

[54] BUILDING WALL ASSEMBLY WITH WEEPAGE CHANNELS

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3,758,997, which is a division of Ser. No. 92,001,
Nov. 23, 1970, Pat. No. 3,678,625.

[52] U.S. Cl. **52/209, 52/400, 52/731,**
52/732

[51] Int. Cl. **E06b 1/16, E06b 1/18, E06b 7/14**

[58] Field of Search **52/209, 400, 721, 732,**
52/463, 731, 281, 488, 455, 457, 497, 458, 204

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[57] ABSTRACT

A building wall assembly including hollow mullions which are adapted to receive recessed framing elements to provide maximum exposure of panel surfaces including decorative panels and both fixed and movable window panels or panes. The mullions are so configured as to be assembled from two mullion elements which permit relative longitudinal sliding movement between the mullion parts responsive to ther-

mally induced expansion and contraction. Each mullion forming element has a generally Z-shaped web portion and flanges extending in the same direction from opposed ends thereof. Framing elements, which are to a major extent recessed within the exterior of the mullion walls, are secured thereto by fastening means. A fastener clip or glazing bead is received within the framing elements. Compressible gasket means are secured within the framing elements and the fastener clip in order to compressibly engage opposed marginal portions of a fixed panel to sealingly secure the same in position.

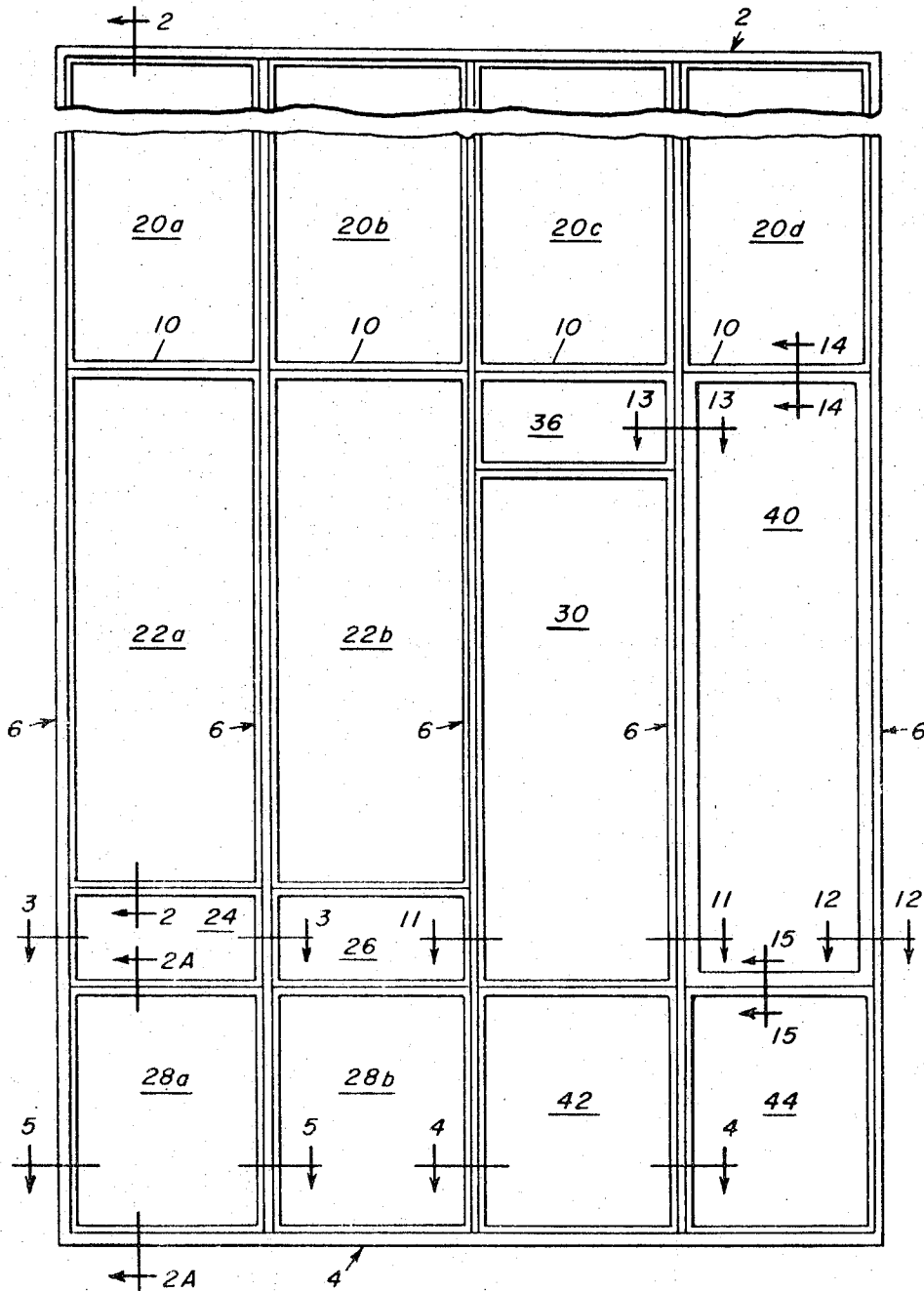
A ventilating window structure incorporating a form of the mullion and frame elements described above. The window having a movable frame member provided with a web-like body portion, outwardly directed flanges defining an outwardly open channel for receipt of hinge means and corner joining means. A glazing bead received within recesses in the body portion of the movable frame element. A rearwardly disposed inwardly directed flange having a glazing strip receiving recess with a gasket or glazing strip secured therein. The glazing bead having a glazing strip receiving opening and a glazing strip disposed therein. The marginal portions of the window pane secured in compressible engagement between the glazing strips.

A rotating window structure having a movable frame member, a mullion as described above and an inwardly open channel shaped fixed frame member. The movable frame member having a tubular body with an inwardly projecting flange and glazing bead receiving openings securing a glazing bead in position. Glazing strips received within the inwardly projecting flange and the glazing bead to secure the window pane to the movable frame.

A compressible gasket or glazing strip element having an anchoring section, a compressible body portion and outer legs. The anchoring section having a resilient pilot section for assisting in introducing the gasket element into a recess. The body section is tubular and a rod-like connecting sector is interposed between the anchoring section and the tubular body section. Angularly rearwardly disposed resilient outer legs are connected with said tubular body section and project farther rearwardly than said tubular body section.

5 Claims, 19 Drawing Figures

FIG. 1.



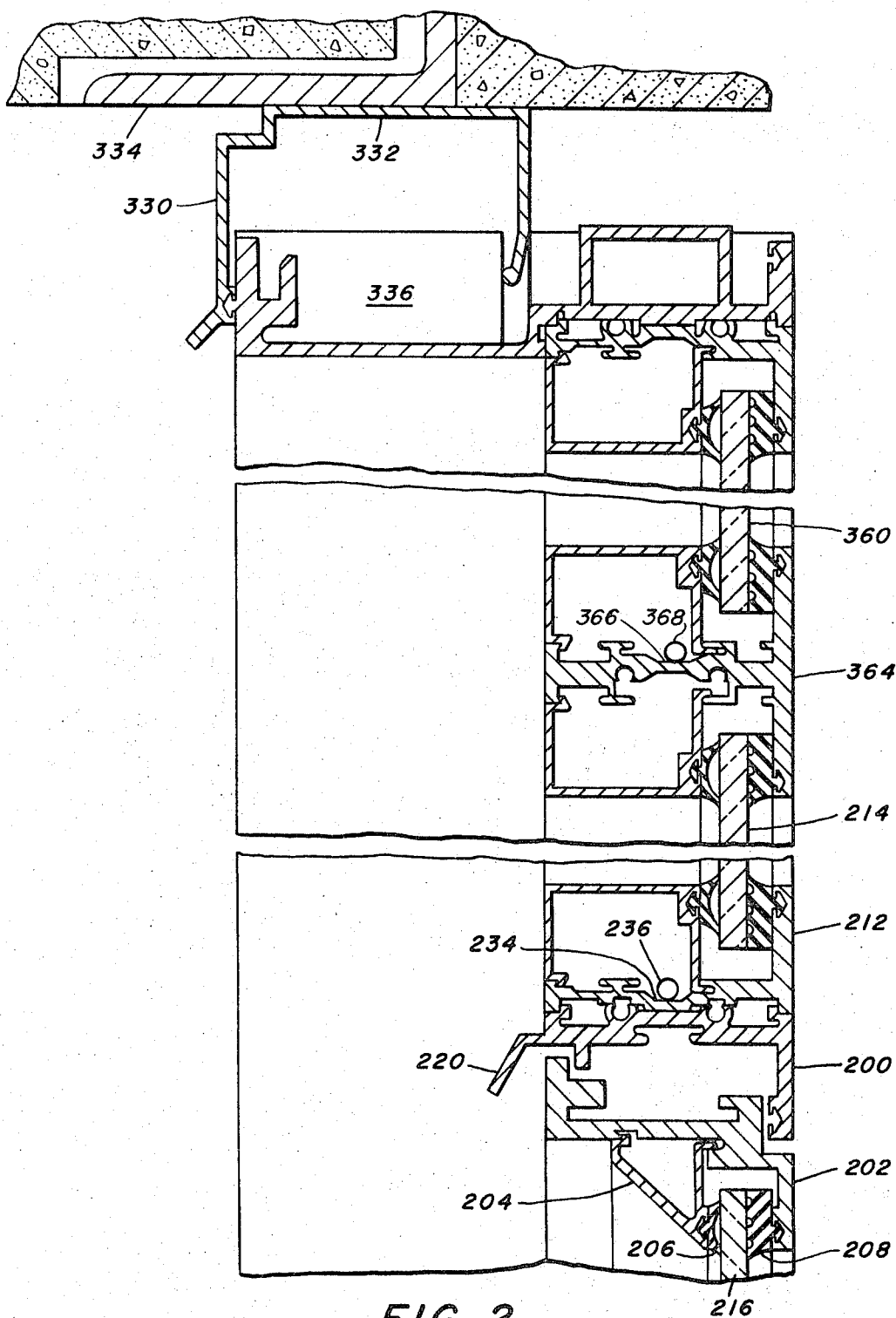


FIG. 2.

