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SLIDING CLOSURE CONSTRUCTION

Filed Jan. 27, 1964

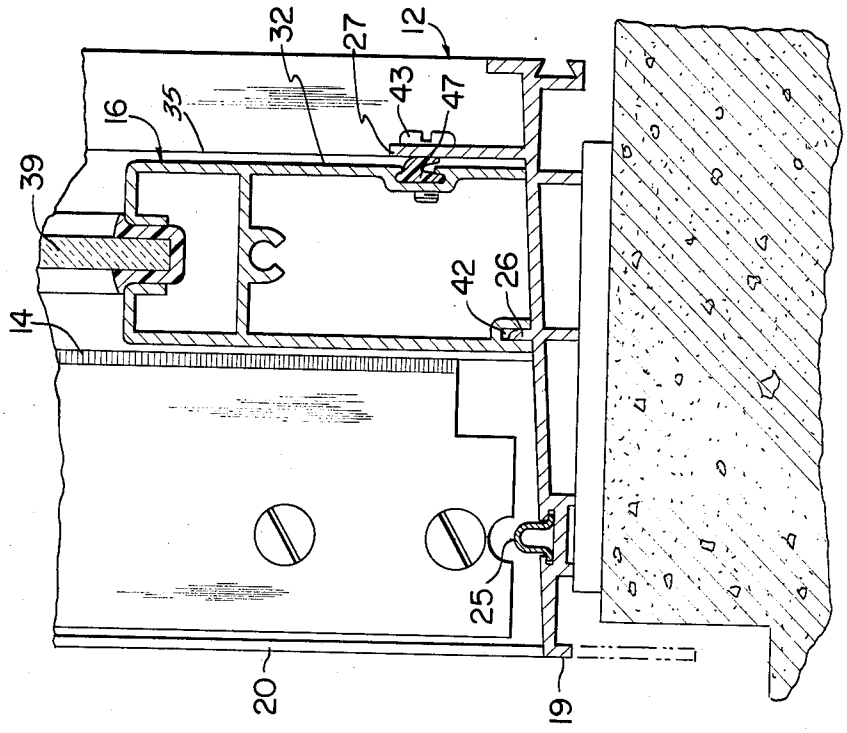



FIG. 3

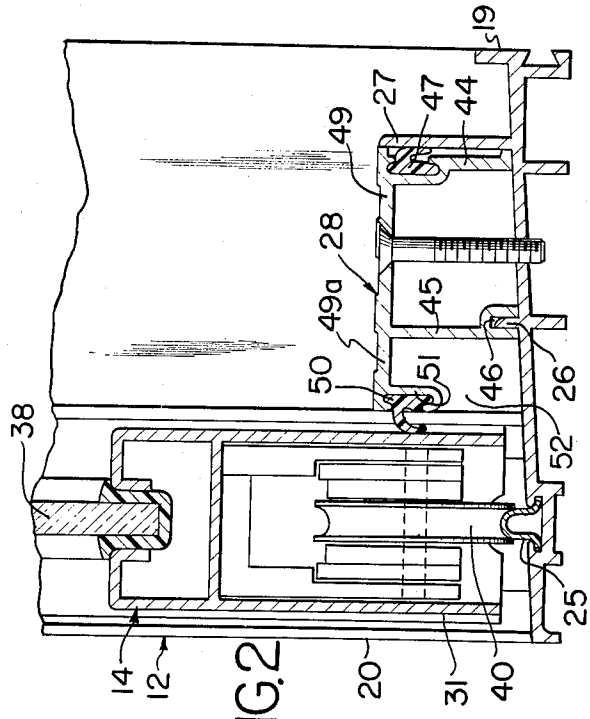



FIG. 2

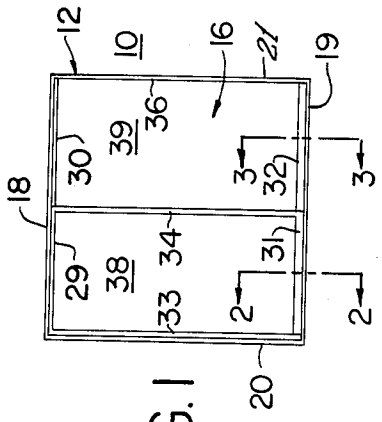



FIG. 1

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# SLIDING CLOSURE CONSTRUCTION

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The present invention relates to a sliding closure construction, and particularly to a sliding door assembly for installation in the outer wall of a structure. The sliding closure construction according to the present invention is particularly useful in a closure of the type wherein there is provided a door frame with fixed and slidably movable doors within the frame.

