United States Patent

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[54] **INTERLOCKING MULLION CONSTRUCTION**
2 Claims, 5 Drawing Figs.

[52] U.S. Cl. **52/731,** 52/395, 52/588
[51] Int. Cl. **E04c 3/30**
[50] Field of Search 52/731, 730, 588, 580

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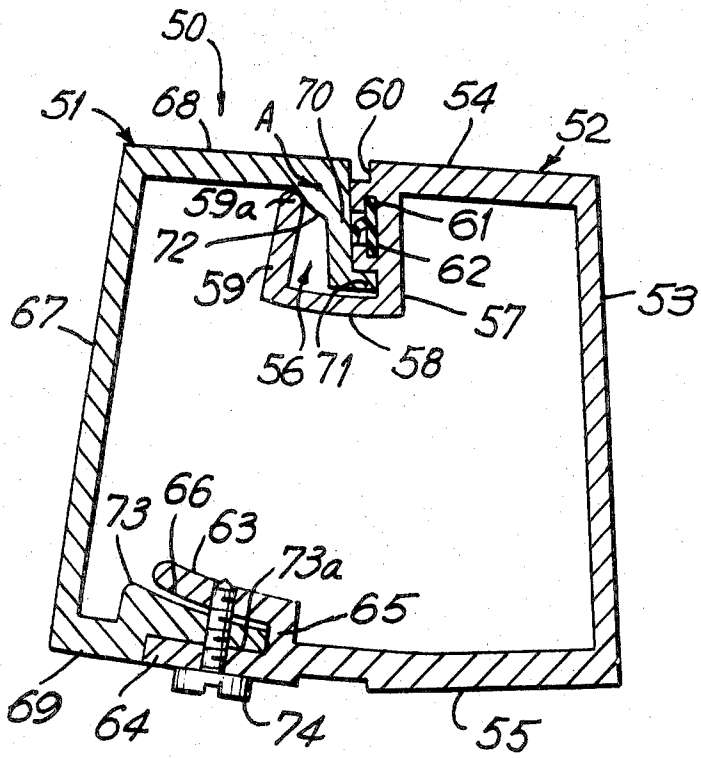
ABSTRACT: An interlocking mullion construction and curtain wall assembly incorporating the same, characterized by the provision of mullion half sections forming, respectively, the leading edge of one curtain wall preassembly, and the trailing edge of an adjacent curtain wall preassembly, the half sections being insertable into partial interlocking engagement by tilting of one section relative to the other section and sidewise relative movement of the sections to insert a trunnion member of one section into an open mouth bearing pocket of the other section, subsequent pivotal movement of the sections into coplanar alignment serving to interlock the two mullion half sections to prevent relative movement of the sections and to form a mullion assembly of a structural strength comparable to an integrally extruded hollow mullion.



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SHEET 1 OF 2

FIG. 1

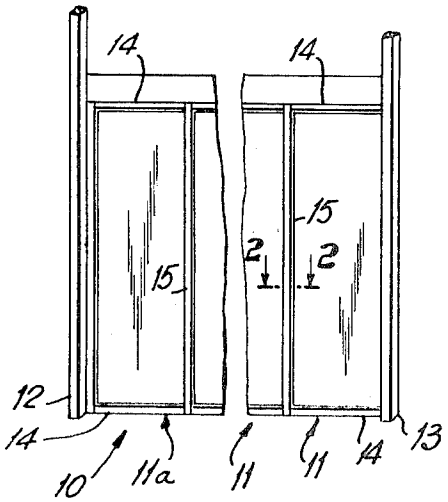
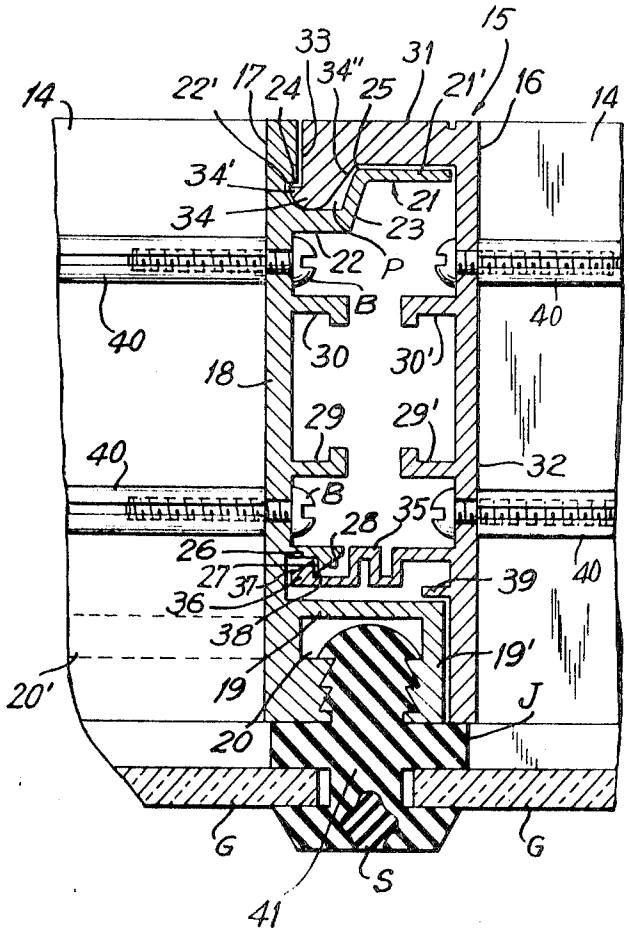