FIG. 2A.

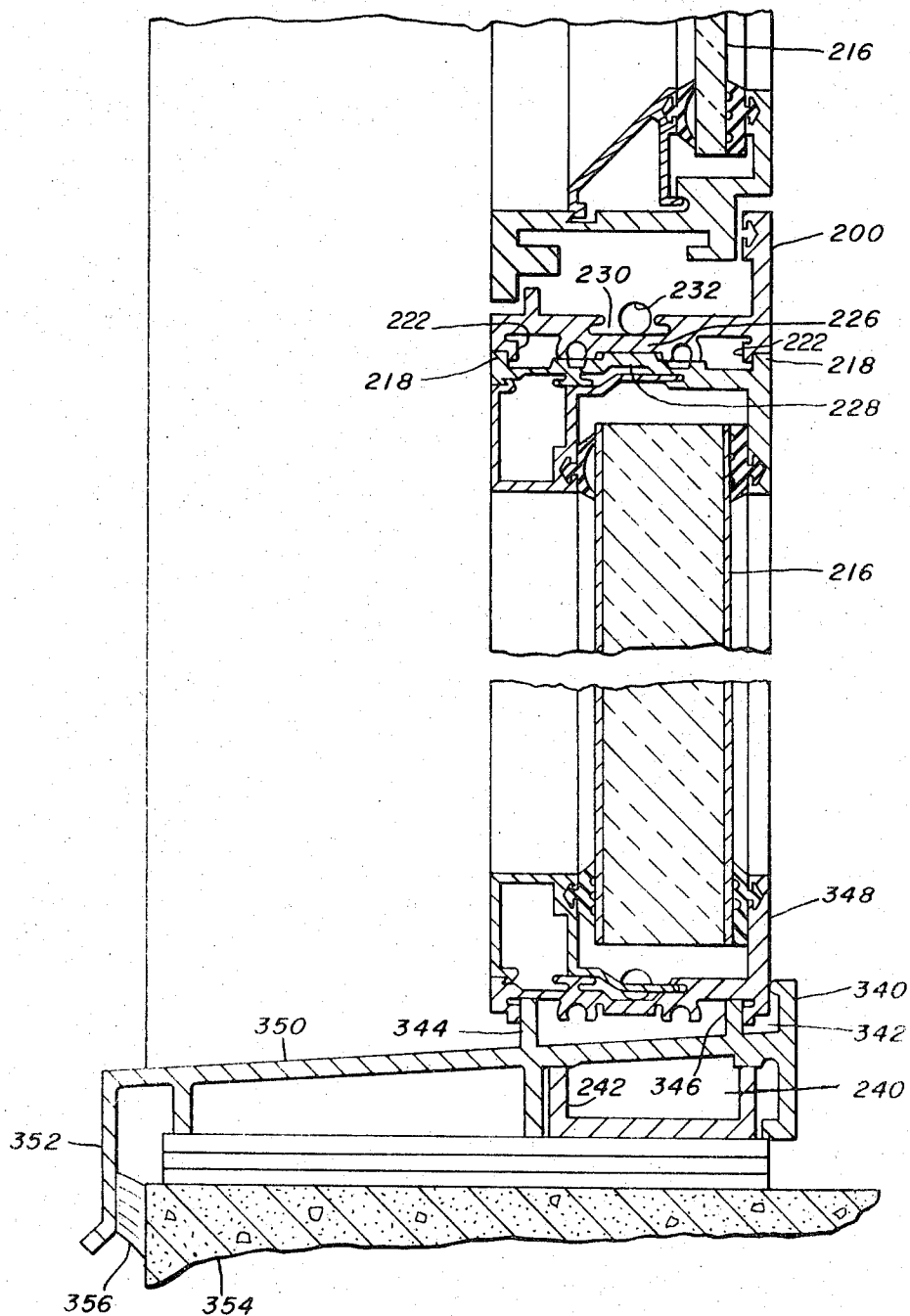


FIG. 3.

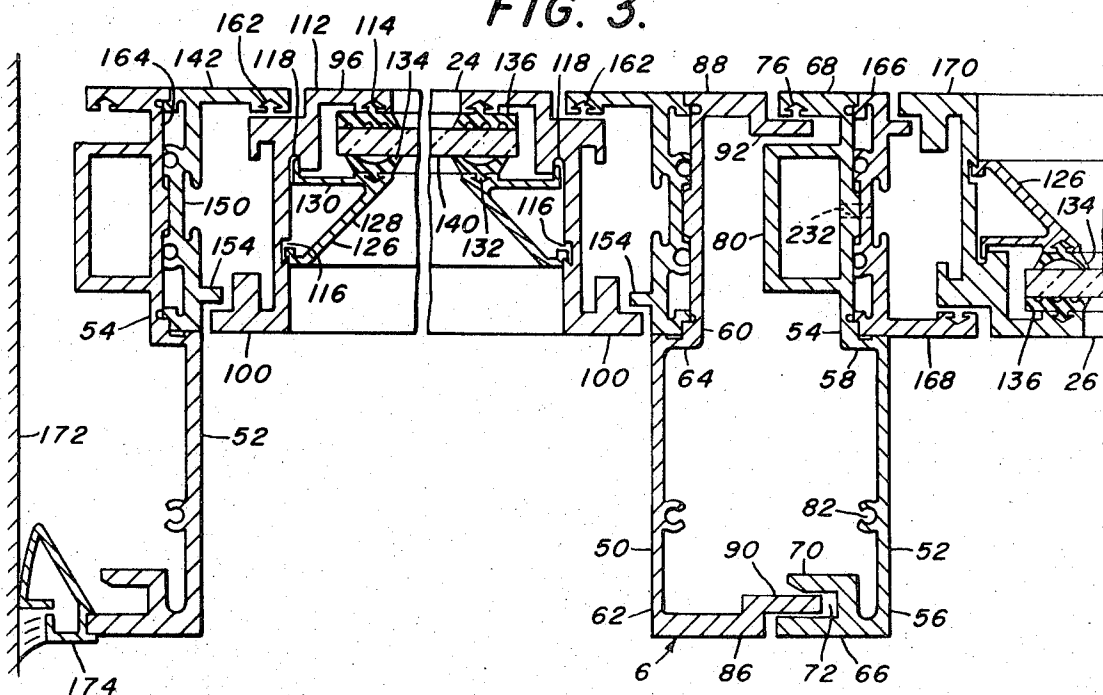


FIG. 13.

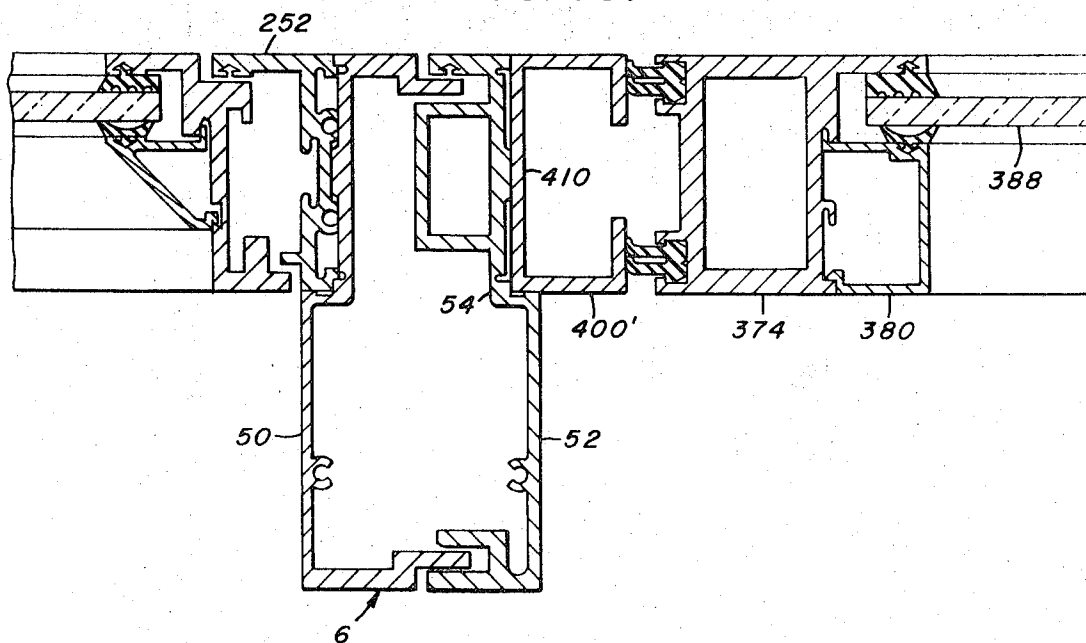


FIG. 4.