Sliding door assemblies of the type described above are commercially available in the building industry. However, such prior known sliding door assemblies have not been entirely satisfactory. One of the important requirements of a closure for installation in the outer wall of a structure is its weather resistance, and particularly under adverse weather conditions wherein a pressure differential may be developed between the exterior of a structure and the interior thereof. Under such adverse conditions, as high winds and driving rains, difficulty has been experienced with the water tightness of the closure. Additionally, it is important particularly in the closure structures formed of metal, that the closure assembly may be readily installed in the wall with a minimum of labor and with sufficient accuracy in alignment of the components to provide the desired weather tight closure.

In one particular type of commercially available sliding door assembly, there is provided a door frame with a fixed door aligned in a portion of the frame opening, and a threshold positioned between the fixed door and the other side of the opening. A movable or sliding door is positioned on a track exteriorly of the fixed door. When the movable door is in the closed position, there is provided a narrow space between the threshold and the inner lower surface of the bottom rail of the movable door. During storm conditions, water will drain down the vertical outer surface of the door and will accumulate at the sill, making it the most critical weathering area. Where the threshold has a forward wall in close proximity to the closed sliding door, the narrow space formed between the threshold and the sliding panel produces a venturi action wherein air and water are syphoned when a pressure differential is applied between the interior and exterior of the structure. As water accumulates on the sill, a negative pressure is established in the venturi area between the threshold and the door, which in turn causes the water to be syphoned up higher and eventually over the threshold. Weather-strip between the threshold and the door has not been entirely successful in preventing the passage of water over the threshold under such adverse weather conditions. The fact that water has been syphoned up in the venturi area to the weatherstrip indicates that the pressure in the venturi area must be less than the outside pressure and hence there cannot exist a significant pressure differential across the weatherstrip. Thus the only real protection achieved by such a configuration is by the sheer height of the threshold step.

Accordingly one object of the present invention is to provide a new and improved sliding door construction adapted for installation in an outer wall structure.

A further object of the present invention is to provide a new and improved sliding door assembly which overcomes the above mentioned difficulties.

A further object of the present invention is the provision of a new and improved sliding door assembly which



is very effective to prevent the ingress of water during adverse weather conditions.

A further object of the present invention is to provide a new and improved sliding door assembly which may be readily assembled and installed in a building with accurate alignment of the components.

Further objects and advantages of the present invention will become apparent as the following description proceeds and the feature of novelty which characterized the invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

In accordance with these and many of the objects of the present invention, there is provided a new and improved sliding door assembly adopted for installation in an outer wall of a structure. The sliding door assembly includes a frame which forms the opening for the door or panel assembly and includes a head member, a sill member, and interconnecting spaced vertical stiles. The sill member is provided with track means and with an integral, short upstanding rib longitudinally of the sill member and inwardly of the track means, and is further provided with a relatively high upstanding fin formed integrally with the sill and inwardly of the rib. In assembly, a fixed door is positioned within the frame and is accurately aligned in proper position by the provision in its bottom rail of a groove which interfits with the rib in the sill to align the door. Moreover, the inner lower surface of the bottom rail of the door engages against the upstanding fin to form a positive barrier against water infiltration below the door panel. Interposed between the fixed door and the other side of the frame is a generally U-shaped inverted threshold having a first leg forming an inner wall positioned adjacent the outer surface of the fin and having a second leg forming an outer wall and provided with a groove in its lower surface interfitted with the rib. The fin forms a positive barrier against water infiltration under the threshold. Moreover the bottom rail of the fixed door and the inner wall of the threshold are provided with an integral weatherstrip, which may be formed of neoprene or like material, and which presses against the fin to form a water-tight seal.

In accordance with an important aspect of the present invention, the outer wall of the threshold is positioned inwardly of the inner surface of the bottom rail of the movable door so that a plenum chamber is provided between the lower inner surface of the movable door, the outer wall of the threshold, and an outer portion of the horizontal tread of the threshold which is effective to prevent venturi action effectively to minimize the ingress of water between the threshold and movable door.

To further aid the performance of the door in adverse weather conditions, a hole can be notched in the interlock of the doors at the ends of the plenum chamber to help in maintaining an equalized pressure within the plenum chamber and thereby further minimize the ingress of water into the chamber and over the threshold.

For a better understanding of the present invention reference may be had to the accompanying drawing wherein:

FIG. 1 is an elevational view of a sliding door assembly according to the present invention;

FIG. 2 is a fragmentary sectional view of the sliding door assembly of FIG. 1, drawn to a larger scale, and taken along the line 2—2 of FIG. 1; and

FIG. 3 is a fragmentary sectional view of the sliding door assembly of FIG. 1, drawn to the same scale as FIG. 2, and taken along line 3—3 of FIG. 1.