FIG. 2



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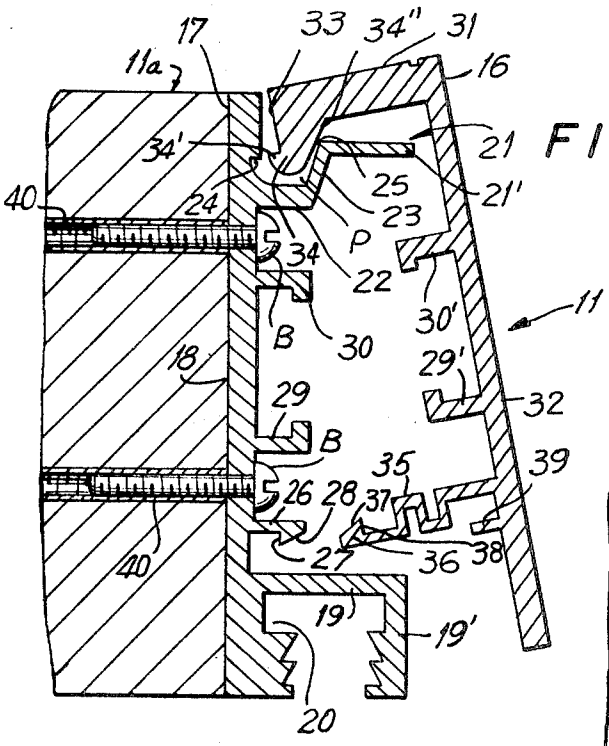

