

Fig. 1

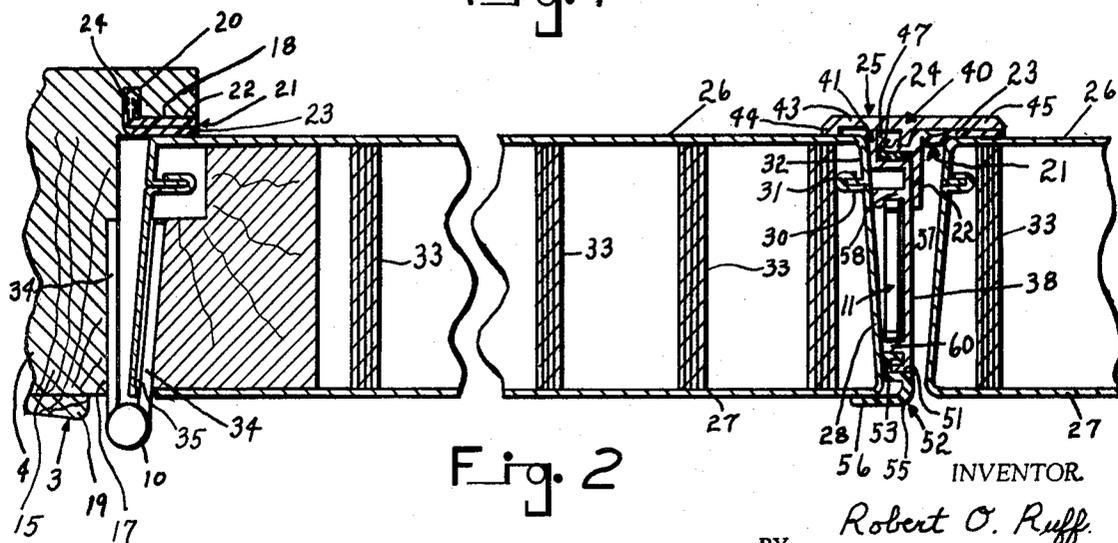


Fig. 2

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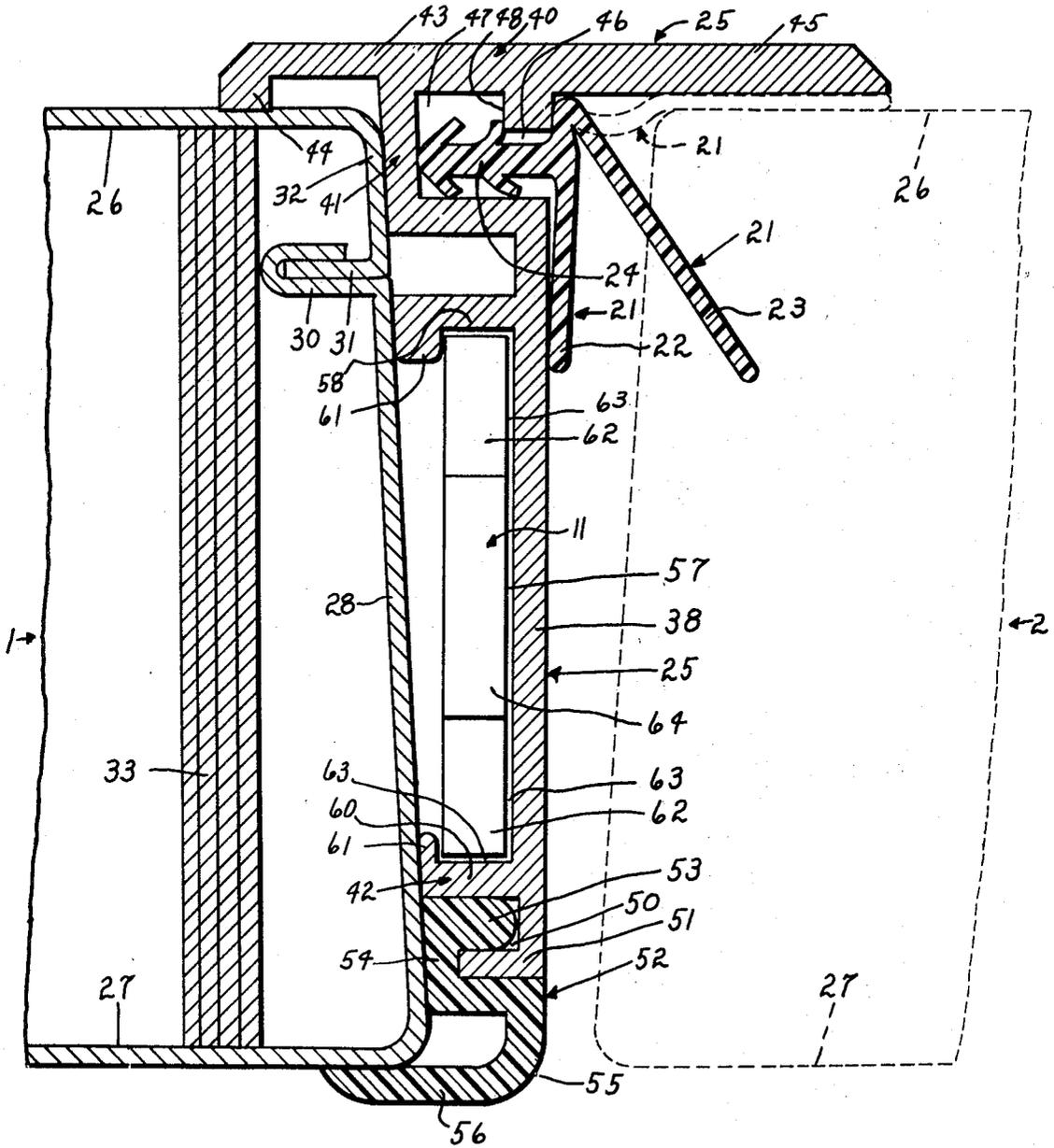


