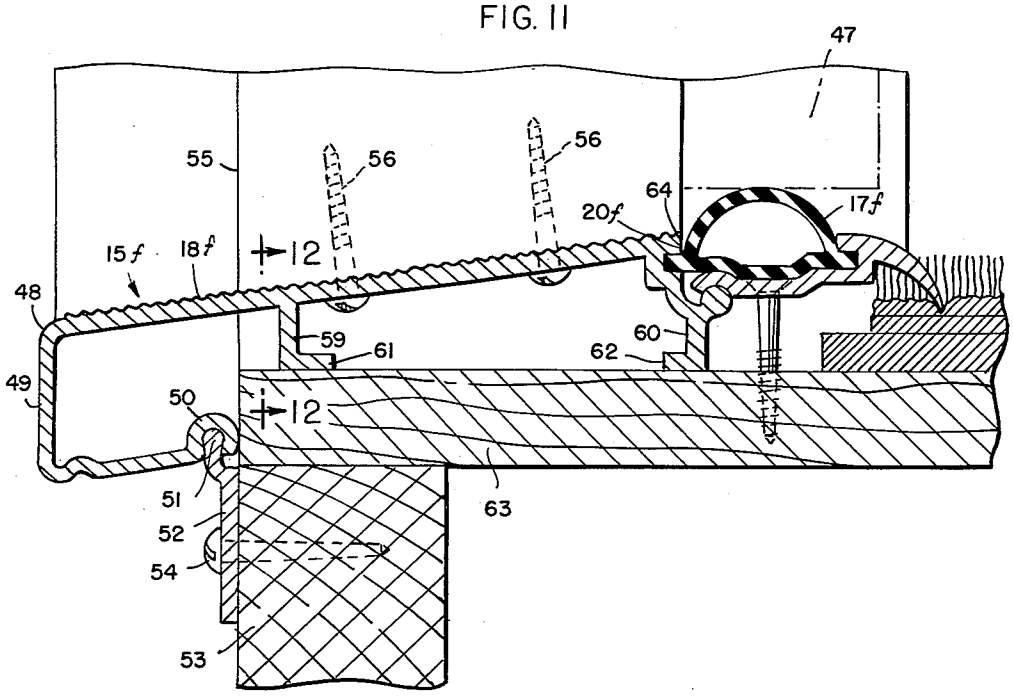
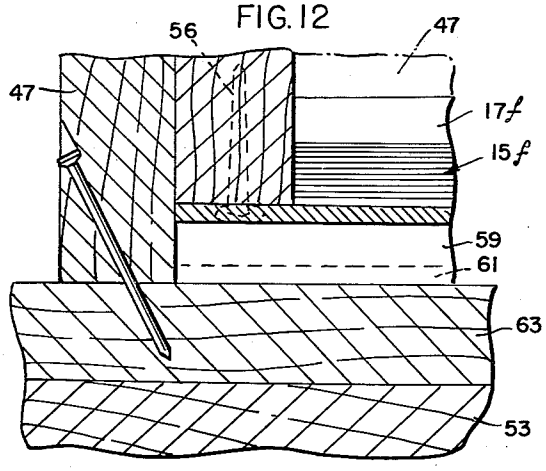


FIG. 12



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THRESHOLD

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Filed Mar. 23, 1959, Ser. No. 801,102

5 Claims. (Cl. 20—64)

This invention relates to doorway frames and sills, and more particularly to a threshold especially suited for use with outer doors for providing a weather strip or barrier therefor which prevents drafts and heat losses.

The present application is a continuation-in-part of my Patent No. 2,880,476, issued April 7, 1959.