FIG. 3

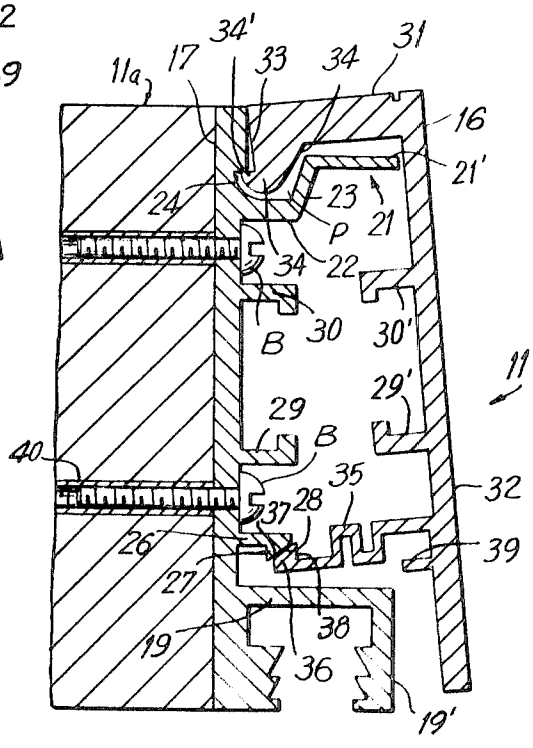

FIG. 4

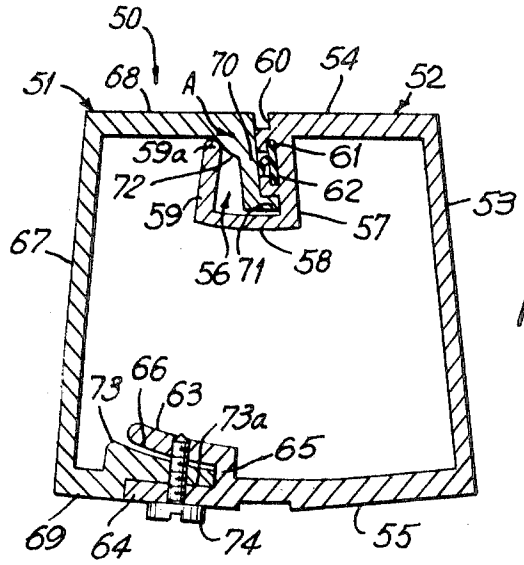

FIG. 5

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INTERLOCKING MULLION CONSTRUCTION

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention is in the field of curtain wall structures, such as are customarily employed in commercial buildings, such as office buildings, stores, hotels and the like.

2. The Prior Art

In the formation of curtain walls it is customary to employ as the mullion or vertical structure members of the wall, extruded aluminum shapes. Mullion structures heretofore employed in the construction of curtain walls fall into two general types, each of which has well appreciated advantages and disadvantages.

One type of curtain wall construction is comprised of a series of vertically spaced-apart, hollow, integral aluminum extrusions, bolted or otherwise secured to the framework of a building. At spaced intervals, horizontal transom bars or frame members are screwed between adjacent mullions, defining with the mullions rectangular pockets or frames within which selected barriers, such as glass panes, window frame assemblies, or opaque wall panels are mounted.

Mullion structures of the integral type have the advantage of being extremely strong and highly resistant to torsional and bending stresses, thereby providing a rigid and rugged curtain wall. However, integrally extruded mullions present significant drawbacks. Specifically, by reason of the integral nature of the construction, the mullion itself is unable to compensate for thermal expansion and contraction and it is necessary to provide for such movement in the interconnection between the horizontal transoms and the mullions, and also in the interconnection between the panels, panes or frames and the skeleton of the curtain wall.

A second disadvantage lies in the fact that, by reason of the difficulty of extruding integral hollow metallic shapes, such extrusions cost approximately 25 percent more than open shapes containing equal amounts of metal.

The most significant drawback in the use of integral mullions lies in the fact that the horizontal transoms must be attached to the mullions "in the field" and the panels mounted in the frames thus formed in the field. Such field assembly is notoriously more expensive than factory preassembly, and presents aesthetic drawbacks in that, since the horizontal components must be applied only after the mullions are fixed in position, the screws or other fastening elements employed in the assembly procedure are exposed to view and to the elements.

In an effort to avoid the disadvantages inherent in the use of integral mullions, the practice has developed of employing split mullion sections. Such split mullion sections have heretofore comprised open extrusion generally U-shaped in cross section, the extremities of the arms of one section being bifurcated to define sidewisely open slots or channels. The other mullion half is provided with arms which may be inserted sidewisely into the slots defined by the bifurcations, so as to interfit with the first mullion half.

Constructions of this sort circumvent certain of the disadvantages of the integral mullion unit but create other serious problems. For example, the split mullion unit permits complete curtain wall subsections to be assembled at the factory, such subsections comprising, for instance, a pair of mullion halves connected by horizontal transoms. It is possible, through the use of such subassemblies, to limit the assembly work on the job to inserting one preassembled section into an adjacent preassembled section by a simple sidewise movement of the sections, followed by the application of fastener means for holding the two sections in position. It will be appreciated that the thus assembled units inherently provide a degree of relative movement required for thermal expansion and contraction.

On the debit side of the ledger, however, split mullion constructions of the type described are significantly weaker than

integral mullions since each mullion half acts as an independent beam structure. In view of this weakness, known split mullion units require the introduction and fastening of steel bracing in the interior spaces between the mullion halves, unless the vertical spacing between adjacent horizontal transom strips is relatively small. The addition and installation of such bracing adds significantly to the weight and expense of the curtain wall assembly and, in large measure, negates the advantages of the use of split mullions. Obviously the requirement of closely spacing the horizontal transom strips limits the panel or glass size which may be accommodated, in addition to increasing the construction expenses.