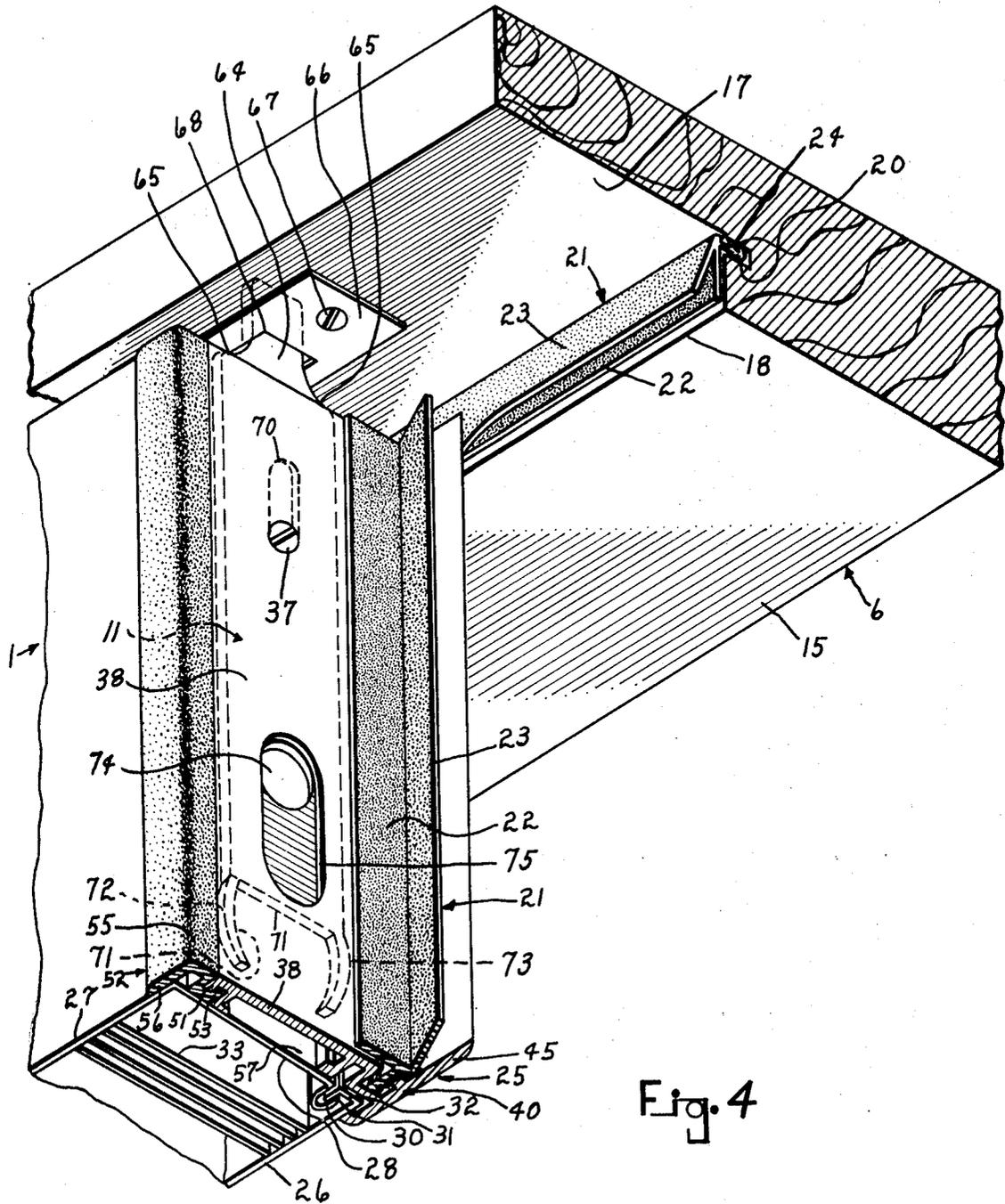
Fig. 3

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4 Sheets-Sheet 3