It is well known that considerable air leakage and heat loss occurs around doors, and is particularly troublesome where the doors provide an entrance between the outside and interior of a house or other enclosure. The lack of an effective seal between the door and underlying floor not only permits the escape of warm air to the outside and, conversely, the entrance of cold exterior air, but with metal thresholds heat has been conducted past the door, causes heat loss to the outside and a frosting of the threshold on the inside. As a result, various endeavors have been made to develop devices which serve to seal the space between a door and the underlying floor without interfering with the normal movement of the door. However, such devices are not universally applicable, are difficult to install, conduct heat, and frequently have sealing strips that are not easily mounted and are readily knocked out of place when inadvertently kicked by one passing through a doorway.

As a consequence of these deficiencies in the known threshold devices, it is believed that an improved threshold structure would be a welcomed contribution to this art particularly one adjustable to any sill pitch and floor level, can be be used as original part of door frames as initial equipment and will block heat loss. The provision thereof is one of the objects of this invention. Another object of this invention is to provide a threshold structure that is easy to cut to size and mount in all doorways either as original or replacement equipment, and which has universal applicability in that it may be used with door frames where the floor-sections are inclined, or offset vertically with respect to a sill or each other to either increase or decrease the spacing between the door and various floor sections either opened or closed.

Another object of the invention is to provide a rot proof threshold for an outside doorway which is non-skid and low enough not to be tripped over, one that is self-supporting throughout its length and adjustable to accommodate any thickness of inside floor covering.

Still another object of the invention is in the provision of a threshold structure which utilizes as the sealing element, a hollow compressible strip (preferably of a resilient material such as rubber or one of the synthetic equivalents thereof) which is put in place by buckling or compressing the same transversely, whereupon the return thereof to its initial condition not only results in an interlock with rigid elements of the device but also serves as a moisture seal and as a heat conduction barrier.

Yet another object is in the provision of a threshold having rigid channel sections and a resilient sealing strip of hollow cross section equipped with a bottom wall that deflects into a groove-like depression in one of the rigid sections, and in maintaining such deflected condition resists removal of the sealing strip from its interlocking relation with the channel sections and preferably overlies the edges to provide moisture seal. Additional objects and advantages of the invention will become apparent as the specification develops including permanent assembly as original equipment, if desired.

Embodiments of the invention are illustrated in the accompanying drawing, in which:

FIG. 1 is a broken perspective view illustrating a section of a threshold device embodying the invention mounted on the sill of a doorway;

FIG. 2 is a transverse sectional view of the sealing strip used in the threshold structure of FIG. 1;

FIG. 3 is another broken perspective view illustrating a section of a threshold device embodying the invention, mounted on the sill of a doorway with the floor having a downwardly stepped portion;

FIG. 4 is a transverse sectional view of the sealing strip employed in the threshold of FIG. 3;

FIG. 5 is still another broken perspective view illustrating a section of the inventive threshold device mounted on a doorway sill, but showing a modified form of threshold;

FIG. 6 is a broken perspective view of one of the elements shown in FIG. 5 illustrating the structure of the heat conductive distinction thereof;

FIG. 7 is yet another broken perspective view illustrating a section of a modified form of the inventive threshold device mounted on the sill of a doorway;

FIG. 8 is a broken perspective view showing a section of a modified form of threshold mounted in the sill of a doorway illustrating another embodiment of the invention;

FIG. 9 is yet another broken perspective view illustrating a section of a modified form of a threshold device embodying the invention in which the sealing strip serves also as the heat transfer barrier;

FIG. 10 is a transverse sectional view of the sealing strip used in the structure of FIG. 9;

FIG. 11 is a cross sectional view of another embodiment of invention in which the threshold embodies the invention and is built in as original equipment; and

FIG. 12 is a front elevational view of one corner of the threshold shown in FIG. 11 illustrating its securement.

FIG. 1 illustrates a threshold device designated in general with the numeral **10**, shown mounted in the sill **11** of a doorway. The sill has a flat top surface **12** that underlies a door when it is closed, and an inclined face **13** on one side of the top surface **12**. The sill **11** joins along the other side thereof with a floor section denoted with the numeral **14**. It will be seen in FIG. 1 that the top surface **12** of the sill can be aligned with and form an effective continuation of the top surface of the floor section **14** at any relative level within building design.