Additionally, the installation of preassembled split mullion units of this type is complicated by the fact that sufficient space must be developed for the introduction into position of the last preassembled unit of any given row, where the units are installed between masonry piers. In order to install the last mullion unit adjacent an overlapping pier, it is necessary first to crowd the initially installed units in a direction away from the position at which the last unit will be installed. This crowding will provide sufficient space to enable the last unit to be installed in such manner that the flanges of such unit are disposed in opposition to the slots or bifurcations in the next to the last unit.

It will be appreciated that some fastening of the units to maintain them temporarily in position will be required since often considerable time elapses between installation of the first unit and the last unit of a row.

After the last unit is positioned, all of the remaining units must be unfastened and shifted slight increments toward the last unit a distance necessary to close the spacing between the units. It will be readily appreciated that the necessity for initially positioning and temporarily fastening the units, unfastening the temporary connections and subsequently repositioning and refastening the units not only increases the expense and difficulty of installation, but often results in a structure in which preassembled units of successive rows are slightly offset one from the other.

SUMMARY OF THE INVENTION

The present invention may be summarized as being directed to a split mullion structure which provides all of the structural advantages of the integrally extruded mullion, principally strength, without any of the disadvantages, as noted above, which inhere in the use of split mullion constructions heretofore known.

More particularly, the present invention relates to a split mullion construction comprising a pair of mullion half sections, one of which sections includes a longitudinally directed bearing pocket having a lengthwise extending, laterally open mount portion. The other mullion half section comprises a trunnion member, preferably eccentric in cross section, which is insertable sidewise into the elongated pocket of the other mullion section when the two mullion halves (which may include associated horizontal transoms, etc.) are disposed in an angular position one with respect to the other.

The mullions and their subassemblies may then be pivoted, with the trunnion of the second section disposed within the bearing portion of the first section, such relative pivotal movement resulting in an interengagement of the mullion parts of a nature which renders the parts united in a manner providing structural strength comparable to an integrally extruded mullion.

Since the mullion, after all, is a split mullion, it is inherently capable of compensating for thermal expansion and contraction.

In view of the strength of the unit, steel bracing required in split mullion units heretofore known may be dispensed with.

Factory preassembled subsections are, of course, permitted, since it is not required that the mullion section be fastened to the building before the horizontal transoms are secured (as is the case with integral mullions).

Assembly of successive preassembled sections does not require the involved positioning and repositioning demanded by split mullion units heretofore known, since the last section may be sidewisely inserted while angled with respect to the adjacent section and thereafter pivoted into position. Thus, the problem of providing clearance for positioning the last section is overcome.

Accordingly, it is an object of the invention to provide an improved mullion assembly and curtain wall construction employing the same.

A further object of the invention is the provision of an improved split mullion assembly having strength and rigidity comparable to integral, extruded mullions.

A further object of the invention is the provision of a mullion construction of the type described adapted to be preassembled into curtain wall subsections, which subsections can be readily interlocked to other subsections on the job.

Still a further object of the invention is the provision of a mullion assembly of the type described which permits of connection between adjacent curtain wall units by an initial sidewise insertion when the units are angularly related, and a subsequent pivotal movement, whereby the requirement for providing clearance for insertion of the last mullion unit in a given row is obviated.

Still a further object of the invention is the provision of an improved curtain wall comprising a series of preassembled sections interconnected by a simple operation on the job site.

To attain these objects and such further objects as may appear herein or be hereinafter pointed out, reference is made to the accompanying drawings, forming a part hereof, in which:

FIG. 1 is a fragmentary perspective view of a curtain wall assembly in accordance with the invention;

FIG. 2 is a magnified section taken on line 2—2 of FIG. 1, showing details of a mullion structure in accordance with the invention in assembled condition;

FIGS. 3 and 4 are views of the mullion structure of FIG. 2 in progressive degrees of assembly;

FIG. 5 is a horizontal, cross-sectional view of a mullion structure in accordance with a further embodiment of the invention.