Referring now to the drawing, there is provided a sliding door assembly **10** according to the present invention. The door assembly **10** includes a frame **12**, a movable

door 14, and a fixed door 16. The sliding door assembly 12 is adapted for installation in the outer wall of a structure, such as a building, with the movable door 14 horizontally slidable exteriorly of the fixed door from its illustrated closed position, to an open position (not shown) juxtaposed the fixed door 16. It will be understood that in a particular sliding door assembly, as required by the installation, more than one fixed door, or more than one movable door may be employed. Advantageously the sliding closure assembly according to the present invention is formed of metal structural components. In the illustrated preferred embodiment, the structural components of the sliding door assembly are of aluminum extrusion.

To form the frame 12 of the sliding door assembly 10, there is provided a head member 18, a sill member 19, and spaced vertical frame stiles 20 and 21 interconnecting the respective ends of the head member 18 and the sill member 19.

In order to provide a suitable means for retaining the fixed door 16 and the movable door 14 within the opening of the frame 12, at least the head member 18 is provided with spaced, parallel, longitudinally extending inner peripheral recesses adapted to retain the upper edge or top rail of the respective doors 14 and 16. Additionally the sill member 19 is provided with suitable track means 25; and inwardly therefrom formed integrally with sill member 19 is provided a short upstanding rib 26 longitudinally of the sill member 19. Inwardly of the rib 26 formed integrally with the sill member 19 is a relatively high upstanding fin 27. The rib 26 and fin 27 cooperate to align and weatherseal both the fixed door 16 and a generally U-shaped inverted threshold 28, FIG. 2, which is positioned between the fixed door 16 and one frame stile 20.

The doors 14 and 16 are formed of a top rail 29, 30 respectively, and bottom door rail 31, 32 respectively, and respective pairs of door stiles 33, 34 and 35, 36. The rails and stiles of the doors 14 and 16 are provided with peripheral recesses which form a continuous inner groove for receiving a respective panel 38 and 39, here illustrated as a glass panel, which may be of any suitable composition.

It will be understood that the bottom rail 31 of the movable door 14 is provided with suitable roller means 40, FIG. 2, which rest on the track means 25 to provide for sliding movement of the movable door 14.

For the aligning and sealing of the bottom rail 32 of the fixed door 16 with the door frame 12, the lower outer edge of the bottom rail 32 is provided with a groove 42 interfitted over the rib 26 and the inner lower surface of the bottom rail 32 is positioned adjacent the relatively high upstanding fin 27. The fixed door 16 may be secured in place by a plurality of metal screws 43 which pass through the fin 27 into the bottom rail 32.

In order to form a weatherseal between the movable door 14, and to provide a step across the sill member 19, there is provided the threshold 28 which is positioned between the fixed door 16 and vertical stile 20. The threshold 28 is of generally inverted U-shaped cross section having a first leg forming an inner wall 44 and a second leg forming an outer wall 45. The outer wall 45 is provided in its lower edge with a groove 46 interfitted over the rib 26 to provide for positioning and weathersealing of the threshold and for aligning the threshold with the fixed door 16. Additionally the inner leg 44 is in close proximity to the relatively high upstanding fin 27 to provide for weathersealing and positioning of the threshold. An integral weatherstrip 47, which may be of neoprene, presses against the fin 27 between both the fixed door 16 and the threshold 28 to further weatherstrip the door closure assembly 10.

To prevent the ingress of water between the threshold 28 and the movable door 14, the threshold is provided



with a bight or tread means 49 and having a portion 49*a* extending forwardly of the outer leg 45. Weatherstrip means 50, here shown as a neoprene gasket, but which may be of mohair, is carried by the forwardly extending portion 49*a* in a groove 51 in the outer edge thereof for forming a seal with the lower inner portion of the door 14. The forwardly extending portion 49*a* of the tread 49, the outer leg 45, and the lower inner portion of the movable door 14 form a plenum chamber 52 above the sill 19 which is relatively large and which is effective to minimize the ingress of water.

In operation, if air is sucked around the weatherstrip 50 it tends to reduce the pressure in the chamber area 52, causing surges of air under the edge of the interior wall of the sliding door 14. As the surges enter the chamber, they are reduced in velocity and tend to equalize the pressure in the chamber with the exterior. This reduced pressure allows any accumulated water in the chamber 52 to drain out of the chamber, aiding further in equalizing surges of air. It was found that an increase in performance of the door occurs where a neoprene weatherstrip 50 is used in place of mohair. The use of a neoprene weatherstrip 50 substantially reduces the flow of air over the threshold 28. Since air is no longer being sucked rapidly out of the chamber 52, fewer surges of air are needed to equalize the pressure.

