Oct. 9, 1962 N. C. WALBERG 3,057,444

TUBULAR MULLION SNAPON ASSEMBLY

Filed Nov. 3, 1958 2 Sheets-Sheet 1

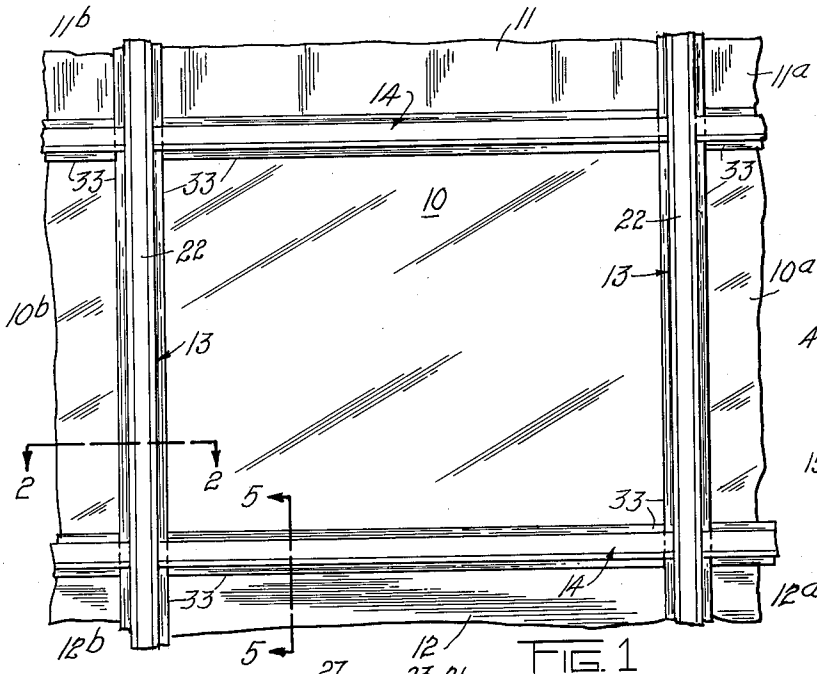


FIG. 1

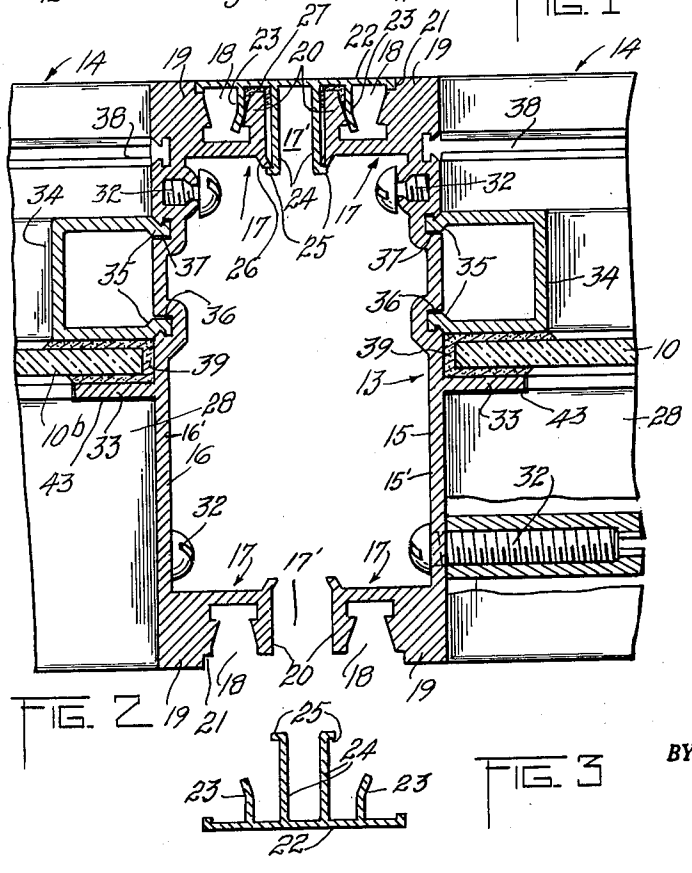


FIG. 2

FIG. 3

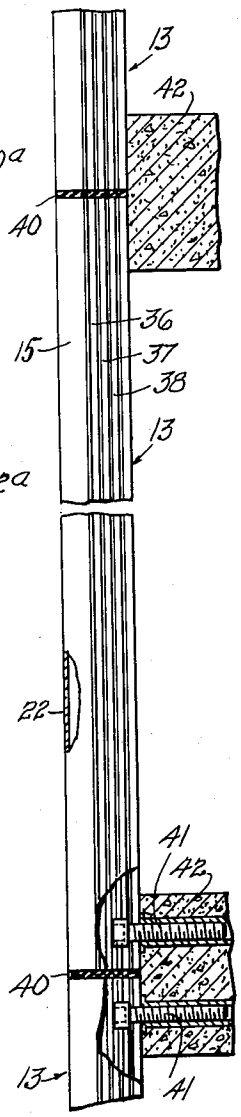


FIG. 4

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TUBULAR MULLION SNAPON ASSEMBLY

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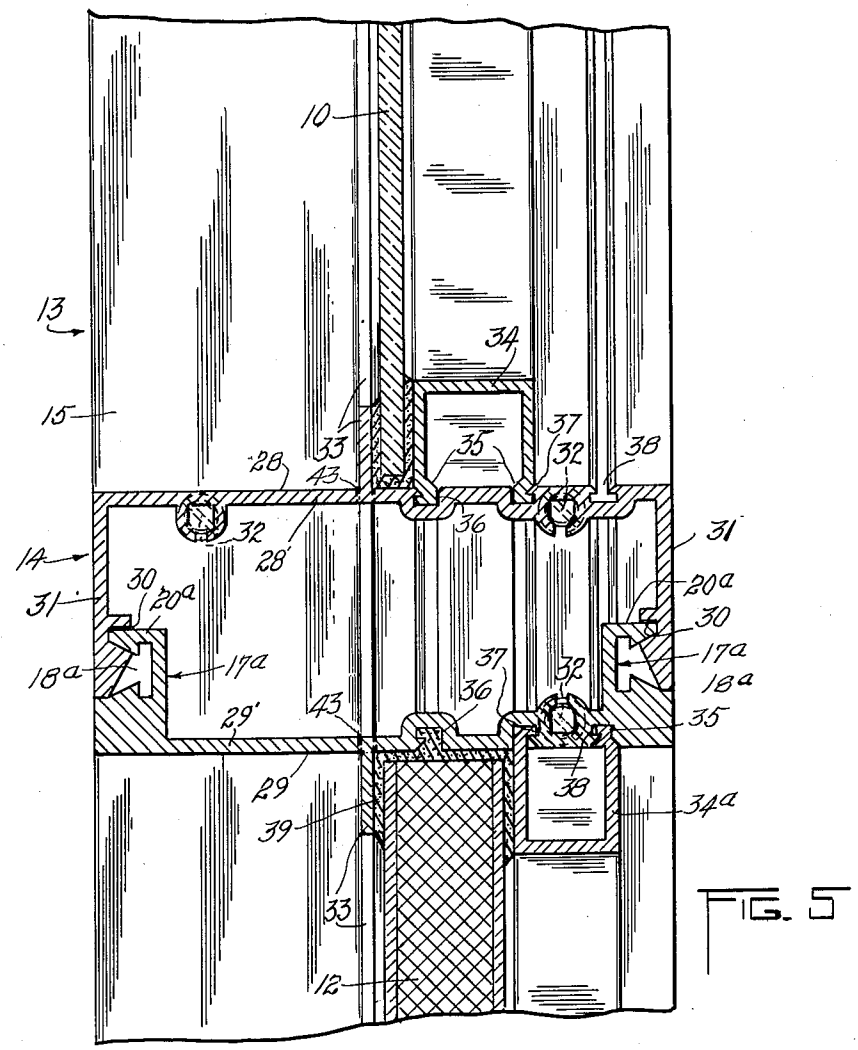


FIG. 5

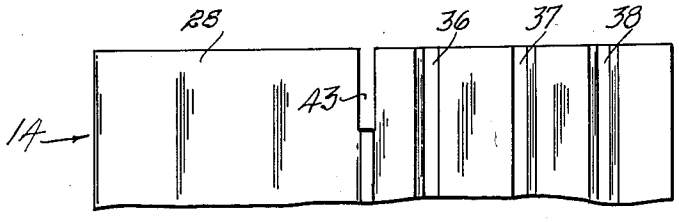


FIG. 6

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TUBULAR MULLION SNAPON ASSEMBLY

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4 Claims. (Cl. 189—34)

The present invention in its broad aspect relates to curtain walls, the skin-type of exterior building wall now gaining acceptance in practically all cities of the nation. More particularly the invention concerns the metal framing of the panels and windows of these curtain walls and has especial reference to a lock closure tubular mullion of extruded metal employed in such framing.