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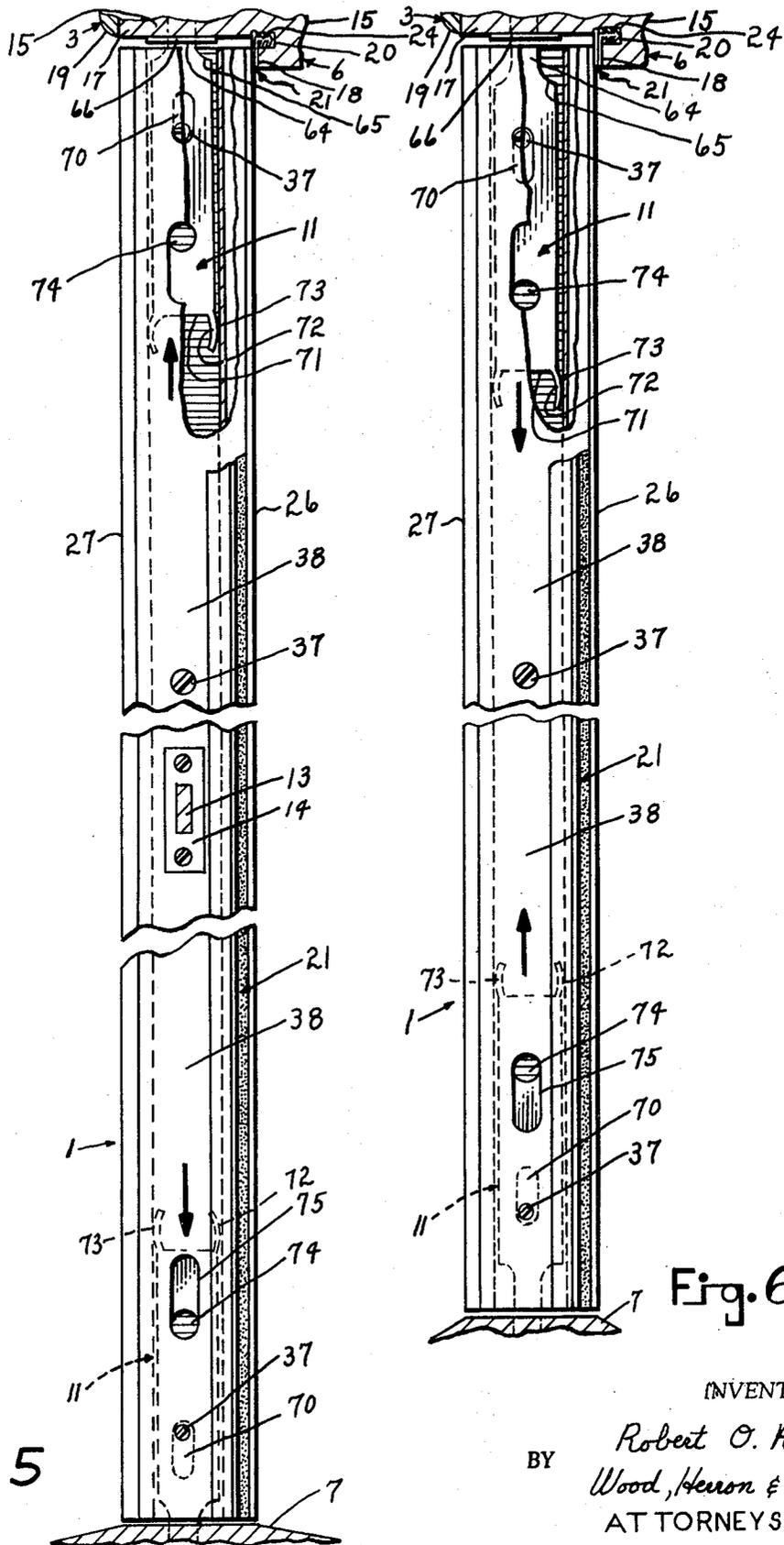


