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Frank

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[54] **CLOSURE ARRANGEMENT FOR A WINDOW OR DOOR OPENING EMPLOYING A SLIDABLE AND TILTABLE PANEL**

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[52] **U.S. Cl.** **49/153,** 49/149, 49/176
[51] **Int. Cl.** **E05d 15/52**
[58] **Field of Search** 49/155, 157, 154, 49/161, 176, 153, 152, 168, 187, 254, 260, 261, 149

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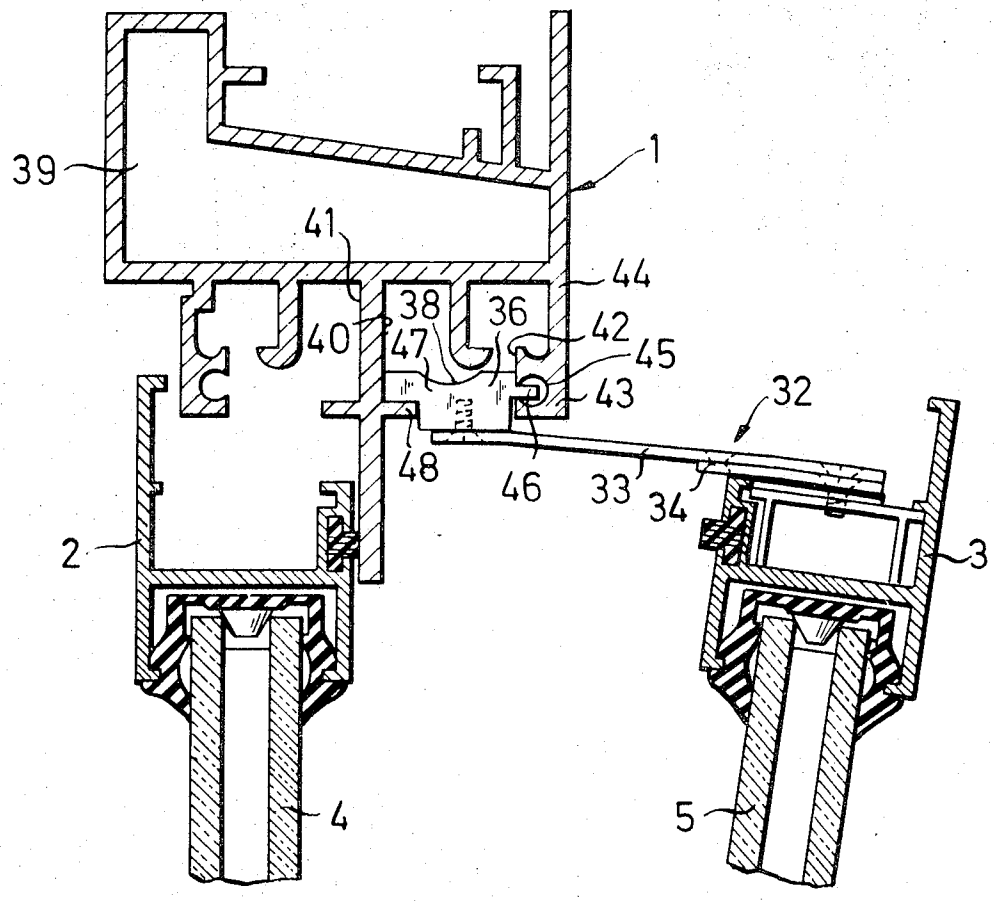
Primary Examiner—Dennis L. Taylor
Attorney—Kurt Kelman et al.

[57] **ABSTRACT**

The opening in a window casing assembled from four lengths of extruded aluminium channel is provided with two sliding sashes having frames of extruded aluminum. The lower horizontal frame member of one sash rides on wheels whose rim matches the semicylindrical top face of a guide rail on the lower horizontal casing member so that the sash may be pivoted about the axis of curvature of the guide rail face. Tilting of the sash is limited by brackets, each bracket including a slide guided along the upper casing member and a link pivotally connecting the slide to the top of the sash. When the sash is locked in the plane of the casing, sealing strips on the sash cooperate with sealing surfaces on the casing above the pivot axis while the engaged sealing strip is kept straight by abutting engagement of respective abutment faces on the lower casing member and the sash below the pivot axis.