The threshold **10** comprises a pair of channel sections **15** and **16** preferably of extruded aluminum and a sealing strip **17** carried in an interlocking relation therewith. The section **15** has an arcuate wall or tread portion **18** that terminates at its lower longitudinal edge **19** in adjacency with the inclined surface **13** of the sill of the door frame. If desired, the lower longitudinal edge **19** may be tapered to provide a line contact with the surface **13**, whereby it may be slightly embedded therein when the threshold is mounted, as will be described hereinafter. The upper longitudinal edge **20** of the section **15** defines with a depending leg **21**, a longitudinally extending recess **22**; and the leg **21** turns downwardly to define a lower edge **23** contiguous with the top surface **12** of the sill **11**. The edge **23** may have a knife-like edge so that it can be embedded in the surface **12**.

It will be evident that the longitudinally extending edges **19**, **20** and **23** are in substantially parallel alignment, and also extending in alignment therewith is an arcuate shoulder **24** horizontally intermediate the edges **20** and **23**, which comprises an arcuate hinge seat **25** that also extends longitudinally of the section **15** in paral-

lel alignment with the longitudinal edges where downward pressure at 24 forces edges 19 and 23 downwardly. If desired, the outer surface of the section 15 may be provided with a plurality of ribs 26 which afford a roughened non-skid surface to provide relatively good traction as well as reinforcement longitudinally.

The channel section 16 has a depending leg 27 terminating in a lower longitudinally extending edge 28 which preferably is of tapered cross section to define an embeddable line contact with the top surface of the floor section 14. The generally horizontal top wall of the channel section 16 terminates at its inner end in a longitudinal extending edge 29 that defines a recess 30 with a channel wall 31 having an intermediate section 32 defining a longitudinally extending groove in the upper surface thereof and which terminates in a slightly arcuate hinge edge 33, which in configuration corresponds to that of the arcuate shoulder 24 of the section 15. It is apparent from FIG. 1 that the arcuate hinge seat 25 has room to move around the hinge edge 33, so that the channel section 16 may articulate appreciably with respect to the channel section 15 about the hinge provided by the cooperative shoulder 24, edge 33 and seat 25.

The channel sections 15 and 16 are rigidly held in position along the sill 11 and floor 14 by a plurality of wood screws 34 which extend transversely through the intermediate section 32 of the channel wall 31 in longitudinally spaced relation. When the screws 34 are tightened, the channel section 16 is drawn downwardly toward the sill 11 and floor 14 whereby the edge 28 is brought into tight frictional engagement with the floor section 14, and the hinge edge 33 similarly engages the shoulder 24 of the channel section 15. As a result, the longitudinal edges 19 and 23 of the section 15 are brought into tight frictional engagement with the respective top surfaces 13 and 12 of the sill.

The intermediate section 32 is equipped with spaced apart rails 39 and 40 which abut the inner edges of the inwardly extending, longitudinal flanges 41 and 42 of the sealing strip 17. This strip has a top wall 35 that terminates in a crown 43 with inclined sides. It will be noted that the strip is open at the bottom and within limits the inwardly extending flanges 41 and 42 can accommodate various widths between recesses with respect to which the flanges 42 and 38 are confined between the recess 30 and rail 40, while the flanges 41 and 37 are confined between the recess 22 and rail 39. It will be noted that the recess 22 merges or communicates with the hinge seat 25, and consequently the flange 37 is frictionally gripped between the longitudinally extending edge 20 of the channel section 15 and the arcuate hinge shoulder 33 of the channel section 16.

The sealing strip 17 may be formed from any suitable material such as grey extruded vinyl, and has the characteristics of being both resilient and compressible whereupon the convex top wall 35 thereof is pressed downwardly when a door is closed thereagainst, but resiliently engages such door to provide a weather barrier or sealing relation therewith. The material, for example, may be natural or synthetic rubber, or it may be one of the various plastics which are known to have the characteristics stated.

