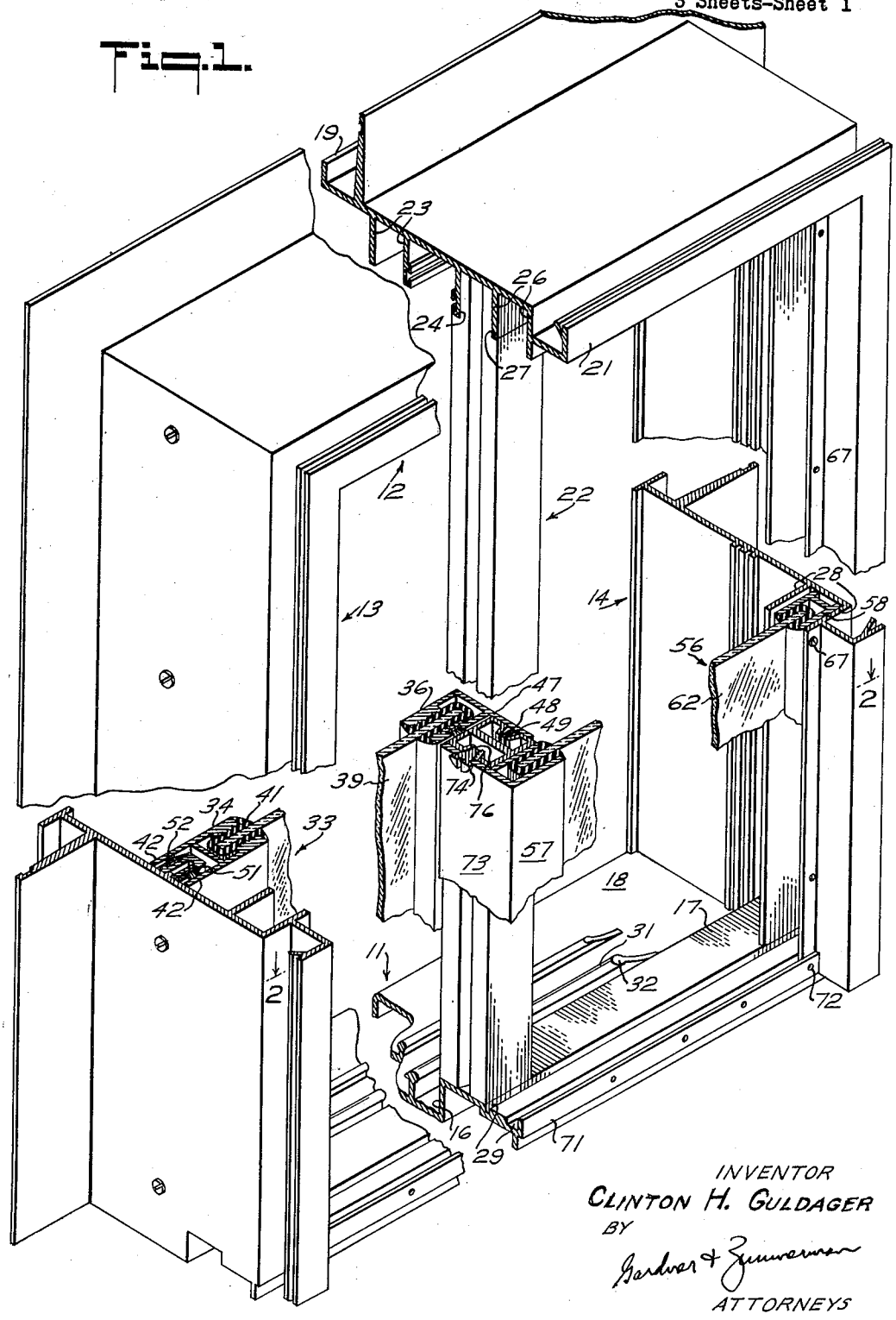
Oct. 15, 1963 C. H. GULDAGER 3,106,753

DEFORMATION RESISTING SLIDING CLOSURE ASSEMBLY

Filed July 11, 1960 3 Sheets-Sheet 1

Fig. 1.