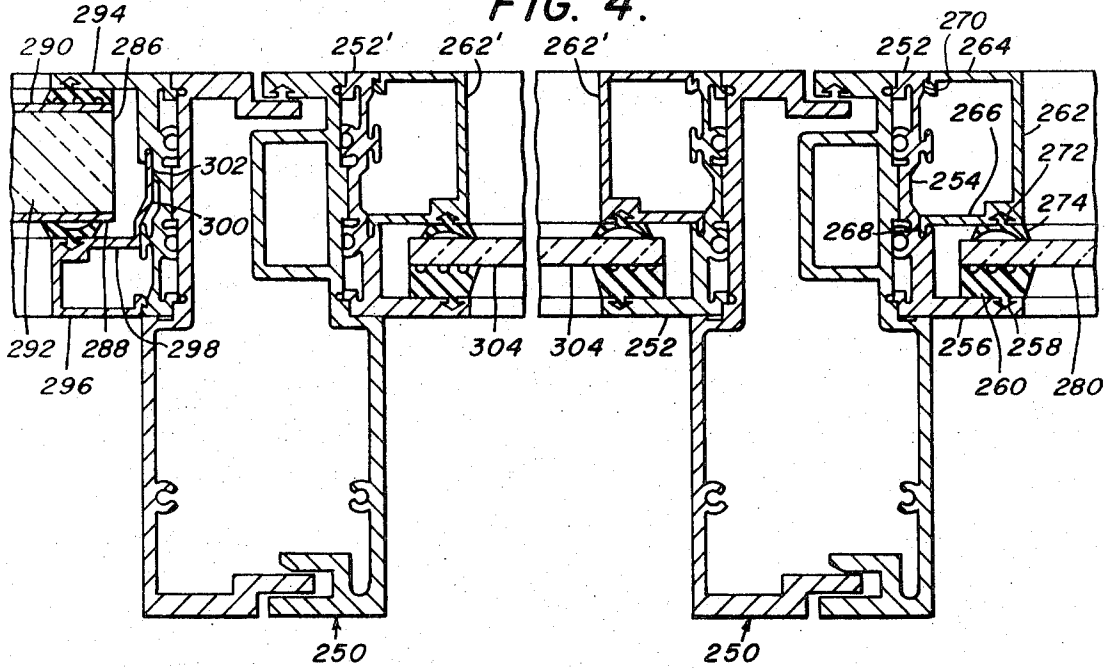


FIG. 5.

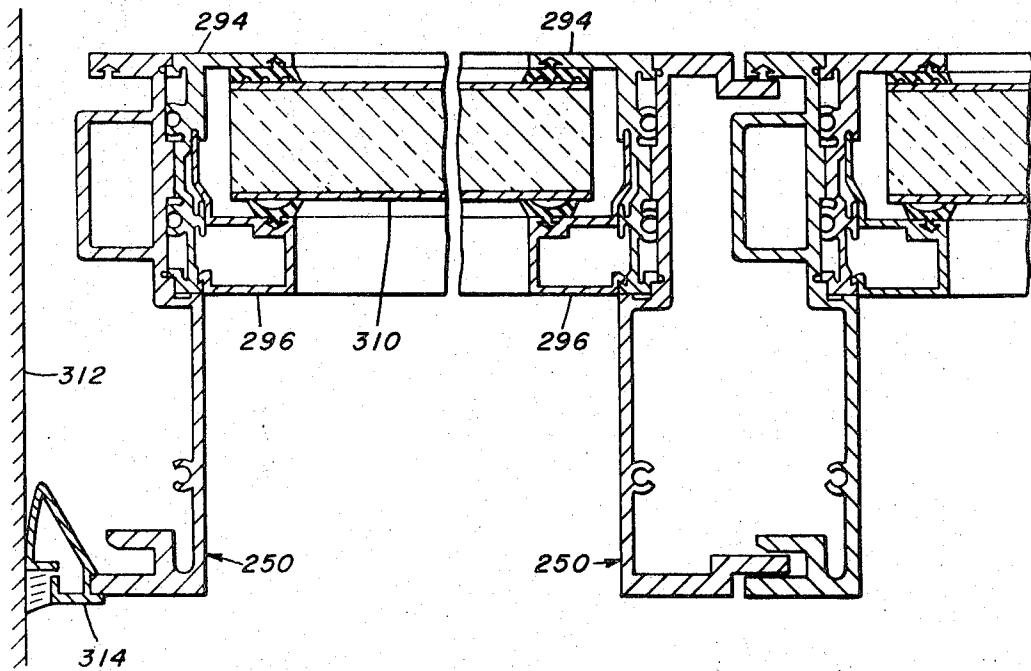


FIG. 6.

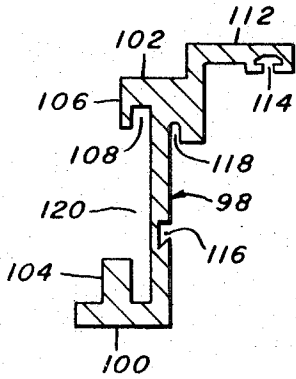


FIG. 7.

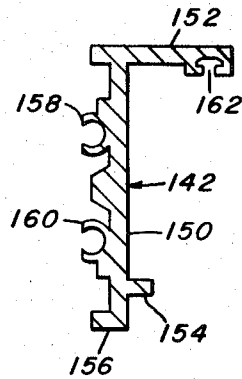


FIG. 9.

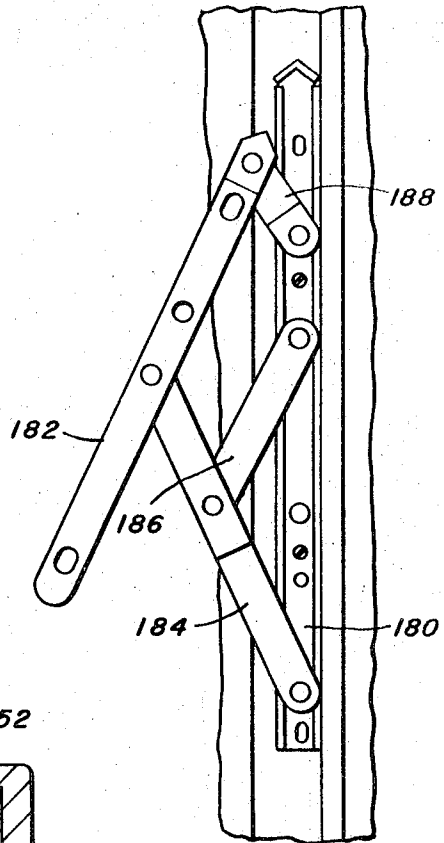


FIG. 8.

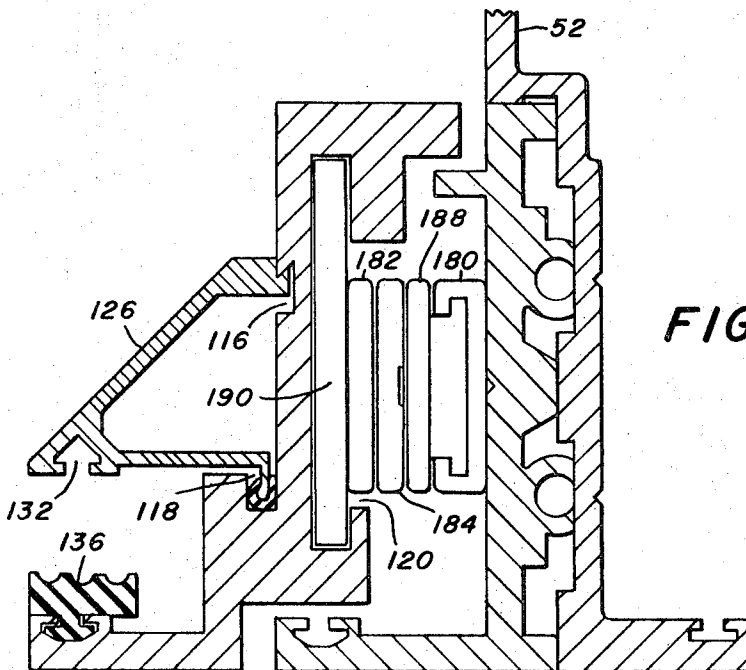
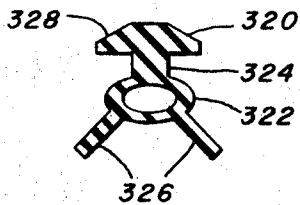


FIG. 10.

FIG. 11.