The versatility of the threshold is appreciated because it will accommodate a building structure wherein the sill 11 may have its top surface 12 above the top surface of the floor section 14.

FIG. 3 illustrates a slightly modified threshold structure in that the hinge relationship is modified to provide a heat conductive barrier and a little different seal 17*a* is employed, one in which the flanges 41 and 42 are interconnected by an integral web 36*a*. With the exception of these changes, the structural elements are the same as those heretofore described in detail and the function thereof is identical. Consequently, the same numerals are employed to denote the various components, but for purposes of differentiation the modified structure from the one heretofore described, each numeral has the suffix *a* added thereto.

The hinge relationship is one in which the recess 22*a* is formed to provide a cylindrical wall and received therein is a semi-cylindrical journal element 45 made of a comparatively hard material of low heat conductivity. In this instance, the material is an extruded plastic such as polystyrene. The journal element 45 has a slit along one side to receive the edge 33*a* which is beaded to fit snugly within the journal element 45.

With this arrangement instead of the two channel sections 15 and 16 being in a metal to metal contact that makes a bridge of high heat conductivity from one side of a door to another, the journal member serves as a heat conductive barrier which prevents heat loss from inside a building and the condensation of moisture inside the building which wets the carpeting or floor surface.

The rails 39 and 40 are lacking in this embodiment and the seal element 17*a* comprises a hollow tubular member having a convex, top wall 35*a*, a bottom wall 36*a* and laterally extending, longitudinal flanges 37 and 38 that are received, respectively, within the recesses 22*a* and 30*a* defined by the channel sections 15*a* and 16*a*. By referring to FIG. 4, it will be apparent that the bottom wall 36 of the sealing strip is ordinarily flat or slightly arched, but when mounted within the channel-sections can be deflected into and conform to the general configuration of the concave groove of the channel wall section 32, if desired. It may also be noted that the arcuate groove provided by the wall section 32 effectively lowers the heads of the screws 34 so that they do not interfere with the sealing strip 17 during the positioning thereof in the channel sections.

The threshold structures illustrated in FIGS. 5, 6, 7 and 8 are substantially identical with that discussed in connection with FIG. 3 except for different embodiments of the hinge arrangement. In FIGS. 5 and 6 the structure is similar to FIG. 1 with the head 24*a* receiving semi-cylindrical journal element sections 45*b* thereon to engage and supoprt the arcuate edge 33*b* of the bottom wall 32*b*. These journal elements are preferably made in short sections to save cutting and to increase the ease of installation.

In FIG. 7 the recess 22*c* and the arcuate edge 33*c* are formed to define a surface of revolution common to them and receive between them a rod or sections of cylindrical dowel-like rods 45*c* which may be of wood as well as plastic. When the screws are tightened there is little danger of dissociation of the parts.

The embodiment shown in FIG. 8 is a modification of FIG. 3 in which the journal element 45*d* is merely shaped to separate in spaced supported relationship an interengaging edge structure such as that shown in FIG. 1.

In FIG. 9, the two channel sections 15*e* are identical and the seal 17*e* not only serves as a seal but also as a heat conduction barrier and as an integrating unit for the assembly. In this embodiment the recesses 30*e* are made sectionally like key hole slots to provide channelways with restricted throats and the flanges in turn 37*e* on the seal 17*e* are correspondingly formed as heads with enlarged heads to interlock with channelways 30*e* and hold the channel sections in spaced relationship. However, in this embodiment the channel sections are independently secured to the sill by screws 34*a* for the purposes and with the novel results already described in connection with the other embodiments, the interlock between the heads 37*e* and the channelways 30*e* providing a pivotal or journal adjustment accommodating floors of different levels.