Referring now to the drawings, FIG. 1 shows a curtain wall assembly **10** comprising a series of individual, preferably factory preassembled, frame units **11**. In the illustrated embodiment, the frame units are mounted between two projecting vertical masonry piers **12, 13** of a building, such as an office building, hotel or like commercial structure. Each of the frame structures **11** is comprised generally of a pair of horizontal, vertically spaced transoms **14, 14**, the distal ends of which are fixed to the terminal ends of the vertically extending mullions **15**.

As will be appreciated from the following description, the mullions **15** are comprised of separate sections **16, 17** (see FIG. 2) which, when interlocked, define the composite mullion **15**. The interlocking mullion sections **16, 17** are preferably formed of elongated extrusions of aluminum or the like.

The mullion section **17** includes a backing web **18** having, at its outermost edge, a front reinforcing wall **19**, which wall, at its outer face, defines a gasket receiver pocket **20**.

In corresponding spaced relation to the front reinforcing wall **19**, there is formed an inner reinforcing wall **21** which, in the illustrated embodiment, incorporates a root section **22** merging with web **18**, an offset flange **23**, and an inner step portion **21'** defining a continuation of the offset flange **23**. A recess **24** is formed at the junction of the root section **22** and the web **18**. It will be observed that the offset flange **23**, root section **22** and recess **24** together define an inwardly directed, vertically extending bearing pocket P, having a constricted open mouth portion defined between the outer terminal end **25** of the offset flange **23** and an opposed portion of the backing web **18**.

Extending inwardly from the backing web **18** there is formed, in addition, a flange **26** having a locking shoulder **27** directed toward and parallel to the web **18**. The outwardly facing portion of the flange **26** includes a cam follower surface **28**, for purposes which will appear hereafter.

Inwardly extending from the web **18** are formed a pair of L flanges **29, 30** which are disposed in opposition, to form an upwardly and sidewisely open, vertically directed guideway having a rectangular cross section. The guideway acts as a receiver channel for an angle iron, one leg of which extends slidably within the guideway, the horizontal leg of the angle iron, after installation of the curtain wall section, being bolted to a horizontal structural component of the building proper, whereby the mullion section **17** is fixed to the building. The angle iron is disposed at the upper edge of each preassembled frame section **11**, the lower edge of the sections being secured to horizontal support components of the building structure by any suitable support clip or other mechanism.

The mullion component **16** comprises an inner reinforcing wall **31** formed at the inner boundary of the backing web **32**. The mullion section **16** includes inwardly facing L flanges **29', 30'**, forming a vertical guideway identical to and for the same purposes as the guideway previously described and formed by the L flanges **29, 30**.

Side edge **33** of the inner reinforcing wall **31** incorporates an inwardly directed, vertically extending trunnion member **34**, of a configuration which is essentially complemental to the bearing pocket P, the trunnion **34** providing clearance for pivotal movement within the bearing pocket.

A latching flange **35** extends inwardly from the backing web **32**, the flange **35** including a discontinuous or bellows type extension, to permit a maximum lateral springing deflection while minimizing metal fatigue in the course of such deflection.

A latching detent **36** is formed at the distal end of the flange **35**, the detent including a leading cam surface **37** and a latching shoulder **38**, essentially parallel to and facing toward the backing web **32**. A blocking flange **39** extends inwardly from the backing web **32** in outwardly spaced relation to the latching flange **35**.

It will be appreciated that the mullion sections **16, 17** form the leading and trailing vertical end portions, respectively, of adjacent frame sections **11, 11**. The frame sections **11**, as noted above, are defined at their upper and lower extremities by horizontal transoms **14**.

The transoms **14** are preferably of comparable depthwise dimension to the overall depth of the mullions. The transom sections may be assembled to the mullion sections at the plant, such assembly preferably being accomplished through the use of through bolts B which extend through apertures formed in the backing sections **18** and **32** of the sections **17, 16**, respectively, the bolts being threaded into generally C-shaped screw ways **40** formed in the horizontal transoms **14**, in a well known manner.

It will thus be seen that the completed, generally rectangular frame members **11** may be delivered to the job for subsequent interconnection and glazing (although it will be readily recognized that preglazed sections may be provided or that the panel fillers may be inserted within the frames at the factory, if desired).

Assembly of the various frames **11** may be readily effected on the job.