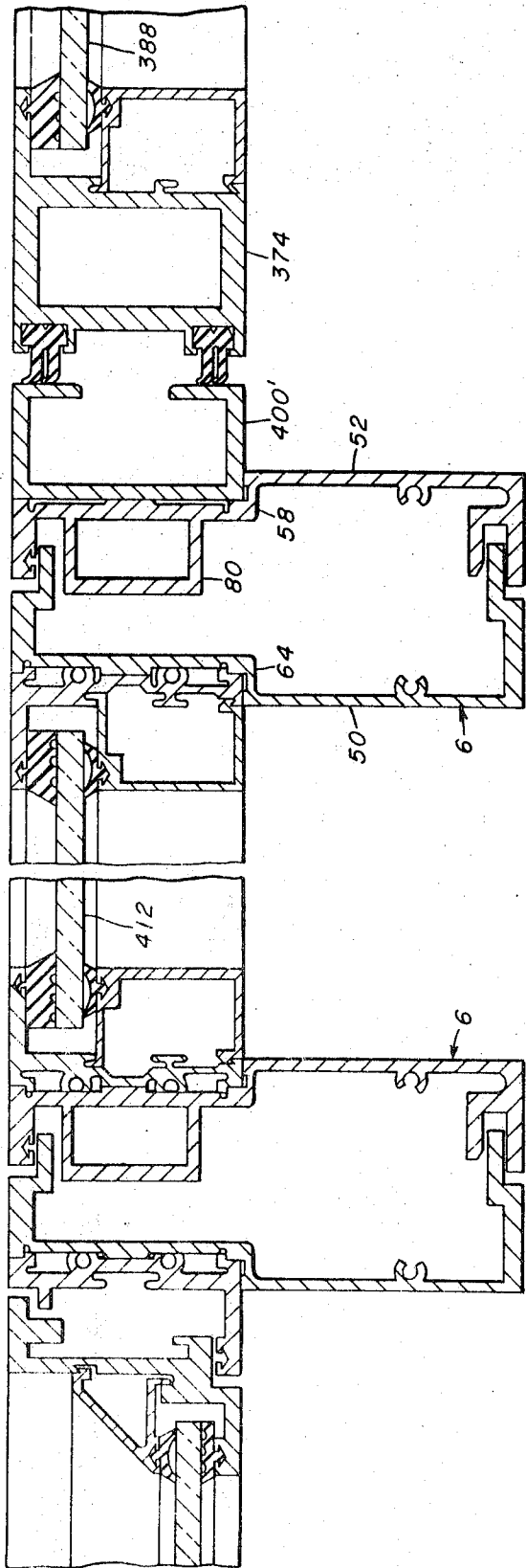


FIG. 12.

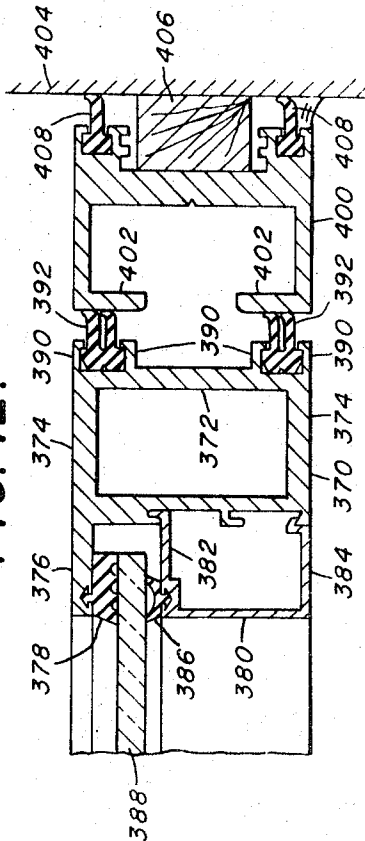


FIG. 14.

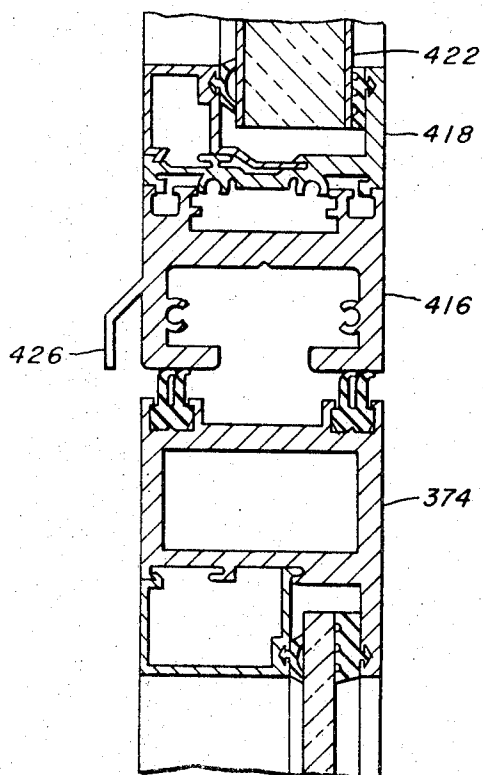


FIG. 15.

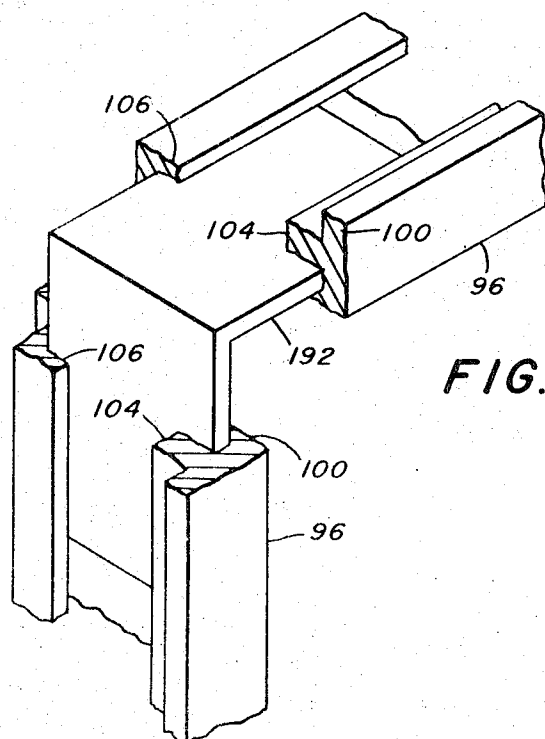
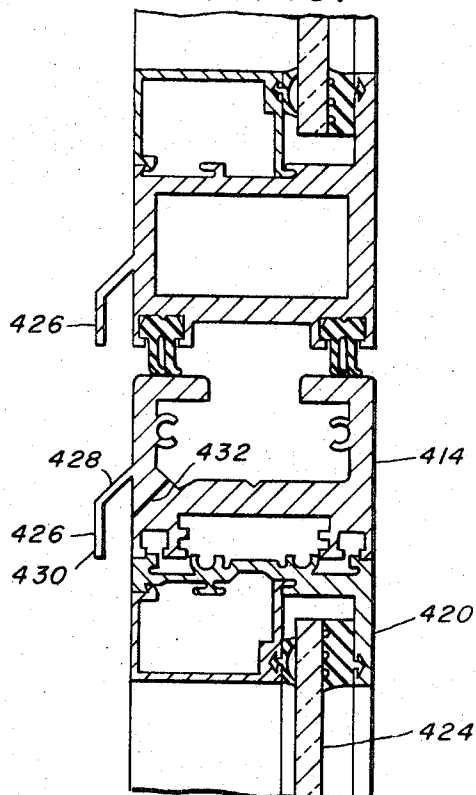


FIG. 16.

FIG. 17.

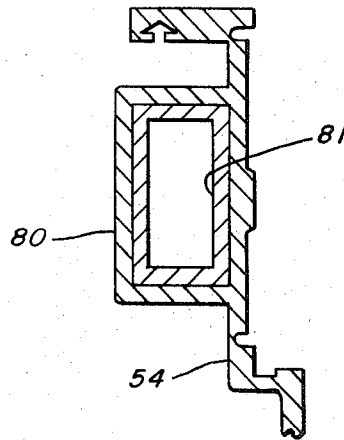
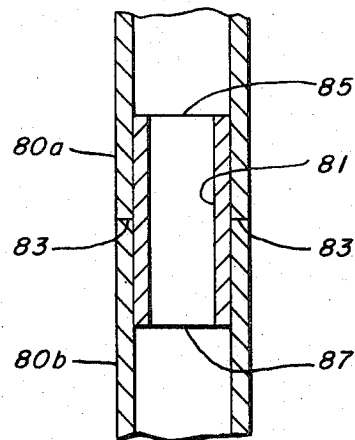


FIG. 18.



BUILDING WALL ASSEMBLY WITH WEEPAGE CHANNELS

This application is a division of application Ser. No. 252,503, filed May 11, 1972, now U.S. Pat. No. 3,758,997, which in turn was a divisional application of application Ser. No. 92,001, filed Nov. 23, 1970, now U.S. Pat. 3,678,625.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to building wall assemblies and more specifically relates to fixed and movable panel and window elements and the framing components therefor.

2. Description of the Prior Art

In conventional building construction installations in connection with both fixed and movable windows and other types of panel elements, generally it has been the practice to provide a fixed frame which in turn is secured to a load bearing or structural member such as a mullion. A window or panel is then mounted in a second frame which is fixedly or hingedly secured to the fixed frame member. In the case of ventilator type windows the pane is secured to a second frame which is movable with respect to the surrounding fixed frame. One of the difficulties encountered with such structures is that the need for separate load bearing elements and fixed framing elements results in a reduction of panel or window sizes due to the width of the load bearing and framing elements. This is undesirable as it is not only aesthetically unpleasing, but also reduces the size of window or panel which can be installed within the available space.