Fig. 5

Fig. 6

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COMBINED ASTRAGAL AND FLUSH BOLT STRUCTURE

BACKGROUND OF THE INVENTION

Sliding bolts of the type contemplated by the invention have been in use for many years in door installations which involve a double door frame having two doors hinged along the opposite sides of the frame. They are used extensively in offices, industrial or commercial buildings and also for residential use. In each case, one of the doors, which may be called the "inactive door" is ordinarily kept latched in its closed position by sliding bolts engaging the header and sill or threshold of the frame, while the active door swings with reference to the inactive door and includes a standard latch having a latch bolt engaged in the edge of the inactive door. The inactive door may be unlatched and swung to its open position, along with the active door, to provide a full width door opening when it is necessary to move large pieces of furniture or equipment through the doorway or for other reasons which require a wide door opening.

The conventional sliding bolts for the inactive door may be installed either in the free edge of a wood door or a door formed of sheet metal. The sliding bolts for a wood door may require the upper and lower edge portions of the inactive door to be milled out to receive a fixed mounting element of some type in which the sliding bolt is confined for shifting motion from its latching to its unlatching position. In a door formed of sheet metal, it may also be necessary to indent or recess the upper and lower end portions at its free or swinging edge to accommodate the mounting elements for the sliding bolts.

One of the primary objectives of the invention has been to provide a generally hollow astragal strip (particularly for sheet metal doors) including an internal slideway for shiftably confining respective flush bolts in the upper and lower end portion of the astragal, the combined astragal and flush bolts providing a neat and trim appearance and eliminating the need for fitting and for conventional mounting elements and other components as are ordinarily required.

According to this concept, the astragal is in the form of a strip which is generally T-shaped in cross section, comprising a longitudinal mounting rail for attachment to the free edge of the inactive door, with a right angular head rail formed along one edge of the mounting rail. The mounting rail is secured by screws to the free swinging edge of the door and includes the internal slideway for the flush bolts, while the right angular head rail provides an overhanging stop engageable with the free marginal portion of the active door when in its closed and latched position.

Another objective has been to provide an astragal of one-piece, self-contained design which permits the use of simplified flush bolts which are concealed and slidably confined within the astragal, thereby to simplify the construction of the flush bolts and astragal.

According to this aspect of the invention, the T-shaped astragal is in the form of an extrusion, preferably of aluminum, the mounting rail (which is secured to the edge portion of the inactive door) having a pair of spaced, parallel limbs formed on its internal surface. The inner ends of the internal limbs are seated against the edge of the inactive door and delineate a slideway for the flush bolts which are spaced from the surface of the door.

Each flush bolt is in the form of a flat bar formed preferably of a hard plastic material such as nylon to reduce friction, the width dimension of the strip being disposed in the plane of the edge of the door, that is, in the direction of its swinging motion, with the outer ends of the flush bolts protruding into engagement with the keepers. By virtue of this arrangement, the flat bars, which constitute the flush bolts, have sufficient strength and rigidity to resist forces tending to open the inactive door.

In order to hold the flush bolt in its adjusted position, the inner end of each bolt includes a forked portion providing spaced spring tangs engaging the sides of the slideway for frictional engagement with the slideway. Each bolt further in-

cludes a circular hole for finger engagement, while the mounting rail is slotted in this area for clearance in shifting the flush bolt to its latched or unlatched position.

A further objective has been to provide an astragal particularly for doors formed of sheet metal, in which the metallic astragal includes a thermal barrier strip for preventing the passage of heat by conduction due to metal-to-metal contact between the astragal and metal doors.

For this purpose, the edge portion of the longitudinal mounting rail, opposite the head rail, includes a thermal barrier strip formed of a plastic material interposed between the door surface and edge portion of the astragal. In addition, there is provided a plastic weather strip arranged to seat between the surface of the overhanging flange of the head rail and the marginal edge portion of the active door to provide a weather seal. By virtue of the thermal barrier strip at one edge, and the weather seal at its opposite edge, the astragal is thermally insulated from both sheet metal doors to prevent conduction of heat from the doors across the astragal.

The various features and advantages of the invention will be more fully apparent to those skilled in the art from the following detailed description in conjunction with the drawings.

In the drawings:

FIG. 1 is an elevation showing a pair of double doors installed in a double door frame and incorporating the astragal and flush bolts of the invention with the bolts in their latching position.

FIG. 2 is an enlarged fragmentary sectional view, taken along the line 2—2 of FIG. 1, further detailing the construction of the doors and showing the astragal and flush bolt, with the doors in closed position corresponding to FIG. 1.