In the embodiment of FIGS. 2 to 4, a first frame section **11*a*** is fixed in position in the manner described, i.e. through the use of clips or locking means at the lower end and through the use of right angle members slidably inserted in the vertically directed guideway defined by the L flanges **29, 30** at the upper end. The next succeeding frame or curtain wall assembly **11** is thereafter assembled to the installed frame **11*a*** in the following manner.

Referring specifically to FIG. 3, the frame section **11** is tilted about a vertical pivot axis so that the backing web **32** is disposed at an angle with respect to the backing section **18** of the mullion section **17**. With the frame section and mullion **16** disposed at such first angularly related position, it will be ob-

served that the trunnion 34 may be sidewisely inserted into the bearing pocket P formed in the mullion section 17, i.e. from the position shown in FIG. 3 to that shown in FIG. 4.

With the parts in the position shown in FIG. 4, the frame section 11 may be rocked or pivoted about the vertical pivot axis defined by the trunnion within the pocket in an outward direction, causing the frame sections 11*a* and 11 to be disposed in a coplanar alignment. Such rocking movement will cause the latching flange 35 to be deflected forwardly by the complemental camming action of the surfaces 37 on the detent and the surface 28 adjacent the locking shoulder. When a sufficient rotation has been effected, it will be evident that the latching shoulder 38 will spring behind the locking shoulder 27, preventing subsequent return pivotal movement of the two mullion sections, the parts thus being positioned in the assembled manner shown in FIG. 2.

Inspection of the construction in such assembled position will reveal that the trunnion 34 can no longer be removed from the pocket P, the interfit of the parts providing a rigid tubular section, resistant to spreading or compressive forces exerted in any direction. More particularly, it is important to note that the completed mullion assembly is essentially a rigid tubular construction having walls overlapped in each direction, which walls are essentially resistant to flexure and nonresilient, the sole resilient component being used merely to maintain the two mullion sections against return pivotal movement.

It will further be observed from the fact that the once-assembled units are subsequently fastened to the structural components of the building and from the further fact that a subsequent mullion section is added after assembly of the first two sections, that return pivotal movement is prevented after the original latching action by external connections securing the the frame or curtain wall section to the adjacent curtain wall section and the the building framework. Thus, after completion of the curtain wall construction, the snap fastening components do not serve as the sole connective influence.

In the completed shell of the mullion structure, the blocking flange 39 lies behind and directly against the forward wall 19 of the mullion section 17, preventing outward and inward relative movement of the noted parts, such relative movement being likewise prevented by the adjacent faces of the flange structure 21 and the rear wall portion 31.

The trunnion 34 includes a tooth 34′ entering into a notch 22′ on the web 18 in the interlocked position of the mullion sections, similarly resisting inward and outward relative movement of the parts.

Movement of the mullion sections toward and away from each other is similarly limited at the outer end, for instance, by the adjacent sidewall portions 19′ of the front wall section 19 of the mullion 17, and the adjacent surface portion of the backing web 32 of the mullion section 16.

Importantly, a relative outward movement between the mullion components is prevented at the inner junction of the mullion components by the engagement of a trailing angle portion 34″ at the rear end of the trunnion against an oppositely disposed portion of the offset flange 23.

Optionally, although clearances are shown for purposes of clarity, the configuration of the trunnion portion may be arranged so that, in the assembled position of the mullion sections, portions 34″ and a portion of the flange 23 are biased or wedged tightly into engagement.

After the frames have been assembled, a glass mounting and sealing gasket assembly 41 is forced into the pocket 20 of the mullion structure, the gasket including lateral leg portions covering the face of the mullion structure and preferably outwardly lapping the front junction J between the sections 16 and 17.

As is conventional, the gasket includes laterally open glass receiver pockets which may receive the glass panes G. After insertion of the panes, a locking strip S may be wedged into a receiver slot formed in the gasket, to rigidify the gasket and assure the permanent attachment of the panes.

It will be appreciated that the horizontal transoms 14 incorporate vertically open pockets 20′ similar to the pocket 20 in the mullion section 17, to permit mounting of continuations of the gasket 41 in the horizontal frame components.