Also, in numerous conventional window installations glazing may be effected solely from the exterior of the building. This is not only awkward, but as a result of increasing labor costs it is extremely uneconomical.

In addition to the above-noted problems, entrapment of undesired moisture within load bearing and framing members tends to create problems which contribute to corrosion, icing, dirt accumulation and premature failure of the wall structure. It is, therefore, necessary to provide suitable means for directing the flow of moisture out of the wall structure and discharging it harmlessly to the exterior of the building.

It is also important, particularly with respect to window structures, to provide an assembly which provides sealed panel retention which affords a barrier to entry of snow, rain and dirt particles into the building through the joint between a window or panel and the surrounding frame structure.

SUMMARY OF THE INVENTION

This invention has solved and improved upon the above-discussed problems in the prior art.

The building wall assembly of this invention provides for at least one pair of spaced parallel vertically disposed hollow mullions. Each mullion is formed from first and second elongated mullion elements. Each mullion element has a generally Z-shaped web portion provided with a forward section, a rear section and a connecting transverse transition wall. Each Z-shaped web portion terminates in a pair of generally parallel inwardly directed flanges. A joint between one pair of adjacent flanges of a pair of mullion elements is established by providing one flange with an inwardly open

channel and another flange with a complementary tongue structure. The flange tongue is frictionally inter-engaged within the flange channel.

First panel retaining means are disposed against the outer surface of the rear section of at least one Z-shaped portion. Placing these retaining means within the recess reduces the space taken up by the framing members and increases the panel or window size which might be accommodated within the frame. Vertical marginal edges of a panel are secured to the mullions by the panel retaining means which engage the marginal portions thereof. Specifically configured recesses in the panel retaining means are provided for mechanical interengagement of gasket and glazing elements therewith. The panel retaining means may include glazing bead elements and/or panel retaining clip elements. Second panel retaining means are horizontally disposed between and secured to mullions and secure the upper and lower marginal panel portions.

Channels are provided for horizontally transporting accumulated water toward a mullion and ultimately transporting it through the mullion wall and downwardly through the interior of the hollow mullion (preferably within tubular conduits disposed within the hollow mullions).

The ventilating window element of this invention has a movable frame portion so configured as to provide recesses for receipt of a glazing bead. Several embodiments of the invention provide inwardly and outwardly projecting types of ventilator windows (and also pivotable windows). In the projecting ventilator windows, the glazing bead and a rearwardly disposed flange on a movable frame each have recesses for receipt of the glazing strip elements which are adapted to engage and compressibly secure marginal edges of the window pane. The movable frame also has an outwardly open channel for receipt of a hinge and for receipt of corner joining splice elements. The stationary frame is provided with weather strip means which compressibly engages the movable frame when the latter is in closed position. The stationary frame also has a stop member to limit rearward travel of the movable frame element and provide a weather barrier.

A uniquely configured compressible gasket element is also provided in this invention. The compressible gasket element has an anchoring section, a connecting portion, a compressible body portion and outer legs. The anchoring section has a pilot surface and the connecting portion has a rearwardly directed sector of reduced width which connects the pilot section with the compressible tubular body portion. Resilient angularly rearwardly directed legs extend farther rearwardly than the tubular body section.

It is an object of this invention to provide a building wall assembly having a uniquely configured mullion which serves both as a structural member and functions to receive a panel and window framing element to reduce the structural frame width and increase the area available for panels and permit the use of larger panels.

It is another object of this invention to provide such a framing system which may be economically manufactured and quickly assembled in order to minimize labor costs.

It is another object of this invention to provide such a system which is adapted for use with various types of

panel elements of varying thicknesses and various types of fixed and movable window elements.

It is another object of this invention to provide a ventilating window structure which has a substantially reduced sight line to provide maximum functional effectiveness combined with an aesthetically pleasing sight line which may be maintained with respect to overlying and underlying panel and fixed window elements.

It is another object of this invention to provide a gasket element which is so configured as to be received within and mechanically engaged by recesses in structural elements and to be compressibly deformed when functioning as a gasket element between two structural members.

These and other objects of this invention will be more fully understood from the following description of the invention, on reference to the illustrations appended hereto.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front elevational view of a type of building wall assembly contemplated by this invention.

FIG. 2 is a fragmented elevational view taken through 2—2 of FIG. 1.

FIG. 2A is a fragmented elevational view taken through 2A—2A of FIG. 1.

FIG. 3 is a fragmentary cross sectional illustration of a window assembly of this invention taken through 3—3 of FIG. 1.

FIG. 4 is a fragmentary cross sectional illustration of a panel assembly of this invention taken through 4—4 of FIG. 1.

FIG. 5 is a fragmentary cross sectional view of a modified form of panel assembly of this invention taken through 5—5 of FIG. 1.

FIG. 6 is a detailed illustration of a type of movable frame member employed in this invention.

FIG. 7 is a cross sectional illustration of one type of fixed framing member employed in this invention.

FIG. 8 is a cross sectional illustration of a form of compressible gasket contemplated by this invention.

FIG. 9 illustrates a form of hinge structure which is suitable for use with the ventilating window structure of this invention.

FIG. 10 is a cross sectional illustration of a type of ventilating window structure of this invention showing the hinge in retracted position.

FIG. 11 is a fragmented cross sectional view of a building wall assembly of this invention showing a modified form of window, taken through 11—11 of FIG. 1.

FIGS. 12 through 15 are cross sectional illustrations taken on 12—12, 13—13, 14—14 and 15—15, respectively, of FIG. 1 showing the framing of a rotating form of window.

FIG. 16 is a partially schematic, partially broken away perspective view of a corner portion of the movable ventilating window frame structure of this invention.

FIG. 17 is a cross sectional illustration of a drainage channel and an associated splice member.

FIG. 18 is a vertical cross sectional illustration of two segments of a drainage channel secured by a splice member.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As used herein, unless specifically indicated otherwise, the term "panel" shall include generally flat sheet-like building wall elements including metal panels, insulated metal panels, translucent and transparent panels all made from various materials including metal, glass, plastic and combinations of these materials.

Referring now more specifically to FIG. 1, a building wall assembly of a type contemplated by this invention is shown. The wall construction has a header 2, a sill 4 and a plurality of mullions 6. A plurality of muntin elements 10 have opposed ends secured to and supported by adjacent mullions 6.

As is shown in the upper portion of FIG. 1, four fixed panel elements 20a, 20b, 20c and 20d, which in the form illustrated are glass panes, are marginally secured within the frames defined by header 2, muntin elements 10 and mullions 6. Immediately underlying the two fixed panels 20a, 20b are two larger fixed panels 22a, 22b, which in the form illustrated are composed of glass. Immediately underlying fixed glass panels 22a, 22b are two ventilating windows 24, 26. Ventilating window 24 is adapted to project outwardly when opened and ventilating window 26 is adapted to project inwardly when opened.

Immediately underlying ventilating windows 24, 26 are composite insulated panels 28a, 28b which consist of two facing panels provided with an interposed insulation material.

Immediately to the right of fixed panel 22b are fixed panel 30 and ventilating window 26 which projects outwardly when opened. To the right of window 36 and underlying fixed panel 30 is rotatably mounted window 40. Underlying fixed panel 30 and rotatable window 40 are fixed panels 42, 44, respectively, which in the form illustrated are translucent and made of glass.

Referring now to FIG. 3, the construction of mullion 6 will be considered in greater detail. Each mullion 6 is composed of two individual elongated mullion elements 50, 52. Each mullion element 50, 52 has a generally Z-shaped web portion. Mullion element 52 has a rear section 54, forward section 56 and transverse transition section 58 connecting sections 54 and 56. Similarly, mullion element 50 has rear section 60, forward section 62 and transverse transition section 64 connecting sections 60 and 62.

Mullion element 52 has a pair of flanges 66, 68 disposed generally parallel to each other and projecting generally inwardly toward the mullion interior to provide a generally channel shaped mullion element 52. Flange 66 is provided with a right angular flange portion 70 which cooperates with flange 66 to define inwardly open groove 72. Flange 68 is provided with a weather strip receiving recess 76 which is forwardly open. In addition, mullion element 52 is also provided with a closed conduit 80, which is preferably integrally formed therewith, and is adapted to serve as a vertical conduit for downward flow of water which might otherwise accumulate within the structural members. The interior face of mullion element 52 is also provided with a generally C-shaped fastener receiving a slot 82 to facilitate joinder to horizontal structural components.

Mullion element 50 is provided with flanges 86, 88 which are generally parallel to each other and are in-

wardly directed. Flanges 86, 88 cooperate with the Z-shaped body portion of mullion element 50 to define an inwardly open channel. Flange 86 terminates in a rearwardly disposed inwardly projecting tongue 90 which is received within groove 72 of flange 66. This interengagement is preferably a friction fit in order to facilitate retention of the two mullion elements 50, 52 in the desired relative position when mullion 6 is formed. Rear flange 88 is provided with a forwardly disposed inwardly projecting tongue 92. The rear surface of tongue 92 is adapted to be engaged by weather strip means (not shown) which conveniently may be anchored within weather strip receiving recess 76. It should be noted that recess 76 is preferably provided with a restricted throat opening to facilitate retention of weather strip material.