9 Claims, 5 Drawing Figures



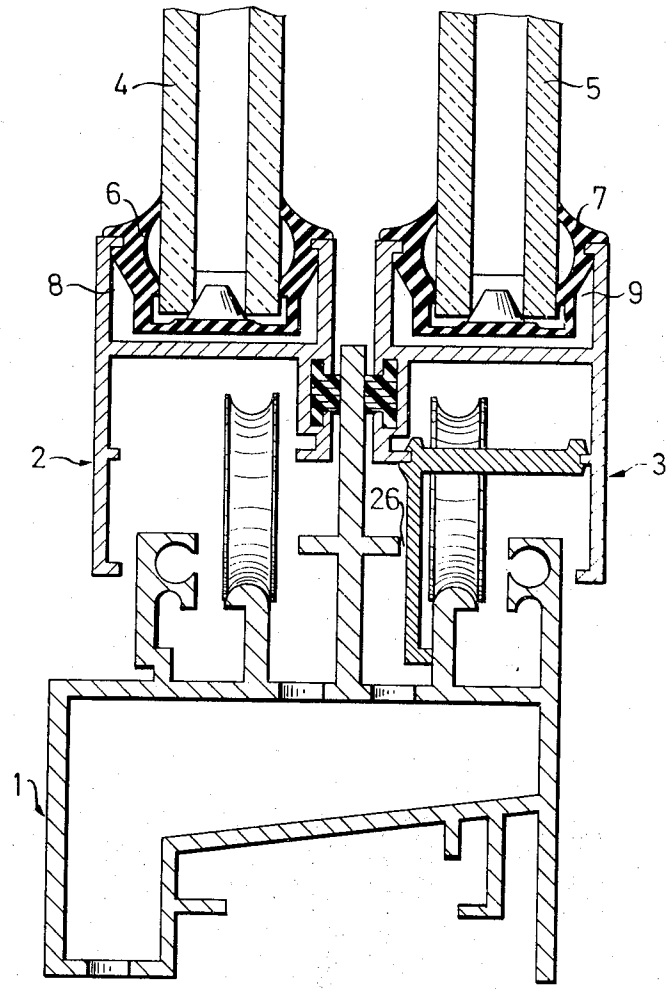


Fig. 1

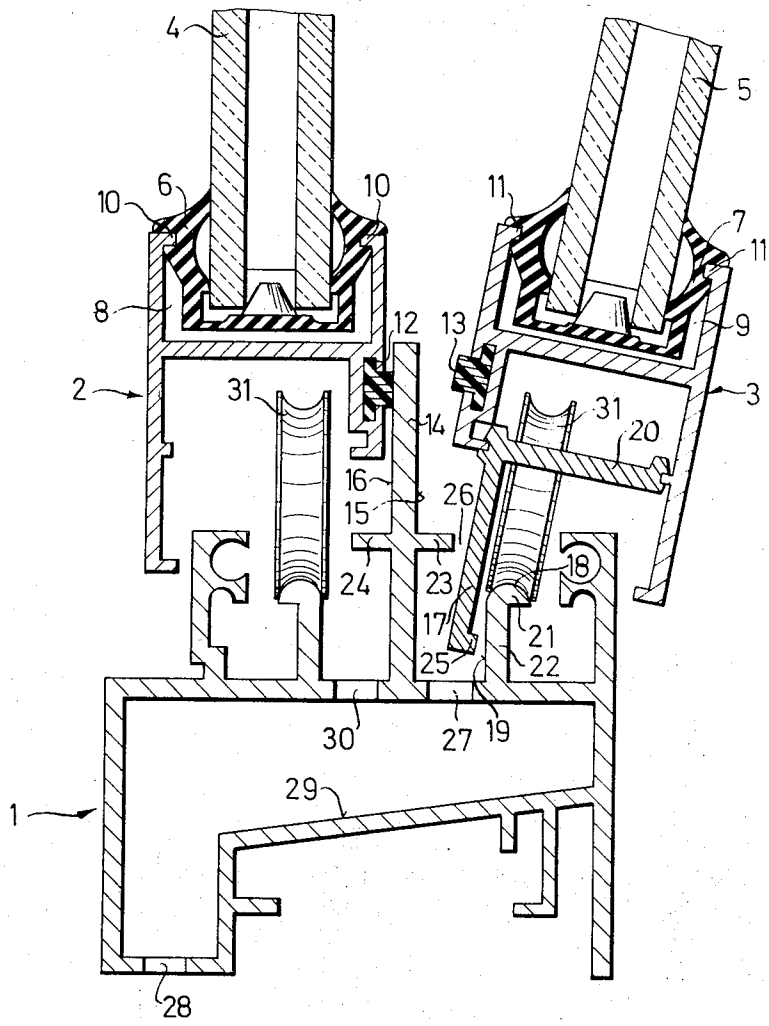

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Fig. 2

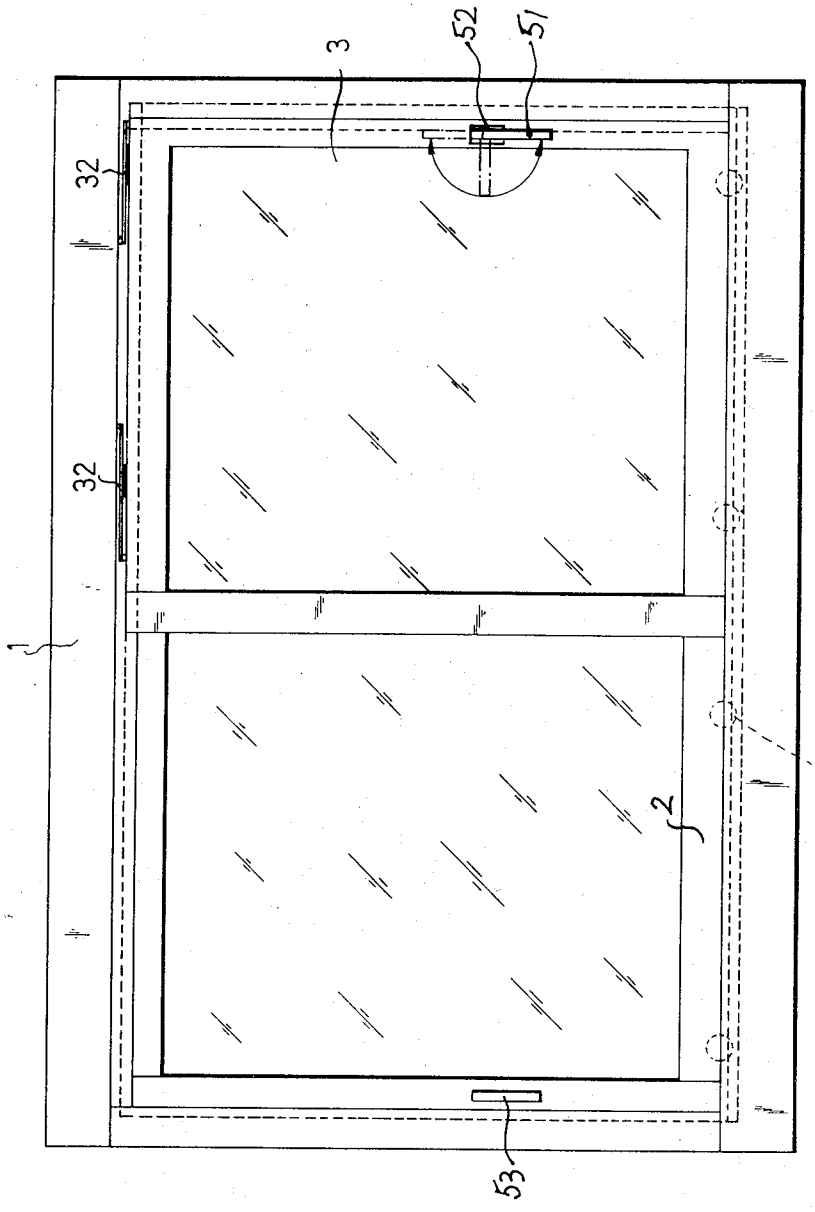

Fig. 3

Fig. 4

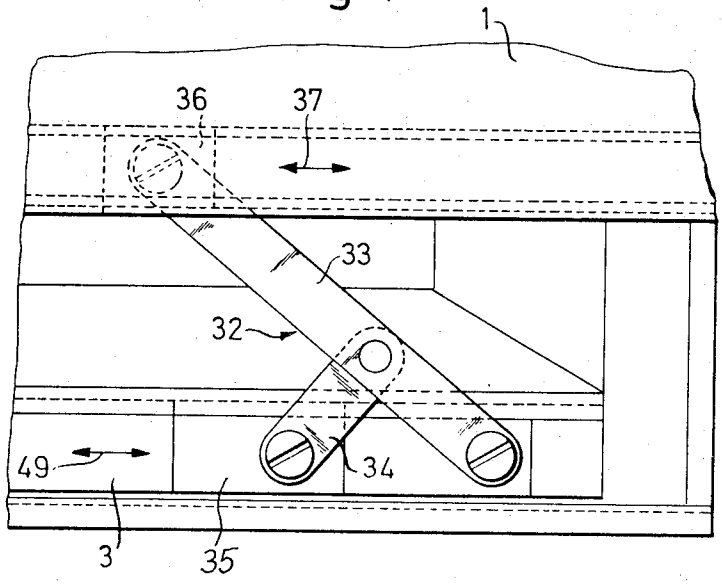
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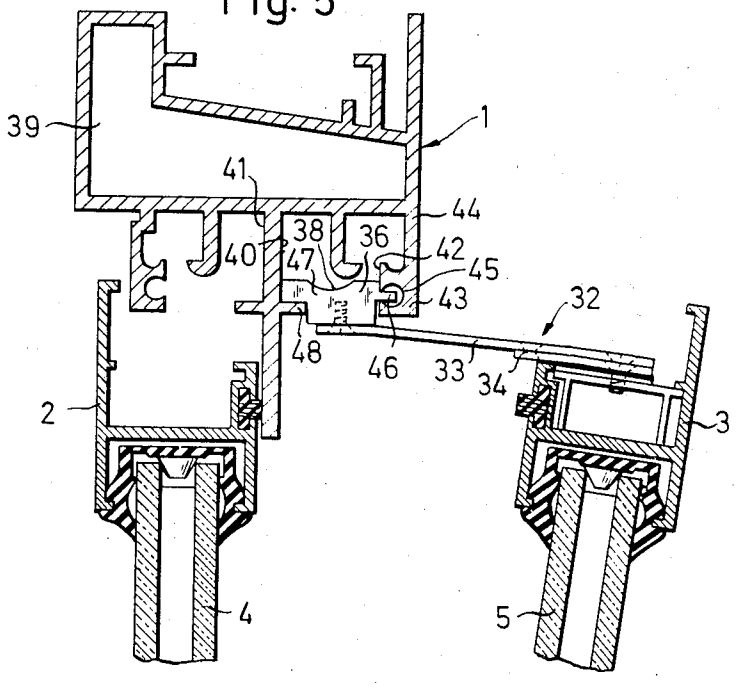
Fig. 5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CLOSURE ARRANGEMENT FOR A WINDOW OR DOOR OPENING EMPLOYING A SLIDABLE AND TILTABLE PANEL

This invention relates to closure arrangements for a door and window opening, and particularly to an arrangement in which a window sash or a door leaf, jointly referred to hereinbelow as panels, may slide in the plane of a casing bounding the opening, or may be tilted out of that plane.

The invention will be described with specific reference to a window having a slidable and tiltable sash, but it is equally applicable to sliding doors which may be tilted out of the plane of the door frame or casing for providing ventilation without loss of privacy.