Referring now to FIG. 5, there is disclosed a further embodiment of the invention wherein the mullion 50 includes half sections 51 and 52. The section 52 includes a backing web 53, an exterior or outer leg 54 and inner leg 55. A pocket assembly 56 is formed as a continuation of the leg 54, the pocket including an inwardly extending flange section 57, a base section 58 and an inner terminal end section 59. Preferably at least the inner surface of the base section 58 is arcuate in section, to accommodate swinging movement of an element of the section 51.

The outwardly facing surface 60 of the flange section 57 may incorporate a weatherstrip receiver groove 61, within which may be mounted an elongated section of weatherstrip 62.

The terminal end of the inner leg 55 of the section 52 is bifurcated, the bifurcation being defined by an inner longitudinally extending rib 63, an outer longitudinally extending rib 64 and a base portion 65, connecting the two ribs. The inner surface 66 of the inner rib 63 is arcuate, to provide clearance for the interfitting of components of the mullion section 51 between the bifurcated ribs by a relative pivotal movement.

The mullion section 51 includes a backing web 67, an outer leg or wall 68 and an inner wall portion 69. The outer wall 68 terminates in an inwardly directed trunnion assembly comprised by an inwardly directed flange 70, having at this innermost end a toe 71 directed away from the web 67 and generally paralleling the wall 68. A rounded abutment 72 is formed at the inner junction of the flange 70 and leg 68.

The manner of use of the mullion assembly is similar to the embodiment first described although, for purposes of simplicity of description, the horizontal transom components have been eliminated from this view.

A frame structure, including as its terminal component the mullion section 52, is mounted in position on a building. The next adjacent frame structure has, as its leading edge component, the mullion section 51. The last mentioned section is tilted with respect to the already installed frame (the section being rotated in a clockwise direction relative to the position shown in FIG. 5) and the trunnion assembly 70 inserted by a combined inward and sideward movement into the pocket 56. Continued pivotal movement about a pivot axis A, essentially slightly outwardly spaced from the abutment 72, will cause sealing flange 73, forming a continuation of the inner wall portion 69, to enter into the space between the ribs 63, 64 defining the bifurcation.

Preferably the abutment surface 72 defines a cam configuration which, on continued movement, coacts with the end portion 59*a* and the end section 59, causing a camming action. This camming action shifts the innermost surface 73*a* against the inner face of the bifurcation 64, resulting in a wedging or locking together of the two halves, thereby effecting an intimate engagement between these parts. A machine screw 74 may be passed through the three layers defining the bifurcations and the sealing flange 73, to prevent return pivotal movement of the parts.

It will be observed that a weathertight seal is formed by the engagement of the weatherstrip section 62 against the flange 70 of the trunnion assembly.

It will be further observed that when the structure of FIG. 5 is completed, the two mullion half sections act essentially as a single, rigid tubular section, i.e. any stress applied to either half is transmitted as well to the other half and is resisted by the mullion assembly as if the assembly were an integral tube.

Outward movement of the two half sections is prevented at the interior of the connection by the inner terminal end portion 59*a* entering behind the abutment 72. Spreading or lateral movement is initially (i.e. until the mullion is fixed to the building frame and subsequent curtain wall sections installed) limited by the screw member 74, and the interfit of the sealing

flange **73** within the bifurcation prevents inward and outward relative movement between the parts at the inner portion of the mullion.

At the exterior of the junction of the mullion sections, the toe **71**, at the end of the trunnion entering into the space between the weatherstrip retainer groove and base **58** of the pocket defining member, provides a locking engagement against inward and outward relative movement of the parts, as well as against compressive movement, the compressive movement being likewise resisted by the engagement of the flange **70** of the trunnion against the outer surface of the weatherstrip receiving groove. It will also prevent rotational movement of the compression flanges, which movement initiates lateral buckling failure in the conventional interlocking mullions.

It will also be observed that the end portion **59***a*, entering behind the abutment **72**, performs not only a wedging function but also a blocking function, preventing outward spreading of the mullion components at the exterior surface.