FIG. 3 is an enlarged fragmentary sectional view taken from FIG. 2, detailing the astragal, its thermal barrier strip, weather strip, and the flush bolt within the slideway formed in the astragal.

FIG. 4 is a fragmentary prospective view, illustrating the upper portion of the door and the header of the door frame with the upper flush bolt engaged within the header and locking the inactive door in its closed position.

FIG. 5 is a view taken along the line 5—5 of FIG. 1, showing the edge portion of the inactive door with its upper and lower portions broken away to further illustrate the engagement of the upper and lower flush bolts with respect to the header and sill or threshold.

FIG. 6 is a fragmentary view similar to FIG. 5, showing the flush bolts shifted to their disengaged position for opening the normally inactive door.

DOOR FRAME AND DOORS

In the structure selected to illustrate the principles of the present invention (FIG. 1) the double doors, indicated at 1 and 2 are of sheet metal construction, while the door frame 3 is milled from or made of wood. It will be understood that the door frame 2 may also be sheet metal construction if desired. The door frame comprises the vertical jambs 4 and 5, a horizontal header 6 and a threshold or sill 7 secured to the floor 8. The doors 1 and 2 are hinged as at 10 to the opposite jambs 4 and 5 of the double door frame in the usual way.

Generally speaking, the door 1 is inactive, that is, it normally remains in its closed position, being secured to the header 6 and threshold 7 by upper and lower flush bolts of the invention, which are indicated generally at 11 in FIG. 1. The active door 2 includes the usual latch mechanism (not shown) which is operated by the knob 12 for opening and closing door 2 with respect to the inactive door 1. The latch mechanism includes a latch bolt indicated at 13 which engages a keeper 14 secured to the edge of the inactive door 1 (FIG. 5). The latch mechanism also includes a lock (not shown) operated by a key in the usual way such that, with the latch bolts 11—11 engaged, the active door 2 can be locked with respect to the inactive door, which normally is locked by the bolts 11—11.

As best shown in FIG. 2, the jambs 4 and 5 and header 6 are of composite construction, each comprising a casing 15 secured within the framing members (not shown) of the door opening which is formed in the wall 16. The casings 15 for the jambs and header are identical, each section being milled to provide an inset or rabbet 17 (FIGS. 2 and 4) which forms the opening for the doors and delineating a stop rail 18 against which the doors seat when in their closed position. The casing sections 15 preferably have a width equal to the wall thickness, with their opposite edges flush with the wall surface on opposite sides. The casing sections further include fascia or trim strips 19 for the jambs and header (FIGS. 1 and 2) which overlie the marginal portion of the casing to provide a finished appearance.

Both doors 1 and 2 may be sealed with respect to the casing members by weather stripping which engages the marginal portion of the doors, the weather stripping being mounted in the jambs and header. For this purpose (FIGS. 2 and 4) each stop rail 18 (jambs and header) includes a groove or slot 20 located at the base of the stop rail 18. Each weather strip, indicated generally at 21, is on one-piece construction formed of a plastic material having rubberlike characteristics to provide a sealing action.

Each weather strip 21 (FIG. 4) comprises a pair of limbs 22 and 23 angularly related to one another to form a V-shaped cross section. The limb 22 forms the base and seats against the stop rail 18. Limb 22 includes a tailpiece 24 having barbs anchored within the groove 20 of stop rail 18, while the limb 23 normally (with the doors open) projects outwardly in angular relation to the base limb 22. When the doors are closed (FIGS. 2 and 5) the limb 23 is compressed against the limb 22 to provide the weather sealing effect.

A similar weather strip, indicated generally at 21 is mounted upon the astragal 25 for providing a weather seal between the swinging edges of the doors 1 and 2 in their closed position as explained later.

The seal strips 21 are not disclosed in detail and have been selected as a preferred example of a structure for weather sealing the doors. Sealing strips of this type are disclosed and claimed in detail in the copending application of Claud Frederick, Jr. Ser. No. 878,441, filed Nov. 20, 1969.

The astragal strip 25 and the flush bolts 11—11 may be installed in a door formed of wood if desired. However, in the example disclosed herein, the structure is embodied in a door formed of sheet metal, as noted above. Described with particular reference to FIGS. 2 and 3, the sheet metal doors 1 and 2 are of similar construction and are of composite design. Each door comprises the opposed sheet metal face panels 26 and 27 which are spaced apart from one another and form the opposite sides of the door.