It will be appreciated, therefore, that when the two mullion elements are assembled in the fashion shown two adjacent flanges 66, 86 of the mullion elements 52, 50 will be engaged in tongue and groove interlock and the other two flanges 68, 88 will be frictionally secured to each other by means of an interposed weather strip material. A closed hollow mullion structure which resists entry of foreign matter into the mullion interior is, therefore, provided. The mullion 6, so formed, establishes an expansion joint as relative longitudinal sliding movement between elongated mullion elements 50, 52 responsive to thermal conditions is permitted.

The mullion elements 50, 52 may be composed of any suitable material which will adequately bear the required load and has other desirable properties such as corrosion resistance and aesthetic appeal. The elements 50, 52 are preferably made from a substantially rigid material such as a metal. Aluminum, for example, may be conveniently and economically extruded into the desired shape and cut to the desired length.

The forward portions 56, 62 of mullion elements 52, 50, respectively, in the form shown, project outwardly toward the exterior of the building. In this form a generally flat interior wall framing structure, which facilitates provision of interior walls, results. Also, this provides an aesthetically pleasing exterior wall appearance. If desired, however, the wall may be so constructed that the mullion elements will project inwardly into the building interior. For convenience of reference, the building will be described with respect to an outwardly projecting mullion. It will be appreciated, however, that these directional references as used throughout will be solely for convenience of reference and the references to "forward," "rear," "inner," "outer" and words of similar import relating to direction or orientation shall in no fashion be deemed limiting upon the invention.

Referring once again to FIG. 3, projecting windows 24, 26 along with their framing elements are there illustrated. Window 24 is provided with a movable frame 96 which has substantially the same cross sectional configuration on all four sides. The cross sectional configuration of the movable frame is shown in detail in FIG. 6. The frame elements have a body portion 98. The body portion 98 has an outwardly projecting forwardly disposed flange 100. The body portion also has an outwardly projecting rearwardly disposed flange 102. Flange 100 has a rearwardly directed rib 104 and flange 102 has a forwardly directed rib 106. Flanges 100, 102 and ribs 104, 106 cooperate with body portion 98 to define an outwardly open channel 108. As

will be described in greater detail below, outwardly open channel 108 is adapted to serve a double capacity, i.e., a hinge receiving recess and a splice receiving recess for establishing corner joints.

Body portion 98 also has an inwardly projecting rearwardly disposed flange 112. Flange 112 is provided with a forwardly open glazing strip receiving recess 114. Recess 114 is preferably provided with a restricted throat portion which facilitates mechanical retention of a glazing strip therein.

Body portion 98 is also provided with two recesses for receipt of a glazing bead. A first glazing bead receiving recess 116 is inwardly open. A second glazing bead receiving recess 118 is disposed rearwardly of recess 116 and is forwardly open.

Rib 104 in addition to helping to define channel 108, which has restricted throat 120, also serves to strengthen and stiffen flange 100. This movable frame 96 may be made of any suitable substantially rigid material, but is preferably made of metal such as aluminum which may be conveniently and economically extruded into the desired shape.

Referring once again to FIG. 3 and to FIG. 10, it is seen that movable frame 96 is shown with a glazing bead 126 engaged within the movable frame 96. The glazing bead has a first leg portion 128 extending generally angularly forwardly and engaged within first glazing bead receiving recess 116 of body portion 98. The glazing bead 126 has a second leg 130 which is engaged within second glazing bead receiving recess 118. The glazing bead 126 is provided with a glazing strip receiving recess 132.

Secured within glazing strip receiving recess 132, which is generally rearwardly open, is glazing strip 134. Glazing strip 134 may be made of any suitable material such as rubber, plastic or a blend thereof. Vinyl or neoprene, for example, may be employed. A second glazing strip 136 is secured within forwardly open glazing strip receiving recess 114 of flange 112. In this fashion, the panel 140, which in this instance is illustrated as a glass panel, has its vertical marginal edges firmly sealed and secured between partially compressed, resilient glazing strips 134, 136. The manner in which the upper and lower marginal portions of the panel 140 are secured to movable frame 96 will be discussed below.

Cooperating with the movable frame 96 to provide a suitable complementary framing structure is fixed frame 142 which is shown in detail in FIG. 7. Referring to FIG. 7, it is seen that the vertical components of the fixed frame 142 are generally L-shaped and have a body portion 150 and an inwardly directed rear flange 152. The fixed frame element also has an inwardly projecting stop member 154 and an outwardly directed flange 156. In addition, two generally C-shaped fastener receiving slots 158, 160 are provided.

In securing vertical and horizontal portions of fixed frame 142, suitable fasteners such as screws may be passed through an opening in one element and into a slot 158, 160 of the other. The rear flange 152 has a forwardly open gasket receiving recess 162 which is adapted to receive a compressible gasket element. In the form illustrated in FIG. 3, the framing element 132 is in contact with the surface 164 of rear portion 54 of mullion element 52. It will also be noted that leg portion 150 is substantially coextensive in length with rear section 54. As a result of transverse transition section 58, the principal width of body portion 150 is disposed

within the recess provided by mullion element 52. In this fashion, the amount of area available for the window pane is increased as the space occupied by framing elements between mullions is reduced. Thus, rather than having a vertical mullion, an adjacent separate fixed window frame and a movable window frame, this invention provides for increased window space by providing only a nominal gap between the outermost extreme of the movable frame 96 and the innermost extreme of the mullion element 52. In effect, the mullion functions in a double fashion to provide a vertical load bearing component and to receive in recess position the fixed window frame.

In the form shown in FIG. 3, window 24 is shown in approximately the closed position. For clarity of illustration, the compressible gasket element which would be positioned within recess 162 has not been shown. It will be appreciated, however, that the rear portion of flange 102 of body portion 98 would be in contact with the compressible gasket member. It would also be appreciated that stop element 154 of fixed frame 142 serves to provide an ultimate limit on the inward movement of movable frame 96 as flange 100 would engage stop 154 were it to move farther rearwardly. In addition, stop member 154 and flange 100 cooperate to define a restriction which resists entry of rain, snow and other foreign matter into the recess which exists between the fixed and movable frames when the projecting window is in closed position. It is preferred to maintain a slight gap between stop member 154 and flange 100 to provide for a venting action which facilitates efficient drainage of moisture through the weepage system which will be described below.

Referring once again to FIG. 3, it will be noted that window 26, which is an inwardly projecting window, has substantially the identical components as window 24, but they are reversely positioned with respect to mullion 6. Generally L-shaped fixed frame member 166 has its flange 168 disposed in a forward position. The fixed frame member 166 is received within the same recess of mullion 6 as was fixed frame 142 of ventilating window 24. Similarly, the movable frame 170 also is reversely oriented with respect to the position of movable frame 96 of window 24. In this fashion the same complementary fit between fixed and movable window frame elements is provided.

One further feature of FIG. 3 which should be noted is that mullion element 52 adjacent window 24 is connected to structural member 172 by means of elongated sealing element 174, thus eliminating the need for second mullion element 50 at this position.

While the movable frames 96, 170 of the ventilating windows 24, 26 may be secured to the fixed frames 142, 166, respectively, by any suitable hinge means, one preferred form of hinge will be described. It should be noted that while this hinge forms no part of the invention per se, the movable and fixed frame members are uniquely designed to accommodate a hinge of this type. Reference is made now to FIGS. 6, 9 and 10. As is shown in FIG. 9, the hinge contains a base portion 180 which is adapted to be secured to a vertical portion of the fixed window frame. The hinge also contains an outer link 182 which is adapted to be received within the throat 120 of channel 108 of the movable frame and secured thereto. Links 184, 186 and 188 are all pivotably secured to base portion 180. The outer extremities of links 184 and 188 are secured, respec-

tively, to a central and end portion of outer link 182. The outer extremity of link 186 is secured to link 184.

As is shown in FIG. 10, fixed frame 142 receives and is secured to base portion 180 and movable frame 96 is secured within the throat portion 120 of channel 108 which contains anchoring block 190. With this hinge structure, in moving the window from a closed position to an open position, the initial movement is an outward translational movement which separates the movable frame from the sealed position against the fixed frame. The second phase of the opening movement is a rotational movement which causes either the upper or lower portion of the movable frame to be displaced a greater distance than the movable frame component to which it is parallel.

Referring now to FIG. 16, a preferred method of economically forming a corner joint in the movable frame will be described. A corner joint formed from two movable frame elements 96 is shown partially broken away in FIG. 16. A right angled splicing member 192, which conveniently may be a welded corner formed from bar stock having a dimension and configuration approximating that of channel 108, is inserted partially into channel 108 of the vertically disposed frame portion 96 and partially into channel 108 of the horizontally disposed frame portion 96. The splicing member 192 may be secured in position either by a friction fit within the channel 108 or by bonding means such as a weld or use of an adhesive material.