It will be seen that according to the present invention there has been provided a sliding door assembly with an improved sill and interdependent components which weatherseal the door assembly in an effective manner. In view of the detailed description, the operation of the new and improved sliding door assembly is believed clear. However, briefly, assuming first that the weatherstrip 50 between the threshold 28 and the movable door 14 is permeable, so that a solid air seal is not provided, air being sucked through such a mohair type weatherseal tends to reduce the pressure in the chamber between the threshold 28 and the movable door 14, causing surges of air under the lower edge of the movable door. As these surges enter the chamber, they are reduced in velocity and tend to equalize the pressure within the chamber to that at the exterior of the door assembly. This reduced pressure allows any accumulated water to drain out of the chamber, aiding further equalizing surges of air. There is no chance for surges of air to increase the pressure in the chamber because of its large area; no venturi action will occur within the chamber. It has been found that the performance of the door to weathersealing can be further enhanced by the use of a non-permeable weatherstrip 50, such as the one made of neoprene. A non-permeable weatherstrip substantially reduces the flow of air between the threshold 28 and the movable door 14. Since air can no longer be sucked out of the chamber 52, few surges of air are needed to equalize the pressure within the chamber to that on the outside. This reduces the turbulence in the chamber and further enhances the discharge of water from the chamber.

Additionally the weathering which heretofore in prior structures has been experienced at the lower end of the fixed bottom rail 32 is minimized by the present construction. As will be understood, water running down the vertical door elements will accumulate under the theshold and under the fixed bottom rail and will be sucked to the interior thereof by vacuum conditions if not weathered properly. The relatively high upstanding fin 27 behind the threshold 28 and the fixed door 16 forms a positive barrier against water infiltration. In order for water to infiltrate to this path, the pressure differential must be sufficient to suck the water up over the relatively high fin. Moreover the integral neoprene weatherstrip 47 which is used on the fixed bottom rail 32 of the door 16 and on the threshold 28 presses aginast the fin 27 to form a water tight seal. This arrangement has the advantage of increasing performance, of eliminating the

requirement for sealants, and substantially reducing installation costs.

Advantageously the present structure aligns the fixed panel **16** and threshold **28** in a new and improved manner, not only to the use of the upstanding rib **26** fitted within the respective grooves **42** and **46** in the fixed panel **16** and threshold **28** but additionally by its utilization of the relatively high upstanding fin **27** which is of substantial height approximately equal to that of the height of the threshold **28**. Thus the rib **26** and fin **27** cooperate to properly align the elements.

Although the present invention has been described by reference only to a single embodiment thereof, it will be apparent that numerous other modifications and embodiments will be devised by those skilled in the art which will fall within the true spirit and scope of the invention.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

**1.** A sliding door assembly adapted for installation in an outer wall of a structure and comprising a frame forming an opening and including a head member and a sill member interconnected by spaced vertical stiles; track means provided in said sill member; a high upwardly extending fin and an outwardly spaced short rib, said fin and said rib being formed integrally with and longitudinally of said sill member and positioned inwardly of said track means; a fixed door in said opening adjacent one of said stiles having its lower end positioned against the outer surface of said fin; a generally U-shaped inverted threshold between said fixed door and the other of said stiles having a first leg positioned against the outer surface of said fin and having a second leg terminating in a groove, said rib being received in said groove, an upper bight portion of said threshold interconnecting said legs and forming tread means, said tread means extending outwardly beyond said second leg; groove means formed adjacent the outer edge of said tread means for carrying weatherstrip means; a movable door positioned in said opening on said track means for sliding movement exteriorly of said fixed door between an open and closed position; weatherstrip means in said groove means sealingly engagable with the lower inner surface of said last mentioned door when said door is in a closed position; said outer wall, the outer portion of said tread means, and the lower inner surface of said last mentioned door defining a chamber above said sill member effective to prevent suction of water past said weatherstrip means; and sealing means between said fin and said first leg.

**2.** A sliding door assembly as set forth in claim **1** above wherein said upstanding fin is relatively high of approximately the same height as said threshold to provide a barrier against water infiltration under said threshold and under said fixed door.

**3.** A sliding door assembly as set forth in claim **2** above and additionally including integral weatherstrip means between said fin and the vertical inner surface of said fixed closure panel and said threshold.



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