A main object of the invention is the provision of a tubular mullion rectangular in cross section and in which two channel members which are similar but of opposite hand, and forming two sides of the mullion, are held together without screws or like fastening devices, the holding means being two side plates which are snapped into place and with the flanges of the two channel members form the other two sides of the tubular structure. These snap in side plates and the first named side members of the mullion can be assembled on the job and to this end are formed with cooperating means for interlocking engagement, the novel construction and arrangement of the locking means being another and important object of the invention.

In most instances curtain walls are designed for multiple story buildings of concrete and steel construction. These walls are usually panelled and also provided with various types of panel windows all of which are held in place by metal framing which in the illustrated embodiment of the invention includes vertical and horizontal mullions.

The lock closure tubular mullion just above described is the vertical member in the framing and may vary in length according to its application and the design of the wall. The right and left side members, respectively, of two spaced vertical mullions frame opposite sides of the panels comprising a wall section and have connection with a plurality of horizontal mullions which separate the panels and/or windows at top and bottom, and it is another object of the invention to provide means whereby these connections may also be made on the job and without welding, or such sections may in like manner be factory assembled.

A still further object of the invention is to make provision in the framing for the accommodation of panels of various thickness, starting with the thickness of glass.

To these and other ends, as will become apparent from the following more detailed description, the invention consists of certain parts, combinations of parts and structural arrangements as will be fully set forth in the specification and more particularly defined in the appended claims.

The accompanying drawings illustrating a preferred embodiment of the invention and forming a part of the specification are as follows:

FIGURE 1 shows in front elevation a glass panel of curtain wall together with the mullions by which the glass is framed, fragmentary portions of adjacent panels with parts of their frame members also being shown.

FIGURE 2 is a section on line 2—2 of FIGURE 1 looking in the direction of the arrows but with one of the snap-in locking plates omitted.

FIGURE 3 is a section taken similarly to FIGURE 2 of the snap-in locking plate referred to as omitted from FIGURE 2.

FIGURE 4 is a detail showing in side elevation fragmentary portions of three aligned vertical mullions and anchoring means therefor as will be explained.

FIGURE 5 is a sectional view on line 5—5 of FIGURE 1 and looking in the direction of the arrows.

FIGURE 6 shows in plan view the portion at one end of a horizontal mullion.

FIGURES 2, 3, 5 and 6 are full scale drawings and FIGURE 4 is drawn to a larger scale than FIGURE 1.

In the drawings similar reference numerals refer to similar parts throughout the several views.

At 10 in FIGURE 1 there is seen in front elevation a glass panel of a curtain wall section, such section constituting a plurality of vertically arranged panels at least one of which may and probably would be a window, fragmentary portions of the panels immediately above and below panel 10 being shown at 11 and 12, respectively. The number of panels in a wall section between any two floors is variable and determined by the architectural design of the building wall. The wall sections are framed on the sides by vertical mullions indicated generally at 13, and the several panels forming a section are separated from each other and framed along their top and bottom edges by horizontal mullions indicated generally at 14 and which, in the manner to be explained, are rigidly connected to the vertical mullions 13.

Fragmentary portions of an adjoining wall section at the right of the one containing panel 10 includes panels 10^a, 11^a and 12^a which are similar to and horizontally aligned with the corresponding panels 10, 11 and 12. And, at the left of the intermediate wall section is a like section which includes the panels 10^b, 11^b, and 12^b in line with the others of corresponding numerals.

Each vertical mullion 13 is a rectangular tube in which two opposing sides, 15 at the right, see FIGURE 2, and 16 at the left, are channel members. These members 15 and 16 are metal extrusions, preferably aluminum, or aluminum alloy. They face each other and are of similar formation but of opposite hand. The channel members 15 and 16 have a U-shaped cross section and include webs 15′ and 16′, respectively, disposed transversely of spaced vertical edges of the panels 10 and 10^b respectively, see FIG. 2.