In the present structure, the panel 27 includes edge flanges 28—28 along the opposite vertical sides of the door. The free edge portion of each flange 28 is bent inwardly to a generally U-shaped formation, indicated at 30, which forms a groove adapted to receive a lip 31 from projecting inwardly from a flange 32 formed along the edge of the opposed panel 26. The door includes a filler or core 33 formed of relatively thin fibrous sheets which extend transversely between the spaced panels 26 and 27. The filler reinforces the composite door and provides a sound-deadening effect.

Both vertical edges of the door are of similar construction; however, the edge portion of the panel 27 along the hinged side of the door is slotted to receive one leaf 34 of the hinge 10 (FIG. 2). The leaf 34 is secured in place by screws (not shown) passing through holes formed in the flange 28, through the hinge leaf 34 and into a reinforcing plate 35 located internally of the flange 28. The mating leaf 34 of the hinge is secured by similar screws (not shown) passing into casing 15 of the jamb 4 or 5. The hinged connection is in duplicate with respect to the jambs 4 and 5 for the doors 1 and 2.

The upper and lower edges of each door include closure strips 36—36 (FIG. 1) having opposed flanges engaging the internal surfaces of the panels 26 and 27. If closure strips 36

are of laminated construction they may be secured with an adhesive, or if formed of sheet metal, they may be spot welded to the door panels to complete the assembly of the composite door.

ASTRAGAL CONSTRUCTION

The astragal, previously indicated at 25, comprises a strip, generally T-shaped in cross section (FIGS. 3—6), which extends along the edge of the inactive door 1 for its full length from top to bottom. In the present example, the strip is formed of aluminum, preferably by the extrusion process. The T-shaped astragal includes the longitudinal mounting rail 38 (FIGS. 3 and 4) which overlies the edge flange 28, to which it is secured by the series of screws 37. The openings for the screws are countersunk in the usual way so that the screw heads lie flush with the exposed surface of rail 38. The mounting rail 38 includes a head rail 40 disposed at right angles to the rail 38 and providing a seat or stop for the active door 2.

In a residential installation, or one which is not extensively used by the public, the doors usually are arranged to swing inwardly, and in this event the head rail 40 is located to the outside of the building. However, when the doors are installed in a public building such as a business or industrial establishment, then the doors are arranged to swing outwardly as a safety measure in the event of a fire or the like. In this case, the head rail 40 is disposed to the inside of the building permitting the doors to swing outwardly, the structure and installation being identical in both instances except that the location of the doors and astragal relative to the opening is reversed.

It will be noted in FIG. 3, that the edge flange 28 at the swinging edges of the doors slope inwardly from the door panel 27 to the door panel 26 in the direction of door swing, whereas the mounting rail 38 of the astragal is disposed at right angles to the panels 26 and 27. In order to establish this right angular relationship, the compound flange indicated generally at 41 (FIG. 3) at the juncture of the mounting rail 38 and head rail 40, is made longer than the compound flange, indicated generally at 42 at the opposite end portion of the mounting rail 38, thereby to compensate for the slope of the flange 28. It will be understood at this point, that the flanges 41 and 42 seat against the sloping edge flange 28, the astragal being clamped in position by the screws 37, previously noted. The astragal is located with reference to the edge flange 28 by the portion 43 of head rail 40 which includes a lip 44 engaging panel 26. The opposite portion 45 of head rail 40 projects outwardly beyond mounting rail 38 in a position to provide a stop which engages the marginal edge portion of the panel 26 of active door 2.

It will be noted in FIG. 3 that the compound flange 41, which is coextensive with the astragal, is generally hollow, comprising a longitudinal slot 46 formed in rail 38 and opening into one side of a generally square groove 47 which also extends longitudinally of the astragal. The tailpiece 24 of the astragal weather strip 21 includes longitudinal barbs, as noted earlier. The barb on one side of the tailpiece is engaged against one side of slot 46 and the opposed barb is engaged against a ledge 48 formed at the juncture of slot 46 and the square groove 47, thus anchoring the astragal weather strip 21 in position with its base limb 22 seated against mounting rail 38.

The free limb 23 of the weather strip normally projects at an acute angle to the base strip 22 when the active door is open, as shown in full lines in FIGS. 3 and 4. When the active door 2 is closed, the marginal edge portion of its panel 26 engages the free limb 23 and forces it in pressure engagement against the overhanging portion 45 of head rail 40, as indicated in broken lines in FIG. 3, thus establishing a weather seal between the astragal and active door 2.