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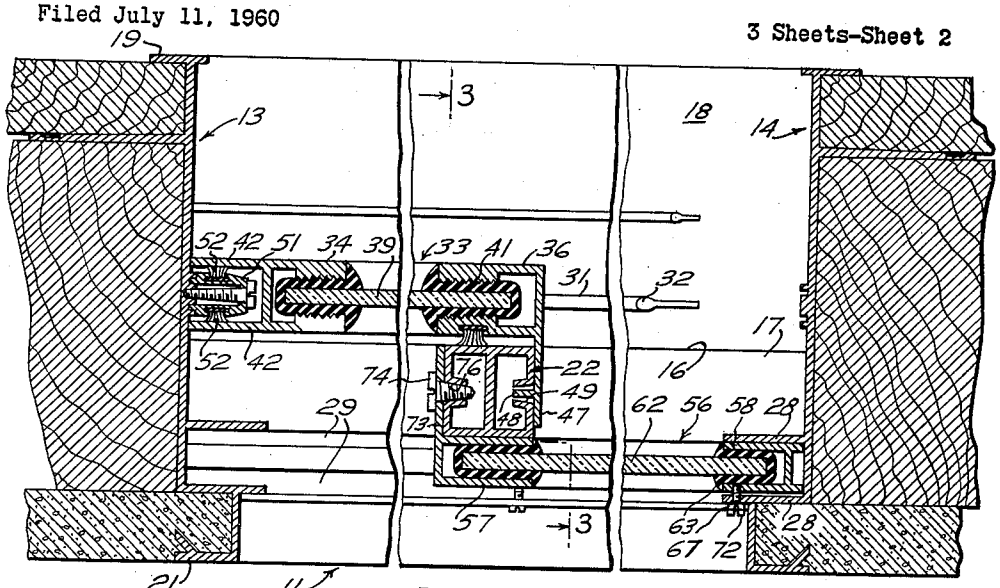


Fig. 2.

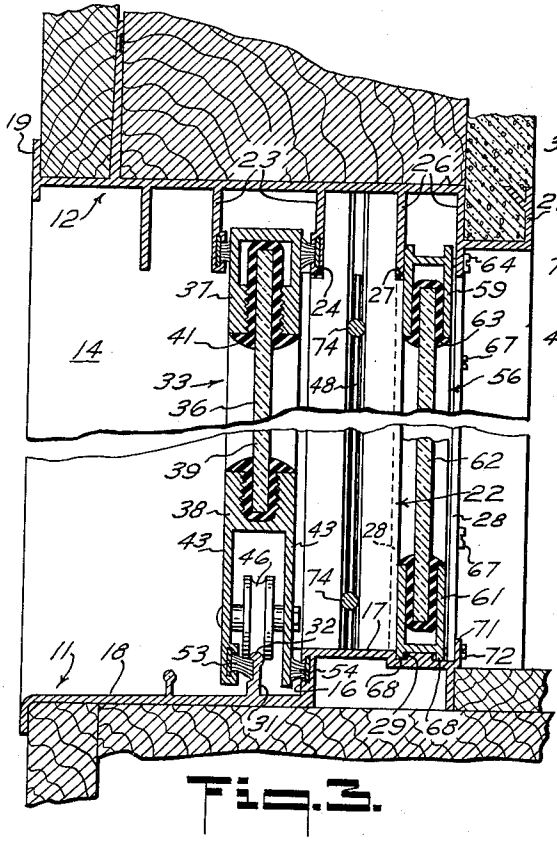


Fig. 3.

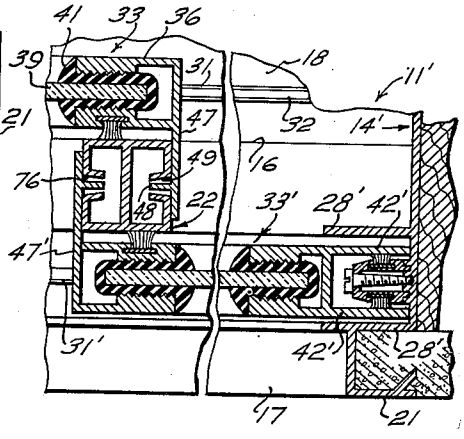


Fig. 4.