It was difficult heretofore to provide an adequately airtight and durable seal between a sliding and tilting sash and the casing of a window, particularly if the tilting movement of the sash was limited to a relatively small angle. Mechanical labyrinth seals, convenient and effective in windows whose sashes perform only a sliding motion, are not applicable where the sash must also pivot about an axis extending in the direction of sliding movement. It was therefore customary firmly to compress a resilient gasket or sealing member between the locked sash and the window casing, and even sealing materials specifically developed for the purpose had but a relatively short service life under the prevailing conditions. Moreover, when the window was moved along the casing without being tilted, frictional wear of the sealing material further contributed to early failure of the seal. Even when the window was tilted prior to being shifted along the casing, the resilient sealing member was often still in contact with a cooperating hard sealing surface and subjected to wear.

In windows of great horizontal length, some warping or sagging of the frame elements is practically unavoidable, and it was attempted to compensate for the resulting poor fit of the sash in the casing by increasing the dimensions of the sealing members, thereby further contributing to high compressive stresses in the sealing member and to wear under the conditions outlined above.

A primary object of this invention is the provision of a closure arrangement for a window or door frame employing a slidable and tiltable panel in which sealing members are stressed uniformly and relatively lightly and do not significantly impede the sliding motion of the panel even when the panel is located in the plane of the casing.