The compound flange 42 at the end portion of rail 38 opposite head rail 40 includes a groove 50 which is delineated by a flange 51 spaced outwardly from flange 42 (FIG. 3). A ther-

mal barrier 52 (FIG. 3) is interposed between the end portion of mounting rail 38 and the corner portion of the door 1 (panel 27 and flange 28) to prevent the flow of heat from the sheet metal door section to the metallic astragal 25. Strip 52 is generally S-shaped in cross section and is formed of a heat insulating plastic material such as extruded vinyl.

One end portion 53 of barrier 52 interfits the groove 50, which forms a keyway, and the intervening section 54 of the strip is clamped against door flange 28 by the lip or flange 51 of mounting rail 38. The remaining portion of the barrier strip 52 has its outer surface flush with the surface of mounting rail 38 and includes a curved portion 55 which joins a right angular section 56, the end portion of which overlies the marginal edge of the door panel 27. The barrier strip 52 is thus clamped in place by the astragal 25 and provides a nonmetallic spacer between the surface of the mounting rail 38 and the metal shell of the inactive door 1. The limb 23 of the astragal weather strip 21, in a similar manner, provides a thermal barrier between the metallic astragal 25 and the metallic shell of the active door 2.

FLUSH BOLTS

As noted earlier, the flush bolts 11 for the upper and lower portions of door 1 are both slidably confined in the astragal 25, the cross sectional configuration of the astragal mounting rail 38 being coextensive for its full length for this purpose. Described particularly with reference to FIG. 3, the interior portion of the mounting rail 38 is configured to provide a slideway 57 for the flush bolts 11—11. The slideway 57 is delineated by the spaced limbs 58 and 60 which project at right angles from the longitudinal rail 38 and form a part of the compound flanges 41 and 42. The limbs 58 and 60 each include an intumed lip 61 which is spaced inwardly from the longitudinal rail 38, the lips being seated against the edge flange 28 of the inactive door 1. The internal surfaces of the intumed lips 61—61 engage the marginal portions of the flush bolts 11 and thus complete the self-contained slideway 57 in which the flush bolts are confined.

The flush bolts 11 for the upper and lower portions of the inactive door 1 are of duplicate configuration except that their positions are reversed (FIG. 5). Described in detail (FIGS. 4—6) each flush bolt 11 is generally in the form of a flat bar formed of a plastic material such as molded nylon to reduce friction and its main body portion 62 (FIG. 3) has a thickness and width which interfits the slideway 57 with a slight amount of clearance, as indicated at 63.

The outer end of each body section 62 includes a latching tongue 64 having a width less than the body section 62 and joined to the body section by the curved shoulder 65. In the extended latching position of the bolts, (FIGS. 4 and 5) the latching tongues project outwardly beyond the upper and lower edges of the astragal and door and through keeper plates 66—66 which are secured by screws 67 to the header and to the threshold. Each keeper plate 66 is provided with a rectangular opening 68 dimensioned to receive the protruding tongue 64. The header and threshold each include a clearance aperture formed behind the keeper plate 66 in the usual way to receive the tongue.

It will be noted, at this point, that the tongue 64 extends widthwise in the door opening direction so that its greatest sectional dimension is disposed in the direction of thrust. This enables the tongue to resist without danger of breakage forces tending to swing the door towards its open position. The body section 62 of the bolt, being confined in the slideway 57 counteracts such thrust forces without undue stress being imposed upon the parts.

In order to confine each flush bolt 11 within its slideway for shifting motion to its engaged or disengaged position, the upper portion of each body section 62, inwardly from tongue 64, includes an elongated clearance slot 70 (FIGS. 4—6). The shanks of the screws 37, near the opposite ends of the astragal pass through the slots 70, thus limiting the sliding motion of

the flush bolt to an extent approximately equal to the length of the tongue 64.

The inner end portion of the body section 62 of each bolt is forked as at 71 (FIGS. 4—6) to delineate the prongs or tines 72—72 which are sprung outwardly into frictional engagement with the internal surfaces of the limbs 58 and 60 (FIG. 3) which delineate slideway 57. For this purpose, the tines 72 are relatively thin in cross section to provide a spring action and they are slightly curved outwardly as at 73—73 beyond the side edges of the body section 62. Upon installation of the flush bolt 11 the curved surfaces 73—73 are sprung inwardly toward one another, therefore they are spring urged against the opposed surfaces of the slideway. The spring action holds the flush bolts 11—11 in position, whether in extended latching position, or in the retracted release position.

The body section 62 of each latch bolt further includes a circular purchase opening 74, the diameter of which is sufficient to provide a finger hold for shifting the bolt. The mounting rail 38 is provided with respective longitudinal slots 75 in alignment with each opening 74 and having a length sufficient to permit the flush bolt to be shifted to its extended or retracted position (FIGS. 5 and 6). The throw or extent of motion of each flush bolt is determined by the engagement of screw 37 with the opposite ends of clearance slot 70. This corresponds with the extent of bolt motion provided by the purchase opening 74 and slot 75.