It is important to note in connection with both of the embodiments specifically described that initial interfitting of the parts is effected by lateral relative movements, which lateral movements are accomplished when the section being installed is tilted relative to the section which has already been installed. Thus, for instance, if the last frame section **11** is to be installed adjacent an extending masonry pier **13** (see FIG. 1) clearance is provided for the initial lateral installing movements by reason of the fact that these movements must be accomplished when the two frames are in a first or angled position relative to each other. Once the initial interfit of the parts has been effected, installation is completed by a pivotal movement, thus providing clearance for swinging the last frame of a series into position adjacent the masonry pier. Accordingly, and in contrast to split mullion structures heretofore known, difficulties in providing clearance are not experienced in the installation of the devices of the present invention.

From the foregoing description it will be evident that there is provided a curtain wall subcombination and mullion structure therefor permitting a maximum number of preassembly operations to be effected at the plant, the preassembled sections being readily interconnected and affixed to the framing of the building on the job site.

It will be understood that the panelling or pane structures carried by the curtain wall sections may be installed at the factory or, as shown in the embodiment of FIGS. **2** to **4**, may be installed on the job after erection of the framing components.

It will be further appreciated that the pivotal movement required for the installation of subsequent sections may be modified in accordance with the requirements of the individual job. Thus, with relatively minor changes, a mullion section may be designed which will permit subsequently installed panels to be tilted inwardly into alignment with installed panels, or outwardly into alignment with such panels in accordance with the requirements of a particular application.

Further situations may arise in which the mullion sections may desirably form the horizontal components of preassembled, interlocking curtain wall sections, with the lower edge of one said section pivotally interlocking with the upper edge of an installed section.

Without limitation to any specific theory invention is believed to reside in part in my discovery that a two part load bearing mullion structure may be integrated into a tubular whole having a strength factor comparable to an extruded integral tubular shape of comparable size, by providing separable mullion halves, which halves are integrated at one junction or connection by a pivotal or rotational movement of the parts into interlocked connection. The pivot connection must be such that relative movement of the halves adjacent the connection is prevented in the assembled condition. The device should include overlapping wall portions spaced from the pivotal connection to resist relative movement at such spaced position.

Where such conditions exist, I have determined that securing of the second junction between the mullion halves in a manner to resist return pivotal movement results in the formation of a two part tubular structure of great strength. The second fastening connection need be resistant only to a return pivotal movement of the mullion halves and, thus, may be accomplished through the use of simple through screws, an elongated snap detent, or a like expedient, as the fastener system per se will never be subjected to great stress.

The unexpected strength of the composite structure is believed to be the result of the fact that lateral bending failures may be induced by progressively smaller forces exerted on a channel structure, as the channel structure is twisted or deflected to a progressively greater degree. By preventing the initiation of a independent twist or deflection of either of the two channel sections, the condition in which lateral bending failure may occur in response to relatively small force factors is prevented from developing. In this manner, a small pivot resisting force is enabled to produce a structure having exceptional rigidity comparable to a tube.

It will be observed that since fastening need be effected on only one edge of the tubular structure thus formed, an aesthetically pleasing appearance, free of exposed fasteners or the like, is presented.

A skilled worker in the art will readily recognize that numerous variations and modifications may be made, without departing from the spirit of the invention. Accordingly, the invention is to be broadly construed within the scope of the appended claims.

1. In a curtain wall assembly or the like including a plurality of adjacent frame subassemblies, a tubular, interlocking split mullion construction linking adjacent frames, comprising first and second, generally U-shaped, rigid half sections each including first and second legs, locking means for joining the first leg of one said section to the first leg of the other said section, said locking means including a laterally open bearing pocket member on one said first leg, a trunnion member on the other said first leg, said trunnion member being sidewise insertable into said pocket when said sections are in a first angularly related position, said pocket member and said trunnion member including cam and follower means, said cam and follower means being spaced from each other in said first angularly related position, and being positioned to be shifted into engagement when said sections are pivoted from said first toward a second angularly related position, said cam and follower means, in the course of said pivotal movement, having coacting interengaging means for progressively laterally shifting one said section relative to the other said section in a direction normal to the longitudinal axis of said sections responsive to continued pivotal movement of said sections, said second leg portions of said sections including blocking portions adapted to overlap in said second angularly related position, said blocking portions, in said second position, being forced into engagement with each other responsive to said lateral relative movement of said sections, and auxiliary fastening means locking said first and second sections together against relative movement in said second angularly related position.

2. The assembly of claim **1** and including a weatherstrip member mounted in said pocket and spanning said sections.