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Filed July 11, 1960 3 Sheets-Sheet 3

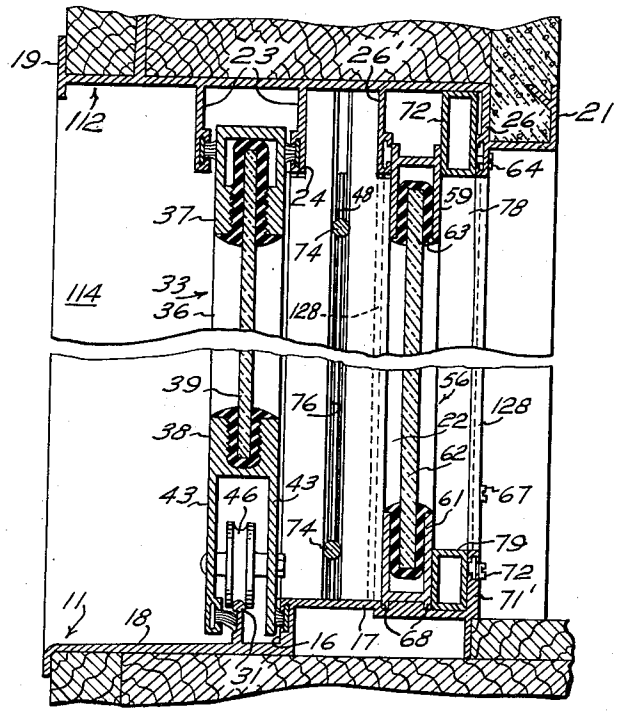


Fig. 5.

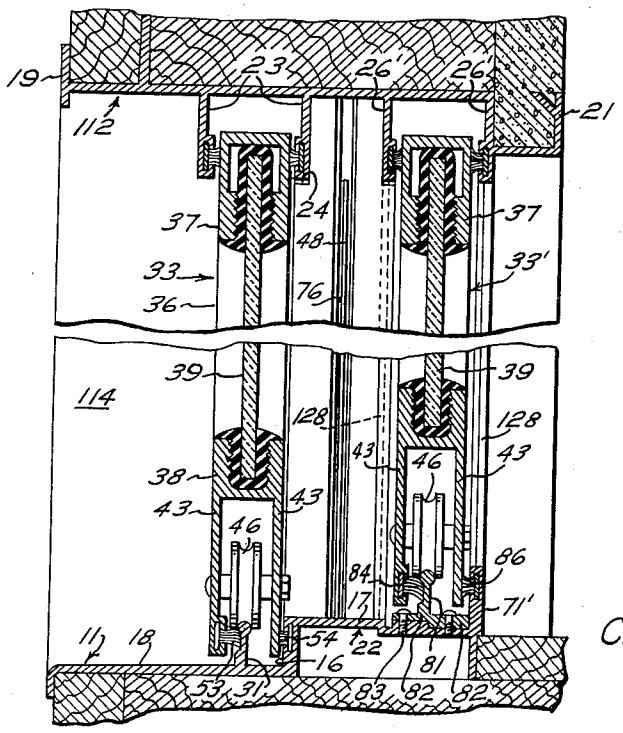


Fig. 6.

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DEFORMATION RESISTING SLIDING CLOSURE ASSEMBLY

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Filed July 11, 1960, Ser. No. 42,163
1 Claim. (Cl. 20—19)

The present invention relates to sliding closures for use in architectural structures and more particularly to pre-fabricated door and window assemblies of the class having a frame mounting a plurality of closure panels.

In the construction of buildings it is a common practice to make use of pre-assembled door or window frames of a type mounting a number of closure panels, generally formed of glass, at least one of which panels may be slidable in the horizontal direction. Pre-formed assemblies of this type are economically made, readily installed and present an attractive appearance in keeping with modern architectural design concepts.