Having described my invention, I claim:

1. A combined flush bolt and astragal device for attachment to the swinging edge portion of a door, said flush bolt being adapted to cooperate with a keeper mounted in a door frame for latching and unlatching the door to the door frame as desired, comprising,

an astragal having a head rail and a mounting rail, said astragal being structured to allow attachment to the swinging edge of a door by fasteners without deforming that swinging edge except as may be required for said fasteners, and said mounting rail having structure that defines a slideway extending longitudinally thereof which is positioned between the nondeformed swinging edge of the door and the interior face of said mounting rail so as to enclose said slideway after said astragal has been attached to the swinging edge of the door,

a flush bolt slidably confined within an end portion of said slideway and having an end portion arranged to protrude beyond the end of the mounting rail, said flush bolt likewise being enclosed between the swinging edge of the door and the interior face of said mounting rail after said astragal has been attached to the swinging edge of the door,

manual means for shifting said flush bolt, when the astragal is attached to the door, between a lock position for latching the door to a door frame in a closed position and an unlock position for allowing the door to be swung to an open position, and

structure defining an elongated slot in said mounting rail, said manual means being accessible through said elongated slot, and said elongated slot only being of sufficient length to allow longitudinal movement of said flush bolt between the lock and unlock positions.

2. A combined astragal and flush bolt device as set forth in claim 1 in which said mounting rail includes

a pair of spaced parallel limbs projecting generally at right angles from the interior face of said mounting rail, the inner ends of said limbs being seated against the swinging edge of the door when said astragal is attached to the door, and the interior face of said mounting rail and the opposed surfaces of said limbs which face one another delineating said slideway.

3. A combined astragal and flush bolt device as set forth in claim 2 in which the ends of said limbs each include an intumed lip with said lips projecting toward one another, the interior face of said mounting rail, the opposed surfaces of said limbs and the internal surfaces of said intumed lips providing a

self-contained slideway between said mounting rail and the swinging edge of the door in which said flush bolt is confined.

4. A combined astragal and flush bolt device as set forth in claim 1 in which said manual means includes a purchase opening formed in said flush bolt in registry with said elongated slot, said purchase opening being accessible for finger engagement through said elongated slot to allow longitudinal movement of said flush bolt.

5. A combined astragal and flush bolt device as set forth in claim 1 in which said fasteners for attaching said astragal to the swinging edge of the door comprise screws passing through said mounting rail and into the swinging edge, and including

means for limiting the longitudinal motion of said flush bolt comprising an elongated slot formed in said flush bolt, one of said screws passing through said elongated slot and cooperating with the ends of said slot to limit the extent of longitudinal motion of said flush bolt.

6. A combined astragal and flush bolt device as set forth in claim 1 including

friction means associated with said flush bolt to pivotally hold said flush bolt in its retracted or extended position with respect to said slideway.

7. A combined astragal and flush bolt device as set forth in claim 6 in which said friction means includes

a pair of opposed tines fixed to said flush bolt which are sufficiently thin to provide a spring action, said flush bolt being installed within said slideway with said tines sprung inwardly toward one another against the opposed surfaces of said slideway.

8. A combined astragal and flush bolt device as set forth in

claim 1 which is particularly adapted for use with an active door and an inactive door where both are hingedly mounted in a door frame, said astragal and flush bolt device being attachable to the inactive door, wherein said head rail and mounting rail are of T-shaped configuration so that a part of said head rail serves as a stop for the active door, and wherein at least said astragal is fabricated of metal, and including

a thermal barrier strip fixed to that edge of said mounting rail opposite said head rail, said thermal barrier strip serving to interrupt heat transfer through said astragal from that environment in which said thermal barrier strip is located to that environment in which said head rail is located.

9. A combined astragal and flush bolt device as set forth in claim 8 in which said mounting rail includes a compound flange projecting from the interior face of said mounting rail, said compound flange being located at the edge of said mounting rail opposite said head rail, said compound flange having a flange which projects toward the swinging edge of the inactive door when said astragal is attached to the inactive door, and said thermal barrier strip being clamped between said flange and the swinging edge when said astragal is attached to the inactive door.

10. A combined astragal and flush bolt device as set forth in claim 8 including a weather strip mounted to said astragal, said weather strip having a flexible limb adapted to seat between the overhanging portion of said head rail and the active door when the active door is in a closed position so as to provide a weather seal between said astragal and the active door.

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