The webs 15′ and 16′ each include at the opposite marginal edges thereof inwardly extending side flanges 17, adjacent side flanges 17 of the respective channel members 15 and 16 forming a space 17′ therebetween. Side flanges 17 of the channel members 15 and 16 have longitudinal slots 18 in their outer faces. This formation makes the flanges 17 U-shape in cross section with side legs 19 and 20, the legs 19 constituting thickened portions along the outer side edges of the members 15 and 16. These leg portions 19 are recessed as seen at 21 in FIGURE 2, to provide seats for plates 22. The plates 22 span the slot openings 18 and the space between the opposing channel members 15 and 16 and with the relatively wide leg portions 19 of the flanges 17 become the other two sides of the mullion 13.

Straddling the outer legs 20 of the U-shaped flange 17 and integral with the plates 22 are flanges 23 having their free edges curved slightly outward to slidably engage inclined inner side faces of the legs 20 when the plates 22 are driven into place by a mallet or other suitable instrument. Thus the flanges 23 exert a force which tends to draw the members 15 and 16 toward each other and hold them firmly in place.

Also extending inwardly from each side plate 22 is an inner pair of flanges 24 having outwardly turned shoulders 25 along their free edges. These shoulders 25, when the plates 22 are being driven into place, bear against the outer side faces of the leg members 20. Along the inner edges of legs 20 are nose portions 26 having inclined surfaces which protrude from the legs proper in reverse direction to that of the shoulders 25 on the

flanges 24. There is a degree of resiliency in the flanges 24 which permits the shoulders 25 to ride over the inclined surfaces of the protrusions 26. This flexing of the flanges 24 is completed just as the plates 22 are seated whereupon the flanges snap back to their original state but with the shoulders 25 latched under the nose portions 26. Thus, while the outer flanges 23 function to hold the members 15 and 16 of the tubing against moving apart the inner flanges 24 become latches cooperating with the flanges 17 of such members to securely hold the side plates in their seated position.

This assembly of parts, it will be observed, can be done on the job when erecting a wall. As shown at the top of FIGURE 2 a sealing compound indicated at 27 may be used in the filling clearance spaces between the flanges 17 and plates 22.

Spacers separating the panels of a wall section are the horizontal mullions 14 which extend between and are connected to the right hand member 15 of the vertical mullion on one side and the left hand member 16 of the mullion 13 on the other side of the wall section. Like the vertical mullions 13 the horizontal ones 14 are rectangular tubes formed of two metal extrusions, viz., upper and lower channel members 28 and 29, respectively, with the lower member 29, in this instance identical with the members 15 and 16 of the tubes hereinabove described. The channel members 28 and 29 respectively include webs 28′ and 29′ which extend transversely of the spaced horizontal edges of the panels 10 and 12 as seen in FIG. 5. The tubes 14 are assembled by slidable engagement of one with the other, the leg portions 20^a of the U-shaped flanges 17^a of the member 29 being received in longitudinal slots 30 in the depending side flanges 31 of the member 28, while the outer portions of these flanges 31 are fitted to slidably engage the slots 18^a of the flanges 17^a. Thus, like the flanges 17 and plates 33 of the mullions 13, the flanges 17^a and 31 of the members 28 and 29 become opposite side walls of the horizontal mullions 14.

Assembly of the horizontal mullions 14 to half sections of the vertical mullions 13 permits this work to be done on the job.

The use of screws, seen at 32, as the means of connecting the parts at right angles to each other, eliminates the necessity of welding. The screws 32 are extended through holes drilled in the members 15 and 16 and threaded into portions integral with the members 28 and 28 of the horizontal mullions. The screws 32 are self tapping and the parts into which they are threaded are double flanges which curve toward each other to form in effect split tubes extending longitudinally of and on the inner faces of the members 28 and 29. A portion of the mullion 14 at the right in FIGURE 2 is broken away to show one of the screws 32 in its full extent. The screws 32 are fairly long and this is important as deflection is prevented from taking place between the screws and the metal engaged thereby and it permits the screws to act in shear only.

Like flanges 33 lying in the same vertical plane and comprising integral parts of the webs 15′ and 16′ of the members 15 and 16 of the vertical mullions 13 and webs 28′ and 29′ of the horizontal mullions 14, surrounding a panel provide a marginal frame against which the front of the panel is held by a like marginal frame formed of beads 34 for the panel 10 and 34^a for the panel 12, it being observed that panel 12 is of a material greater in thickness than the glass of panel 10. To accommodate panels differing in thickness the retaining beads are of different sizes. The preferred type of bead, as illustrated in the drawings, is U-shaped, the side legs being parallel and provided along their free edges with feet 35 which slidably engage in and have interlocking relation with undercut grooves in the outer faces of the parts 15, 16, 28 and 29 which frame a specific panel. There are a plurality of these grooves, in this instance three and numbered 36, 37 and 38. The grooves in which the beads are held are determined by the thickness of the panel. For instance, the beads 34 for the panel 10 engage the inner groove 36 and the intermediate one 37 while the beads for panel 12 are similarly slidably supported in the center groove 37 and the outer groove 38. At 39, FIGURE 5 is seen the usual protective sealing material interposed between the panels 10 and 12 and the marginal frames by which the panels are faced.