In a sliding closure assembly of the usual proportions, a considerable span is present between the upright jamb members of the frame. Owing to the span between the upright load bearing members, the head member of the frame has heretofore exhibited a tendency to sag and thus interfere with proper functioning of the closure in several respects.

Sagging of the head member may interfere with the sliding movement of a panel and in extreme cases may prevent opening and closing thereof. Such deformation may accelerate wear and may result in the leakage of air and moisture around the closure.

A particularly disadvantageous result of sagging of the head member is that the removal and replacement of panels may be made difficult. This effect is particularly noticeable in closures of the type mounting a fixed panel together with a sliding panel, in which closures replacement of the fixed panel may occasionally be required due to glass breakage. Generally the fixed panel is fitted into the frame with fairly close tolerances and even a minor deformation of the frame may cause severe difficulty in the removing and mounting of the panels.

To prevent the foregoing effects, it will be found highly advantageous to provide an upright load bearing member at an intermediate position between the jamb members of the frame. In the usual case of a frame mounting two closure panels, the load bearing member should preferably be situated midway between the jambs to provide maximum support of the head.

Heretofore, insofar as I am aware, no commercially practical sliding closure assembly has been available with an intermediate upright load bearing member as a permanent and unitary member of the frame. A common practice, where center support is desired, has been to mount at least one fixed panel in the frame and to rely on structural elements of this panel to provide support for the intermediate portion of the head. Thus a typical conventional closure assembly mounts a sliding panel together with a fixed panel and the latter is provided with a stile midway between the jambs which offers some support to the head.

It should be noted that the central upright member in these prior constructions is basically a component of the panel rather than being a permanent and integral element of the frame. Thus when the panel is removed, for replacement for example, the head member of the frame is left without support at the center and the above described deleterious sagging may occur. Thus the conventional constructions do not provide a satisfactory and

fully reliable means for forestalling deformation of the head and such constructions will be found subject to the difficulties hereinbefore discussed.

The present invention provides for a prefabricated unitary sliding closure assembly having an intermediate upright load bearing member which is a permanent element of the frame rather than of a panel. Accordingly, the member supports the head irrespective of the presence or absence of the panels and thus sagging cannot occur. As a further advantageous feature of the invention, the intermediate support member is uniquely situated in the frame so that the inventive concept is equally useful for assemblies mounting a fixed panel together with a sliding panel, assemblies mounting two sliding panels, and assemblies which are convertible between the foregoing two forms.

Notwithstanding the additional support provided to the head, components of the invention are arranged so that a minimum area at the center of the frame is occupied by opaque structural elements. A still further feature of the invention is a novel means for weathersealing the juncture between the bottom of a sliding panel and the threshold of the assembly.

Accordingly it is an object of this invention to provide an extremely strong, rigid and deformation resisting sliding closure assembly for installation in buildings.

It is another object of this invention to provide a sliding closure assembly mounting a plurality of closure panels in a frame and having constantly operative provision for preventing sagging of the head member of the frame.

It is another object of the invention to provide a prefabricated sliding door construction including a frame having a central upright load bearing member, which construction is applicable to closures mounting a pair of adjacent sliding panels, closures mounting a sliding panel together with a fixed panel, and closures which are convertible between the foregoing two forms.

It is still another object of the invention to provide a sliding closure assembly having an intermediate upright load bearing member as an element of the frame thereof which assembly requires only a minimum area of the frame to be occupied by opaque structural elements.

It is a further object of the invention to provide an improved weather-sealing means for the threshold of a frame mounting a sliding closure panel.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of the preferred form of the invention which is illustrated in the drawing accompanying and forming part of the specification. It is to be understood, however, that variations in the showing made by the said drawing and description may be adopted within the scope of the invention as set forth in the claim.

FIGURE 1 is a broken-out perspective view showing a sliding closure assembly for installation in the door opening of a building, the assembly being of the type mounting a single sliding panel together with a fixed panel.

FIGURE 2 is a fore-shortened plan section view taken along line 2—2 of FIGURE 1.

FIGURE 3 is an elevation section view taken along staggered line 3—3 of FIGURE 2 and showing further details of the construction.