Referring now to FIGS. 11 and 12, an embodiment is shown in which the channel section 15d (FIG. 8) is modified to have the tread portion 18*f* widened to encompass, or preferably replace as shown, the wooden sill generally furnished with door frames. From the edge 20*f* which

is located in the plane of the front face of the door 47 the channel portion 15*f* has the outwardly extending tread portion 18*f* sloping downwardly to a front edge 48 where the tread extends downwardly as at 49 to provide an appearance of thickness and then rearwardly a predetermined distance to terminate in a contour forming one of two mating interengaged contours, one of which is a female contour 50 engaged by a male contour 51. The other contour is formed along the upper edge of a binding strip 52 fastened in an appropriate position on the front face of a box joist 53 by screws 54.

As shown in FIG. 12 the side frames having jamb contours 55 are cut at an angle to receive the squared ends of the channel section 15*f* in proper position and screws 56 are driven into the jamb elements to hold the ends of the channel section 15*f* snugly in place. Upon the lower face of the tread portion 18*f*, vertical rails 59 and 60 are provided having footing flanges 61 and 62 respectively that rest on the sub floors 63 to support the assembly in place. Thus, with the inter-engagement established at 50 and 51 holding down the channel section 15*f* as well as the overlap of the jamb cut at the sides the thresold and the door frame are securely held in its resting position and a door sill is provided with is vermin and rot-proof as well as providing a non-slip threshold in appearance and a heat loss barrier etc., as already described, the remaining elements having already been described in connection with other embodiments.

It will be noted here that feather edges 64 are provided overhanging the upper face edge of the channel sections to shed and seal them from the entrance of moisture. This structure is usable with the other modifications if desired.

With the structures of FIGS. 1–10, the mounting thereof upon the sill of a doorway is quite easy. It is only necessary to make two cutting operations. First, the channel section 15 is cut transversely so as to fit snugly within the smaller dimension (that is, width) of a doorway as abutting the jamb or stop elements and the channel section 16 is similarly cut transversely so as to fit within the larger dimension of the doorway (that is, to fit snugly between the walls of the door jamb that corresponds to the size of the door). The channel sections are then tightened in position by the screws 34, and, except for FIG. 9, the channel strip 35 is then slipped into the channel sections so that the flanges 37 and 38 thereof are received within the longitudinally extending recesses 22 and 30. In FIG. 9 the sealing strip 17*e* is already in place when the channel sections are fastened down.

The sealing strip will, of course, first be cut to the same length as that of the channel section 16, and the portion of the flange 37 which would ordinarily abut the face 46 at each side of the door jamb is trimmed off. After the sealing strip 17 is in place, the arcuate top wall 35 may be pinched and a slight upward force applied thereto which has the effect of deforming the bottom wall 36 so that it nests within the arcuate groove defined by the wall portion 32 of the channel section 16. Thereafter, the wall 36 tends to maintain such concave configuration which is effective to resist inadvertent displacement of the sealing strip from its interlock with the channel sections.

In all of the threshold structures described and as already mentioned, the channel sections are relatively pivotal or swingable about the cooperative hinge elements provided respectively thereby so as to accommodate sill and floor arrangements of various configurations and levels. In each form of the structure, the sealing strip is readily mounted by compressing or pinching it transversely to insert the outwardly extending flanges thereof into the channels therefor. With the structure of FIG. 1, the respective flanges may be fed into the recesses defined outwardly of the rails 39 and 40 by tilting the flanges during the insertion thereof. When in position, an interlocking relation is established between the channel sections and the sealing strips that firmly holds the sealing strips in place and resists inadvertent displacement thereof.

In the embodiment disclosed in FIG. 9, the beads 37*e* are threaded endwise in the mating channels 30*e* before fastening.

While the foregoing specification embodiments of the invention have been set forth and described in considerable detail for purposes of illustration, it will be apparent to those skilled in the art that numerous changes may be made in those details without departing from the spirit and principles of the invention.