Referring now to FIGS. 2 and 2A, the horizontally disposed fixed frame portions 200 which are employed in projecting ventilating window 24 will be described. It will be noted that movable frame portion 202 and its glazing bead 204 and glazing strips 206, 208 are of identical configuration with the previously discussed vertically disposed portions of the movable frame. An outwardly and downwardly directed weather shield 220 serves to resist entry of moisture into the space between fixed frame 200 and movable frame 202. Referring now to the fixed frame portion 200 illustrated in FIG. 2A, it will be appreciated that it has a generally L-shaped configuration and is generally substantially identical with the vertical fixed frame configuration.

It should first be noted that fixed frame portions 200 are secured at opposed ends to mullions 6 which support the same. This joint is effected by passing fasteners (not shown) through a mullion wall and into the C-shaped slots 198 of fixed frame portions 200. As will be noted in FIG. 2A, element 212 has two upstanding flanges 218 which support the transverse outer extremities of fixed frame member 200. In the form illustrated inwardly and downwardly directed flanges 222 of fixed frame 200 provide mechanical engagement between fixed frame portion 200 and underlying structural element 212. In addition, the central transverse section 226 is supported by central transverse portion 228 of structural element 212. The manner in which structural elements 212 secure fixed panels 214, 216 in place will be discussed below.

Referring once again to FIGS. 2, 2A and 3, the system for disposing of undesired moisture which might otherwise accumulate within the structural components will now be described. As is shown in FIG. 2A, the horizontally disposed fixed frame element 200 has a centrally disposed recess 230 which is preferably substantially coextensive in length with fixed frame portion

200. At the end of fixed frame 200 the edge abuts against rear portion 54 of mullion 6 which has an opening or passageway 232 therethrough. As is shown in FIG. 3, this passageway 232 connects with the interior of vertically disposed weepage conduit 80. Thus, moisture accumulating on the upper surface of fixed frame portion 200 will flow into recess 230 and then longitudinally along the recess through passageway 232 and into vertical weepage conduit 180.

In similar fashion, structural elements 212 shown in FIG. 2 also have a central recess 234 which is adapted to carry moisture therealong and ultimately through opening 236 in mullion wall 54 and into closed vertically disposed conduit 80. Moisture entering a closed conduit 80 will be carried by gravity vertically downwardly to the sill portion which is shown in FIG. 2A. A horizontally disposed conduit 240 then transports the water longitudinally to an opening therein which permits discharge of the water to the exterior of the wall. These openings are preferably positioned at desired intervals in the forward wall 242 of conduit 240 in order to establish outward flow and ultimate harmless discharge of the moisture. While the preferred form of vertical weepage conduit may be economically and desirably integrally formed with a mullion section 50, 52, if desired, a separate conduit element may be secured within the mullion. Also, if desired, a weepage conduit could be provided in each of the two mullion forming components, thereby providing two conduits within each mullion 6. Finally, while it is not the preferred form, one might allow the entire hollow interior of the mullion to serve as a vertical conduit for downward discharge of the water. It will, therefore, be appreciated that moisture which might tend to accumulate in horizontally oriented outer components and produce potentially hazardous corrosive effect, as well as undesired freezing of the moisture to produce icing conditions, is ultimately harmlessly eliminated by the weepage conduit systems of this invention.

Where the height of the wall construction is such that the assembled mullions may be provided in finite vertical sections, it is preferred to provide continuity of aligned conduits 80 between overlying and underlying mullion sections. This may be conveniently and efficiently accomplished, as is shown in FIGS. 17 and 18, by inserting a tubular splice member 81 part way into the underlying conduit 80 and part way into the overlying conduit 80. The splice member preferably has substantially the same cross sectional configuration as the conduit, but is of slightly smaller size in order to provide for a slight friction fit. Thus, in the form illustrated, a splice section of generally rectangular cross sectional configuration having an upper extremity 85 and a lower extremity 87 is shown.

Reference will now be made to FIGS. 4 and 5 in order that the slightly modified form of structural assembly employed in retaining fixed panel elements may be described. As is shown in FIG. 4, the mullions 250 are identical with those previously described. The generally L-shaped structural member 252 is generally similar to that employed in the fixed frame for the movable window. The principal differences are the absence of stop element 154 employed in connection with the window and the presence of certain recesses for receipt of a panel retaining clip. For convenience and simplicity of reference, unless otherwise indicated, any reference to a "generally L-shaped fixed framing member"

or words of similar import, as used herein, shall be deemed to encompass not only the structures described in connection with the L-shaped fixed ventilating window frame, but also the slightly modified form employed with fixed panels. Reference to such a member within the context of a particular structural use shall be deemed to refer to a form of L-shaped member having a suitable configuration for the particular use, such as those specifically described herein, for example.

In the form shown in FIG. 4, the fixed L-shaped member has a body portion 254 and a forwardly disposed flange portion 256. The flange portion has a rearwardly open recess 258 into which is received a glazing strip 260. A generally U-shaped panel retaining clip 262 has legs 264 and 266 mechanically engaged within recesses 268, 270 of body portion 254. The forwardly disposed leg 266 has a forwardly open recess 272 which receives a glazing strip 274.

The glazing strips 260, 274 may be made of any suitable material such as rubber, plastic or other suitable materials having the desired resiliency, compressibility and mechanical strength as well as weather resisting properties. Vinyl and neoprene materials are suitable material for such use. The panel retaining clip 262 is substantially rigid and may be composed of any desirable material including metals and plastics. Panel 280 is marginally engaged between glazing strips 260, 272 and is retained therebetween.

A similar structure is shown at the left hand side of FIG. 4 in connection with panel 286 which has an outer metal facing 288, an inner metal facing 290 and an interposed insulating material 292. The generally L-shaped extrusion 294 is identical with L-shaped extrusion 252. In order to accommodate the excess width of panel a modified form of panel retaining clip 296 is employed. Its innermost leg 298 is provided with an inwardly directed flange 300 which is received within a recess 302 in L-shaped member 294. In this fashion, panels 280 and 286 are effectively secured in sealed fixed position within the wall structure. Horizontally disposed framing members cooperate with the vertically disposed L-shaped members to facilitate support by load bearing mullions 250 without requiring any major modifications to the intermediate supporting structure apart from the panel retaining clips. Mere substitution of panel retaining clip 296 for panel retaining clip 262 compensates for the excess width of the panel 286 as compared with panel 280. It is noted that central panel 304 is secured between the two mullions 250 by means of generally L-shaped framing member 252' and panel retaining clip 262'.

FIG. 5 shows a similar structure wherein an insulated double faced panel 310 is secured between mullions 250 by means of panel retaining clips 296 which are secured to generally L-shaped members 294. The left hand portion of FIG. 5 shows the mullion section secured to a permanent structural member 312 by means of an interposed element 314.

While various forms of glazing strips may be employed and several suitable constructions have been shown in the figures previously discussed, one preferred form which may be economically manufactured and effectively employed is illustrated in FIG. 8. This element consists of an anchoring section 320, a compressible tubular body portion 322 and a connector section 324 joining anchoring section 320 and body portion 322. A pair of generally straight tapered angu-

larly rearwardly disposed legs 326 depend from the tubular body portion. The anchoring section has a forwardly disposed pilot surface 328 which facilitates insertion of this section into a glazing strip receiving recess. Once the anchoring section has been secured within the recess the resiliency of the legs 326 and the compressibility of the tubular body portion 322 cooperate to provide a compressible glazing strip which will firmly engage and secure a panel surface. As the material out of which the glazing strip is made is preferably a resilient material such as a rubber or plastic (vinyl or neoprene, for example) or a combination thereof, it will initially yield through resilient movement of the legs and compression of the tubular body, but will reach a point of equilibrium at which the abutting panel will be compressively and firmly secured in position.

Referring once again briefly to FIGS. 2 and 2A, the manner in which the wall construction is secured to the header and sill members will be briefly considered. As is shown in FIG. 2, a header plate 330 has a generally channel shaped configuration and is adapted to have its base portion 332 secured to a steel lintel 334 by suitable means as by bolting. A solid structural member such as a wooden section 336 may be interposed if desired.

As is shown in FIG. 2A, the sill structure provides a sill member 340 which has an upwardly open channel 342 and flanges 344, 346 which support L-shaped structural member 348. The L-shaped member 348 may conveniently be bolted to sill member 340. The exterior portion of sill member 340 consists of a sloping web portion 350 which facilitates drainage of moisture moving down the exterior of the building and a downwardly directed flange 352 which facilitates sealed joiner to the foundation 354 by means of appropriate sealing compound 356.

Referring back to FIG. 2, it is noted that where a fixed panel 360 overlies another fixed panel 214 a generally T-shaped structural member 364 may be substituted for two generally L-shaped structural members which would otherwise be employed. It, in effect, is a single element of similar configuration to two adjacent L-shaped members. Drainage recess 366 provides access to passageway 368 to permit moisture discharge.

Turning now to the pivotable form of window 40 shown in FIG. 1, this type of window may be conveniently hinged so as to be adapted to rotate either about its horizontal or vertical central axis or, if desired, an axis displaced therefrom. As it forms no part of the invention per se, it will suffice to say that any conventional form of hinge construction which permits rotational movement may be employed. One suitable form would be a structure which employed a cylindrical boss projecting from opposed ends or sides of the window frame with the boss projections being received within cylindrical recesses in the stationary frame of the window. Alternate forms of hinges may be employed and numerous forms will be known to those skilled in the art.