FIGURE 4 is a partial plan section view showing the adaptation of the invention to a closure assembly of the type mounting a pair of sliding closure panels.

FIGURE 5 is elevation section view, corresponding to FIGURE 3, showing a modification of the invention which may be converted from the mounting of a sliding

panel together with a fixed panel to the mounting of a pair of sliding panels and showing the structure in the former arrangement, and

FIGURE 6 is a view showing the structure of FIGURE 5 converted to the mounting of a pair of sliding panels.

Referring now to the drawing and more particularly to FIGURES 1 to 3 in conjunction, there is shown a rectangular frame having as elements a sill member **11**, head member **12** and a pair of upright jambs **13** and **14** which extend between corresponding ends of the sill and head.

To provide a vertical step **16** for facilitating weather-sealing, the inward portion **17** of sill **11** is elevated with respect to the outer portion **18** thereof and to engage the outer surface of a building, the extreme outer edge of the sill is turned downwardly. Similarly, the head **12** and jambs **13** and **14** are provided with angled formations **19** and **21** along the outer and inner edges respectively to provide for installation of the frame in a building.

Considering now an aspect of the invention, through which any tendency of the head **12** to sag is resisted at all times, an upright linear support member **22** extends between the sill **11** and head **12** at a position midway between the jambs **13** and **14** and in parallel relationship therewith. The support member **22**, which is preferably of hollow rectangular cross section, is positioned with the outer surface of the member flush with step **16** on sill **11**. The extremities of the support member **22** are secured to sill **11** and head **12** primarily independent of any other parts so that the support constitutes a permanent and unitary load bearing element of the frame. If, as in the present instance, the frame elements are aluminum extrusions, the ends of support **22** may be welded to the sill **11** and head **12** although it should be understood that other materials and other methods of attachment may be employed.

To provide for an advantageous arrangement of closure panels in the frame, as will hereinafter be described in more detail, the support **22** is formed to have substantially less thickness in a direction perpendicular to the frame than the sill **11** and other components of the frame. Thus an unobstructed region is provided within the frame on both the outer and the inner sides of the support **22** in each of which spaces a panel may be mounted.

Considering now means for receiving the panels in the frame, a first pair of spaced apart parallel downwardly depending flanges **23** are disposed along the underside of head **12**, the innermost of the flanges being received in a rabbet **24** formed in the forward face of the upper end of support member **22**. A second pair of spaced apart parallel downwardly depending flanges **26** are disposed along head **12** at the inner side of the support **22**, the outermost of this pair of flanges being received in a rabbet **27** formed in the upper end of the inner face of support **22**. The flanges **23** and **26** thus form two parallel channels along the underside of head **12**, one outward from support **22** and the other inward therefrom, for receiving the upper edges of closure panels.

Additional means for receiving the innermost panel are a pair of spaced apart parallel flanges **28** which extend along jamb **14** to continue the channel of head flanges **26** downward along the jamb and a pair of spaced apart parallel grooves **29** formed along the upper surface of sill **11** inwardly in the frame from support **22**. Inasmuch as the outermost of the two panels mounted in the frame is to be slidable, an upstanding linear track slat **31** is disposed along the upper surface of sill **11** outwardly from support **22** and in a centered position beneath the head flanges **23**. A cylindrical bead **32** is formed along the upper edge of the track **31**.

A sliding closure panel **33** as here shown is comprised of a sash frame formed of spaced apart vertical channel members **34** and **36** connected at the top and bottom ends by horizontal channels **37** and **38** respectively. Each of the component channel members of the sash is open at the side facing the center of the sash to receive the edges of a rectangular glass pane **39** and a packing of resilient sealing material **41**. The vertical channel **34** which is closest to the jamb **13** is provided with a pair of spaced apart flanges **42** extending towards the jamb. Similarly, a pair of spaced apart parallel downwardly directed flanges **43** are provided along the underside of the bottom channel **38** of the sash.