What is claimed:

1. In a threshold of the character described a pair of cooperating metal channel sections adapted to be secured in parallel relation to one another along the sill of a doorway and defining respectively longitudinally extending substantially coplanar spaced recesses,

means constituting the sole interengagement between said channel sections including a sealing strip of flexible resilient material of low heat conductivity having longitudinal edges receivable respectively in said recesses in vertical interlocking relationship therewith,

said sealing strip having a lower wall extending substantially horizontally between said longitudinal edges and an upwardly bowed top wall extending above said channel sections for cooperative sealing engagement with a door closed thereagainst,

a plurality of edges extending downwardly from one of said channel sections in contact with said sill to support the sealing strip above the sill,

said channel sections having horizontal overlapping portions defining vertically nesting arcuate walls disposed in spaced pivotal relationship, and

said interengagement means including an element of low heat conductivity mating with said arcuate walls between said overlapping portions and disposed in mutually supporting and supported relationship therewith.

2. In a threshold of the character described a pair of cooperating metal channel sections adapted to be secured in parallel relation to one another along the sill of a doorway and defining respectively longitudinally extending substantially coplanar spaced recesses,

means constituting the sole interengagement between said channel sections including a sealing strip of flexible resilient material of low heat conductivity having longitudinal edges receivable respectively in said recesses in vertical interlocking relationship therewith,

said sealing strip having an upwardly bowed wall extending above said channel sections for cooperative sealing engagement with a door closed thereagainst.

a plurality of edges extending downwardly from one of said channel sections in contact with said sill to support the sealing strip above the sill,

said channel sections having horizontal overlapping portions defining vertically spaced arcuate walls defining opposing surfaces of revolution, and

said interengagement means including an element of low heat conductivity mating with said arcuate walls in articulating relationship between said overlapping portions and disposed in mutually supporting and supported relationship therewith to hold said recesses in fixed spaced relationship.

3. In a threshold of the character described a pair of cooperating metal channel sections adapted to be secured in parallel relation to one another along the sill of a doorway and defining respectively longitudinally extending substantially horizontally spaced recesses,

means for supporting an edge of one of said channel members upon the other channel member including overlapping portions of said channel members defining vertically spaced substantially concentric walls

disposed intermediate said recesses and in weight bearing relationship,

means constituting the sole interengagement between channel sections including a sealing strip of flexible resilient material of low heat conductivity covering said overlapping portions and having longitudinal edges receivable respectively in said recesses in vertical interlocking relationship therewith,

said sealing strip having an upwardly bowed wall extending between the edges above said channel sections for cooperative sealing engagement with a door closed thereagainst,

a plurality of elements spaced transversely of and extending downwardly from one of said channel sections in horizontally spaced contact with said sill to support the sealing strip above the sill, and

said interengagement means including an element of low heat conductivity mating with said concentric walls between said overlapping portions and disposed in mutually supporting and supported relationship therewith.

4. In a threshold of the character described a pair of cooperating metal channel sections adapted to be secured in parallel relation to one another along the sill of a doorway and defining respectively longitudinally extending substantially horizontally spaced recesses,

means constituting the sole interengagement between said channel sections including a sealing strip of flexible resilient material of low heat conductivity having longitudinal edges receivable respectively in said recesses in vertical interlocking relationship therewith,

said sealing strip having an upwardly bowed and downwardly yieldable wall extending above said channel sections for cooperative sealing engagement with a door closed thereagainst,

a plurality of transversely spaced elements extending

downwardly from one of said channel sections and a depending element on the other of said channel sections, said elements contacting said sill to support the sealing strip above the sill,

said channel sections having horizontal overlapping portions defining vertically spaced walls disposed in cooperative articulating relationship,

said interengagement means including an element of low heat conductivity mating with said walls between said overlapping portions and disposed in weight bearing mutually supporting and supported relationship therewith and against relative movement in a horizontal direction, and

said overlapping portions vertically being disposed between said transversely spaced elements.

5. The combination called for in claim 4 in which said spaced elements are disposed upon said one of said channel sections and said depending element is disposed on the other one of said channel sections and is spaced horizontally from said plurality of elements, and means for securing said channel sections to said sill disposed in said other channel section between said recesses and between said depending element and said plurality of elements.

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