With this object and others in view, the closure arrangement of the invention includes a casing which bounds a window or door opening and has upper and lower casing members elongated in a common, normally horizontal direction. A panel member has upper and lower edge portions respectively adjacent the two casing members, and its lower edge portion is operatively connected to the lower casing member for movement about a pivot axis adjacent the lower casing member and resulting in movement of the upper edge portion toward and away from the upper casing member. Such movement is limited by a bracket device. A first guide on the lower casing member guides the lower edge portion of the panel longitudinally of the casing member. The distance over which the panel is guided is at least equal to one third of the horizontal panel dimension under practical conditions. A second guide on the upper casing member similarly guides the bracket device so that the panel may be shifted either in the closed or the tilted position. The structure described so far is partly known.

According to the invention, cooperating sealing members are arranged on the lower edge portion of the panel and on the lower casing member. They are offset from the pivot axis of the panel toward the upper casing member or the upper edge portion of the panel, at least one of the sealing members being of resilient material, and both being elongated in a normally horizontal direction. The seal is made more effective while being protected against rapid deterioration by cooperating abutment members on the afore-mentioned lower edge portion and lower casing member which are offset from the afore-mentioned pivot axis in a direction away from the respective sealing members. When the panel is locked in a position in which its upper edge portion is closely adjacent the upper casing member, the sealing members and the abutment members engage each other.

Additional features and many of the attendant advantages of this invention will readily be appreciated as the invention becomes better understood from the following detailed description of a preferred embodiment when considered in connection with the appended drawing in which:

FIG. 1 shows a window of the invention in fragmentary side-elevational section;

FIG. 2 illustrates the device of FIG. 1 in a different operating position;

FIG. 3 is a front elevational view of the same window in yet another operating position;

FIG. 4 is a fragmentary top plan view of a portion of the window in a position corresponding to that of FIG. 2; and

FIG. 5 is a side-elevational section of another portion of the window in the condition illustrated in FIGS. 2 and 4.

Referring now to the drawing in detail, and initially to FIG. 3, there is seen a horizontally elongated, rectangular casing 1 which bounds a window opening. The illustrated opening is obstructed by two glazed sash frames 2, 3 which may slide on wheels 31 in the plane of the casing 1. As will presently be described in greater detail, the frame 3 may be tilted about its lower horizontal edge portion when the handle 51 of a locking mechanism, not otherwise shown and conventional in itself, is moved on a pivot 52 from the position shown in fully drawn lines to the position shown in broken lines, as indicated by an arcuate double arrow. The handle is also conveniently employed for shifting the frame 3 on its wheels 31, and a handle 53 is provided on the sash frame 2 for the same purpose. Two brackets 32 limit the tilting movement of the frame 3.

FIGS. 1 and 2 show the lower edge portions of the two sash frames 2, 3 and the adjacent lower horizontal member of the casing 1 in fragmentary side-elevational section. The two sash frames 2, 3 are substantially identical and arranged in such a manner that they are mirror images of each other in the view of FIG. 1. Elements on the sash frame 2 have been omitted from the drawing in order not to crowd the same, and it will be understood that the following, more detailed description of the sash frame 3 is equally applicable to the frame 2 and associated elements except as specifically stated otherwise.

The central openings in the sash frames 2, 3 are closed by double layers of glass 4, 5, the panes of each double layer being spaced apart to provide an insulating air chamber, as is conventional. Plastic channels 6, 7 seal the panes 4, 5 to the frames 2, 3 in respective grooves 8, 9 of the latter, the channels being anchored in the frames by narrow flanges 10, 11 entering conforming grooves in the plastic material. The two sash frames 2, 3 are each assembled from four lengths of extruded aluminum alloy of uniform, approximately H-shaped cross section over substantially their entire length. Resilient packing strips 12, 13, also extending over the full length of each frame member project from conforming, elongated recesses in the lower flanges of the two H-shapes which face each other and serve as sealing members in the operating condition illustrated in FIG. 1.

The casing 1 also is assembled from four lengths of extruded aluminum alloy. The extrudate is a tube of approximately L-shaped cross section from which flanges project inward of the window opening, or upward as viewed in FIGS. 1 and 2, and in the opposite direction for fastening the casing 1 to a surrounding wall in a manner not directly relevant to this invention and not further to be described.