The sliding closure panel **33** is mounted in the frame with the upper edge of the panel entered between flanges **23** on the head, a linear strip of weathersealing material **44** being disposed along the facing surfaces of each such flange to bear against the edge of the panel. To support the panel **33**, a plurality of sheave wheels **46** are rotatably mounted between the bottom flanges **43** of the panel, the wheels having a circumferential groove riding on the bead **32** of track **31**.

Thus the panel **33** is slidable into abutment with jamb **13** to close the door and is slidable away therefrom to the open position. To accommodate the center support member **22** of the frame without causing an increased area of the closure to be occupied by opaque structural elements, the panel **33** is formed to have a width slightly in excess of the spacing between jamb **13** and support **22**. Thus, in the closed position, the channel **36** of the panel frame is contiguous with the support **22**.

To further support the sliding panel **33** when in the closed position, a linear flange **47** is formed along channel **36** of the panel which flange projects at right angles to the panel in the direction of the support **22**. A smaller sub-flange **48** is disposed along the flange **47**, at right angles thereto, and enters into a slot **49** formed along the side surface of the support **22** when the panel is slid to the closed position.

Provision for weatherstripping the sliding panel **33** includes a linear rib **51** disposed along jamb **13** and carrying a linear strip of resilient weather-sealing material **52** along the inner and outer sides. Rib **51** is centered with respect to the side flanges **42** of the panel **33** so that the flanges are received one on each side of the rib when the panel is moved to the closed position.

A highly advantageous means for weather-sealing the bottom of the sliding closure panel includes a first strip of resilient sealing material **53** secured along the inner surface of the outermost flange **43** at the bottom of the panel which strip bears against the outer surface of track **31**. A second strip of sealing material **54** is secured along the vertical surface of the step **16** on sill **11** and bears against the innermost of the panel bottom flanges **43**. The foregoing structure provides a double barrier to the movement of air or water under the sliding panel **33** and, in conjunction with the step **16**, effectively seals the threshold of the assembly.

Considering now the fixed panel **56**, such panel includes a rectangular sash frame having upright channels **57** and **58** connected at the top and bottom by channels **59** and **61** respectively, each such channel having an open face to receive an edge of a rectangular glass pane **62** and packing material **63**. The top channel **59** extends upwardly between head flanges **26** and is secured therein by transverse fasteners **64**. The pair of parallel spaced apart flanges **28** disposed along the jamb receive the side channel **58** of the panel and threaded fasteners **67** are transpierced through the innermost flange to bear against the channel. A pair of short parallel flanges **68** are formed along the lower surface of the bottom panel channel **61** and enter the matching grooves **29** formed along the top surface of sill **11**. An upwardly projecting flange **71** is provided along the inner edge of sill **11** through which flange threaded fasteners **72** are transpierced to bear against channel **61** and thus to secure the lower edge of the panel **56** within grooves **29**.

As hereinbefore discussed with reference to the sliding panel, the fixed panel 56 is of sufficient width to extend from jamb 14 to the far side of the center support member 22 so that the side channel 57 of the panel overlies the support and a minimum area of opaque structural elements is present within the frame.

Fixed panel 56 is attached to the center support 22 by means of a linear flange 73 which is disposed along the edge of channel 57 and projects at right angles therefrom to lie against the side of the support 22 which faces jamb 13. Self tapping screws 74 are transpierced through the flange 73 and engaged in a longitudinal groove 76 in the support 22 to secure the adjacent end of the panel 56 thereto.

It should be noted that the above described attachment of the panel 56 to the frame center support 22, specifically by means of the screws 74, is a disengageable one. Thus the panel 56 may be removed and replaced without disturbing the support 22 and thus without removing the support offered to head 12 by such member. Accordingly, no sagging of the head 12 can occur at any time.

Referring now to FIGURE 4, the application of the invention to a sliding closure assembly mounting a pair of sliding panels is illustrated, elements of this embodiment of the invention being substantially similar to those of FIGURES 1 to 3 except as will be described.