As a structural detail the opposing sides 28 and 29 of the horizontal mullions are notched at 43, see FIGURES 2, 5 and 6, to receive the flanges 33 of the vertical mullions 13 and thus provide a mortise and tenon joint in the framing.

As hereinabove stated the length of the vertical mullion is determined by the number and height of panels in a wall section. A typical application would call for vertical mullions extending the full height of a curtain wall. In such instance the mullions would be in sections as illustrated in FIGURE 4 with each section extending from one floor to the one next above it, the adjoining sections having an expansion joint 40 of a plastic substance interposed between them. The curtain wall is attached to the building frame in any preferred manner, the means shown in the drawings, FIGURE 4, being bolts 41 anchored in floor slabs 42 and which clamp the vertical mullions against such slabs, this fastening being done before placement of the outer face plate 22.

From the foregoing it will be understood that vertical tubular mullions formed of separate parts may be assembled on the job without welding or the use of screws; that tubular horizontal mullions may be secured by screws to the separated but opposing parts of the vertical mullions, this also being done on the job and the necessity of welding eliminated; that the framing will accommodate panels varying in thickness, and that the frame structure of a curtain wall embodying the invention will be of rigid construction while having sufficient flexibility to permit expansion and contraction of the metal due to changes in temperature.

I claim:

1. In a curtain wall including a plurality of rectangular panels framed by vertical and horizontal mullions, in combination, a pair of vertically disposed panels in substantially parallel relation and including spaced vertical edges, and a vertical mullion assembly extending transversely of said spaced vertical panel edges, said mullion assembly comprising a pair of opposed spaced channel elements having a substantially U-shaped cross section and including webs disposed transversely of said panel edges, said webs including an outwardly projecting lateral flange disposed parallel to and adjacent one side of said pair of panels for vertically orienting said panels, bead means removably mounted on said webs in spaced parallel relation from said lateral flanges for retaining and orienting said panels from the side opposite that at which said lateral flanges are disposed, said channel elements including substantially parallel side flanges at the marginal edges of said webs, said side flanges on the respective opposed channel elements terminating short of each other and defining a space therebetween, said side flanges having a substantially U-shaped cross section forming slots opening in a plane substantially parallel to said webs, adjacent side flanges of the respective channel elements including substantially parallel legs having inclined surface portions within said slots, said inclined surface portions extending angularly toward said webs, said side flanges including a nose portion spaced inwardly from said inclined surface portions, and connector plates including a portion overlying said side flange slots and straddling the space therebetween, said connector plates including a first pair of laterally projecting flanges diverging from each other and compressibly engaging said inclined leg surface portions and a second pair of laterally projecting flanges disposed between said first pair and

terminating therebeyond in laterally extending shoulder portions snapped beneath the nose portions of said side flanges, said adjacent side flanges of the respective channel elements and said connector plate portions being disposed substantially parallel to the plane of said rectangular panels.

2. The structure of claim 1 including a third vertically disposed panel disposed in substantially parallel relation beneath one of said first mentioned pair of panels and having spaced, parallel horizontal edges, a horizontal mullion assembly extending transversely between the horizontal edges of said last mentioned pair of panels, said horizontal mullion assembly terminally abutting the web of one of the channel elements of said vertical mullion assembly, and driven fastener means extending through the web of said one channel element and engaged in the terminal end of said horizontal mullion assembly.

3. The structure of claim 2 wherein said horizontal mullion assembly includes an intermediate terminal slot in alignment with and receiving the outwardly projecting flange of said one channel element.

4. The structure of claim 2 wherein said horizontal

mullion assembly comprises a pair of channel elements, one of said channel elements being identical to one of those of said vertical mullion assembly, the other channel element of said horizontal mullion assembly including a web disposed transversely of the horizontal edge of one of said last mentioned pair of panels, said other channel element web including side flanges terminating in an inwardly opening groove receiving the leg of said one channel element therein, said driven fastener means retaining said horizontal mullion assembly channel elements in assembled relation.

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