The vertically widest flange 14 which projects from the lower casing member shown in FIGS. 1 and 2 has opposite vertical sealing faces 15, 16 which engage both sealing members 12, 13 in the sash position of FIG. 1, and the sealing member 12 in the position of FIG. 2 in which the sash frame 3 is tilted away from the frame 2 about a pivot axis well below the sealing members 12, 13.

Ribs on the sash frame 3 engage grooves on the web portion 20 of an extruded, L-shaped aluminum rail 25 whose flange portion 17 provides an extension strip for the flange of the sash frame 3 in which the sealing member 13 is anchored. A corresponding rail has been omitted from the showing of the sash frame 2. The free rim portion of the flange 17 is offset at right angles to present an abutment face to a cooperating, analogous side face portion 19 on a flange 22 of the casing 1 which is vertically narrower than the flange 14 and has an enlarged free edge portion 21 whose face 18 is of semicylindrical shape about an axis of curvature at right angles to the plane of FIGS. 1 or 2.

A transverse rib 23 projects from the flange 14 toward the flange portion 17 of the rail 25, and another rib 24 projects toward the non-illustrated counterpart of the rail 25 on the sash frame 2. The gap 26 between the rib 23 and the flange portion 17 narrows so as almost to disappear in the upright position of the sash frame 3 seen in FIG. 1. The ribs 23, 24 thus provide some protection against excessive compression of the sealing elements 12, 13.

Water deposited on the glass panes 4, 5 or other portions of the two sashes by condensation or otherwise may enter the tubular portion of the illustrated lower casing member through openings 27, 30 and is deflected by an obliquely inclined wall 29 of the tube to the downwardly directed, short leg of its L-shape, normally located outside the building wall, and released from openings 28 in the bottom wall of the shorter leg.

The wheels 31, shown also in FIG. 3, are rotatably mounted on the flange portion 17 of each rail 25 and pass through openings, not explicitly shown, in the web portion 20. The rim of each wheel has a circumferential groove which conforms to the semi-cylindrical shape of the top face 18 on the flange 22. The enlarged edge 21 of the flange thus provides a guide rail on which the sash frame 3 may slide along the casing 1, and the sash frame 2 similarly is guided on its wheels 31. Additionally, the sash frame 3 may pivot about the axis of curvature of the face 18, but such pivoting movement is not normally contemplated for the sash frame 2.

Joint consideration of FIGS. 1 and 2 shows that pivoting movement of the sash frame 3 toward the sash frame 2, and the resulting compression of the sealing member 13 between the lower edge portion of the sash frame 3 and the flange 14, is limited by abutting engagement of the flange portion 17 with the abutment face portion 19 of the guide flange 22 well below the pivot axis of the sash frame 3. Additionally, any sagging or warping of the lower edge portion of the panel including the sash frame 3 is rectified by the abutting engagement of the flanges 17, 22, and proper alignment of the lower edge portion of the sash panel and the lower casing member is maintained over the full horizontal length of the panel. The pressure to which the sealing element 13 is subjected is therefore uniform as long as the cross section of the sealing member is uniform over its length, a condition met without any difficulty. It is not necessary to increase the cross section of the sealing member beyond the minimum required for closing the gap between the sash frame 3 and the flange 14. The contact pressure may be very low, whereby the resistance of the sealing member 13 to sliding movement of the sash is minimal when the sash is in its upright position, and nil when the sash is tilted as in FIG. 2. The frictional wear of the sealing element is greatly retarded thereby.

One of the two brackets 32 shown in FIG. 3 is seen in greater detail in FIG. 4. A link 33 is hingedly fastened to the top edge portion of the sash frame 3 and to a slide 36, obscured in FIG. 4, which is guided along the horizontal upper member 39 of the casing 1 in the direction of the double arrow 37 which is parallel to the direction of sliding sash movement indicated by the double arrow 49. The slide 36 may move over the full distance over which the sash frame 3 may slide, this distance, under practical conditions, being at least equal to one third of the horizontal length of the sash frame 3. A short auxiliary link 34 connects the link 33 with a slide 35 movable a short distance along the top edge portion of the sash frame 3 while the latter is tilted toward and away from the casing 1.