In this embodiment the fixed panel is replaced with a second sliding panel 33' similar to that hereinbefore described except that the flange 47' and the flanges 42' are disposed along reversed vertical edges of the panel to provide for the reversed placement of the second panel relative to that of the first panel 33. Modifications to the frame include the disposition of a second track 31' along sill 11' inwardly from support member 22 and an appropriately wider spacing of flanges 26' on the head and flanges 28' on the jamb 14'. To provide for the foregoing modifications, the members of the frame comprising sill 11', head 12' and jambs 13' and 14' are formed to provide a greater spacing between the inner face of support 22 and the inner face of the frame.

Thus the invention provides for the mounting of a pair of sliding panels while still providing full permanent support for the head member.

The invention can, in fact, be applied to an assembly which is inter-convertible between the mounting of a sliding panel together with a fixed panel and the mounting of a pair of sliding panels thereby permitting a single unit to be manufactured for use in either form and permitting an installed unit to be readily modified as the user desires. Referring now to FIGURES 5 and 6 there is shown a third embodiment of the invention adapted for conversion as discussed above. Except as will be hereinafter described, elements of such embodiment are substantially similar to the corresponding elements of FIGURES 1 to 3 as previously described.

Referring initially to FIGURE 5 in particular, the assembly is shown in a first condition in which a fixed panel 56 is mounted therein. The frame structure is similar to that of FIGURES 1 to 3 except that the spacing of flanges 26' on head 112, flanges 128 on jamb 114, and the spacing of sill flange 71' from support member 22 is increased and the excess space between such flanges, specifically the space not occupied by the edges of fixed panel 56, is filled by linear spacers 77, 78 and 79 respectively. The spacers 77, 78 and 79 may be of rectangular cross-section and the panel fasteners 64, 67 and 72 respectively bear against the spacers to hold the panel edges in position.

Referring now to FIGURE 6, the assembly of FIGURE 5 is shown converted to the mounting of two sliding panels. The outer sliding panel 33 and inner sliding panel 33' are similar to those hereinbefore described with reference to the embodiments of FIGURES 1 to 3 and FIGURE 4 respectively. To provide for the mounting of the addittional sliding panel 33', the spacers 77, 78 and 79 of FIGURE 5 are removed from the frame and an upright linear track 81, formed with base flanges 82, is secured along the upper surface of sill 111 inwardly from support member 22 by means of screws 83 which transpierce the base flanges 82 and engage in the sill.

As in the embodiment of FIGURES 1 to 3, advantageous weather sealing of the threshold of the assembly beneath the sliding panel 33' may be provided by a pair of linear weather strips 84 and 86. Strip 84 is disposed along the outer bottom flange 43 of the panel 33' and bears against the adjacent surface of track 81 and strip 86 is disposed along the step formed by sill flange 71' and bears against the innermost of the panels flanges 43.

What is claimed is:

A sliding closure assembly comprising a sill, a head member spaced above said sill in parallel relationship thereto, a pair of parallel spaced jambs connecting the ends of said sill and said head member to form a rectangular frame therewith, a linear support member extending between said sill and said head member at an intermediate position between said jambs and secured to said sill and head member to form a unitary element of said frame, said support member being of less thickness than said sill and said head member in a direction normal to said frame and being disposed at an intermediate position in said frame with respect to said direction normal to said frame, first retentive guide means depending from said head member and extending longitudinally thereon and parallel therewith, said first means being disposed on one side of said support member with respect to said direction normal to said frame, second longitudinal retentive guide means depending from said head member on the opposed side of said support member and parallel with said first means, a first rectangular closure panel mounted in said frame and disposed on said one side of said support member, said first panel engaging said first guide means for securing the upper portion of said panel from transverse movement in said frame, said panel including a stile member adapted for positioning adjacent said one side of said support member, said stile member having a first flange extending inwardly of said frame in said direction normal thereto and adapted to abut against said support member in sealing realtionship therewith, a second rectangular closure panel mounted in said frame and disposed on said other side of said support member, said second panel engaging said second guide means for securance against transverse movement and including a second stile member adapted for positioning adjacent said other side of said support member, said second stile member having a flange extending inwardly of said frame in a direction opposite to that of said first flange and adapted to abut against said support member in sealing relationship therewith, and at least one of said closure panels being travelable along said sill.

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