The top edge portions of both sash frames 2, 3 and the upper horizontal member 39 of the casing 1 are better seen in FIG. 5. Being a longitudinal portion of the same extrudate as the lower casing member, the upper casing member 39 has a relatively wide, central, dependent flange 41 whose vertical face portion 40 provides a rigid sealing member cooperating with a resilient member on the sash frame 3 as described above. The face 40 also partly bounds guideway 38 for the slide 36. The main portion 47 of the slide 36 projects downward from a gap between a transverse rib 48 on the flange 41 and a corresponding rib 46 on the innermost depending flange 44 of the upper casing member 39. The slide 36 is additionally guided in a circularly arcuate groove 45 in the enlarged free edge portion 43 of the flange 44 and by a vertical face 42 of the edge portion 43. The link 33 is attached to the underside of the main portion 47.

It will be appreciated that the position of the sealing members and of the abutment members may be interchanged without losing all advantages of this invention, and the material of construction of the two pairs of structural features will determine their function. Thus, the members **12, 13** when made of metal will primarily have a straightening and aligning effect on the sash frame, while contributing some sealing effect, as the abutment elements **17, 19** do in the illustrated embodiment, and the abutment elements **17, 19** below the pivot axis of the sash **3** will predominantly act as sealing elements when at least one of them is made of relatively soft, and preferably elastomeric material. The arrangement specifically described, however, has been found more advantageous at this time because it requires less rigidity in the sash frames.

The slide **36** is preferably made of nylon or other plastic when the casing **1** is made of aluminum, but other combinations of materials may be selected to minimize friction between the slide **36** and the walls of the guideway **38.**

Other modifications and variations of the instant invention will readily suggest themselves to those skilled in the art on the basis of the above teachings. It should be understood, therefore, that within the scope of the appended claims, the invention may be practiced otherwise than as specifically disclosed.

What is claimed is:

1. A closure arrangement for a door or window opening comprising, in combination:

a. a casing bounding said opening and having an upper casing member and a lower casing member, said members being elongated in a common direction;

b. a panel member having upper and lower edge portions respectively adjacent said casing members;

c. pivot means operatively connecting said lower edge portion to said lower casing member for angular movement of said panel member about a pivot axis adjacent said lower casing member and for movement of said upper edge portion toward and away from said upper casing member;

d. bracket means limiting movement of said upper edge portion away from said upper casing member;

e. first guide means on said lower casing member guiding said lower edge portion in said common direction over a distance at least equal to one third of the dimension of said panel member in said direction;

f. second guide means guiding said bracket means on said upper casing member in said direction over said distance;

g. cooperating sealing members on said lower edge portion and on said lower casing member elongated in said direction and offset from said pivot axis toward said upper casing member and said upper edge portion respectively; and

h. cooperating abutment means on said lower edge portion and said lower casing member having respective abutment faces elongated in said common direction and offset from said pivot axis in a direction away from the respective sealing members,

1. said sealing members and abutment faces engaging each other when said upper edge portion is contiguously adjacent said upper casing member.

2. An arrangement as set forth in claim **1,** wherein the length of said abutment faces is substantially equal to the dimension of said panel member in said direction.

3. An arrangement as set forth in claim **2,** wherein said lower edge portion includes a strip element elongated in said direction and freely projecting toward said lower casing member, said strip element carrying the abutment face on said lower edge portion.

4. An arrangement as set forth in claim **3,** wherein said lower casing member includes a guide element elongated in said direction and freely projecting toward said lower edge portion, said guide element carrying said abutment face of the lower casing member and constituting a portion of said first guide means.

5. An arrangement as set forth in claim **4,** wherein said guide element has an exposed longitudinal edge of arcuate cross section about said pivot axis.

6. An arrangement as set forth in claim **5,** further comprising a plurality of wheels rotatably mounted on said lower edge portion, each wheel having a rim of arcuate cross section conformingly engaging said exposed longitudinal edge of said guide element, said edge and said rims jointly constituting said pivot means.

7. An arrangement as set forth in claim **1,** wherein said casing members and said edge portion are each of uniform cross section at least over said distance.

8. An arrangement as set forth in claim **1,** wherein said lower casing member includes a flange element elongated in said direction and freely projecting toward the upper casing member beyond said pivot axis, a portion of said flange element constituting the sealing member on said lower casing member.

9. An arrangement as set forth in claim **1,** wherein said bracket means include a slide member and a link pivotally connecting said slide member to said upper edge portion, said second guide means guiding said slide member in said direction.

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