Reference is now made to FIGS. 11 and 12 which illustrate the securement of the fixed frame for this type of window as well as the cross sectional configuration of both the fixed frame and the movable rotatable frame. Considering first FIG. 12 and the movable frame 370, it is noted that the frame has some features in common with the generally L-shaped structural mem-

ber 294 shown in FIG. 5 and employed to secure a fixed panel. The body portion of frame 370 rather than being of web like construction is of tubular generally rectangular construction having long sides 372 and short sides 374. A rearwardly disposed inwardly directed flange 376 is provided with a forwardly open glazing strip receiving recess into which glazing strip 378 is placed. Glazing bead 380 is of generally U-shaped configuration and has leg portions 382, 384 mechanically engaged with movable frame 370. A second glazing strip 386 is secured within glazing bead 380 with the glazing strips 378, 386 engaging, sealing and mechanically securing opposed surfaces of panel 388 adjacent the marginal edge thereof. The outer portion of the movable frame 370 has two pairs of adjacent parallel flanges 390 which cooperate to define a pair of outwardly open channels within which are disposed elongated outwardly directed gasket element 392.

The fixed frame portion 400 shown in FIG. 12 is of generally channel shaped configuration with re-entrant flange portions 402 so positioned as to be in contact with gasket elements 392 when the window is in closed position. These gasket elements are composed of a suitable resilient material having weather resistant characteristics and are partially resiliently compressed when the window is in closed position. The fixed frame may be secured to the adjacent structural component 404 by any suitable means such as the joining method illustrated in FIG. 12 wherein wooden element 406 is interposed and fasteners (not shown) are employed. Gasket elements 408 are preferably provided.

Referring now to FIG. 13, it will be seen that the movable frame member 374 is as described and illustrated in FIG. 12. The fixed frame member 400' is slightly modified in that it has a flat bottom section 410 and does not have rearwardly directed channel portions for receipt of gasket elements. It is noted that element 400' is received within the rearwardly disposed recess of mullion 6 against rear section 54. Thus, this form of window also is compatible with the mullion structure of this invention and the advantageous reduction in space devoted to fixed window frame elements and corresponding increase in sight line and window size may be obtained.

FIG. 11 is similar to FIG. 13 in that it shows a mullion 6 interposed between the fixed frame element 400' and an L-shaped member such as 252 which is the fixed frame for the rotating form of window secured to a mullion 6 of the type described above in FIG. 3 having components 50, 52. In between the two mullions 6 is secured a fixed panel 412 in the member described above. It will thus be appreciated that the rotating window structure may be employed in a wall construction employing the fixed panel assemblies and ventilating window assemblies of this invention.

Referring now to FIGS. 14 and 15, the header and sill portions of the fixed frame for the rotating window will be described briefly. In general, the fixed frame 414 is of the same configuration shown in FIG. 12. It is noted, however, that both the header 416 and the sill 414 fixed frame portions are secured, respectively, to overlying and underlying L-shaped structural members 418, 420. The overlying L-shaped structure secures the lower marginal edges of a composite insulating panel 422 and the lower portion secures the upper marginal edges of a transparent glass or plastic panel. In addition, the exterior portion of stationary frame sections

416, 414 have, respectively, weather guards 426 as does the exterior portion of movable frame 374. Each weather guard has an angularly downwardly directed first portion 428 and a depending vertical portion 430. All rain and snow impinging upon the overlying surface will be directed downwardly and away from the joint between the movable frame 374 and the fixed frame 414, 416. In addition, a weepage passageway 432 is provided within fixed frame 414 in order to provide a means of draining any water which might otherwise accumulate within the channel.

It will, therefore be appreciated that the building wall construction of this invention provides a unique system of wall components which economically facilitate the use of various combinations of fixed panels, inwardly and outwardly projecting ventilating windows and rotating windows in order to provide a wall construction which is both functional and aesthetically pleasing. The windows are provided with enlarged pane areas as a result of the mullions having recessed portions for securement of the fixed window frame elements of the ventilating windows and rotating windows. Effective means are provided for weepage and elimination of potentially harmful moisture accumulations within the structural components. Uniquely configured glazing beads and panel retaining clips cooperate with uniquely configured structural shapes to provide for both panel retention and the sealing thereof against entry of undesired rain, snow and other foreign matter. In addition, replacement of panels and glazing of panes from the interior or exterior of the building are facilitated. Also, a preferred form of gasket strip provides for improved retention properties.

It will further be appreciated that various materials may be employed in this invention. With a minimum number of cross sectional configurations of the basic structural components, a wide variety of wall assemblies may be constructed according to the requirements of a particular installation. The mullions and stationary and movable framing components are preferably made from a rigid material such as extruded aluminum. Also, desired decorative finishes may be provided on the mullions, panels, glazing beads, panel retaining clips and structural components. Decorative appearances are facilitated by the choice of materials. Where aluminum, for example, has been selected for the panel and/or structural components the materials may be anodized or otherwise decoratively finished. To the extent to which plastics are employed, the plastic may be of the desired color.

It will further be appreciated that the mullions of this invention provide means for ready expansion and contraction responsive to changes in thermal conditions in addition to providing load bearing characteristics and increased panel or pane sizes. Finally, the mullions are preferably provided with conduit means for confined vertical transport of accumulated fluids.

Whereas particular embodiments of the invention have been described above for purposes of illustration, it will be evident to those skilled in the art that numerous variations of the details may be made without departing from the invention as defined in the appended claims.

I claim:

1. A building wall assembly comprising a pair of spaced generally parallel vertically disposed hollow load bearing mullions,

each said mullion formed from a first elongated mullion element and a second elongated mullion element,

said first and second mullion elements each having a body portion, a rearwardly disposed flange extending transversely inwardly from said body portion and a forwardly disposed flange generally parallel to said rearwardly disposed flange extending transversely inwardly from said body portion to define a generally channel shaped mullion element,

each said first and second mullion element body portion having a generally Z-shaped configuration with a forward section, a rear section and a connecting transition section,

said mullion elements being secured to each other so as to permit relative longitudinal sliding movement responsive to expansion and contraction caused by changes in thermal conditions,

each said mullion element body portion having at least one rearwardly disposed outwardly facing recessed portion,

said generally channel shaped mullion elements disposed with their openings facing each other with said flanges cooperating to define a closed hollow mullion,

one of said flanges of said first and second mullion elements terminating in a transversely inwardly open channel and an adjacent flange of the other said mullion element having a tongue portion extending into said channel,

each said mullion having fixedly secured thereto a substantially rigid generally L-shaped framing member having a first portion disposed adjacent one said mullion body portion with at least a portion thereof extending into said rearwardly disposed recessed portion and a second portion disposed generally perpendicular to said first portion and projecting away from said mullion element body portion,

said generally L-shaped framing member disposed in contact with said rear section, whereby said first portion of said generally L-shaped framing member is at least partially recessed with respect to the outer surface of said forward section,

said recessed portion and said first portion of said generally L-shaped framing member being so configured as to provide a first relative position wherein said first portion is at least partially received within said recessed portion with said second portion projecting from the rear portion of said first portion and a second position wherein said first portion is at least partially received within said recessed portion with said second portion projecting from the forward portion of said first portion, whereby said assembly may permit panel replacement either from the interior side or exterior side of said wall assembly,

said generally L-shaped framing member having said second portion positioned adjacent a marginal portion of said panel,

first panel retaining means cooperatively associated with said generally L-shaped framing member securing a panel to said hollow load bearing mullion,

a first compressible gasket element secured to said second portion in contact with a surface of said panel,

said first portion of said L-shaped member having recesses for receipt of a panel retaining clip, said first panel retaining means having a panel retaining clip secured to said L-shaped member, a second compressible gasket secured to said panel retaining clip with said gasket in contact with a surface of said panel, and second panel retaining means generally horizontally disposed securing horizontal marginal portions of said panel and having ends secured to said mullions, whereby said panel is substantially continuously secured in position by said L-shaped framing member and said first and second panel retaining means and is supported by said mullions.

2. The building wall assembly of claim 1 wherein an upwardly open weepage channel is integrally formed within said second panel retaining means and extends to at least one said adjacent mullion, said weepage channel being substantially continuous between adjacent mullions, a passageway through said mullion wall aligned with said weepage channel to permit water flowing in said channel to pass through said mullion wall and into the hollow interior of said mullion, and a sill element underlying and supporting said mullion adapted to receive water flowing downwardly within said hollow mullion and discharge the same exteriorly of said wall structure, whereby water received within said weepage channel will be transported generally horizontally within said channel to said adjacent mullion which will transport said water generally vertically to said sill.

3. The building wall assembly of claim 2 including a vertically disposed tubular weepage conduit defined within the interior of said hollow mullion and formed integrally with said mullion, and said vertically disposed weepage conduit communicating with said horizontal weepage channel through said mullion passageway, whereby weepage water entering the interior of said mullion will be confined within said conduit.

4. The building wall assembly of claim 1 including said first portion of said L-shaped member being substantially completely disposed within said rearwardly disposed mullion body recessed portion.

5. A building wall assembly comprising a pair of spaced generally parallel vertically disposed hollow load bearing mullions, each said mullion formed from a first elongated mullion element and a second elongated mullion element, said first and second mullion elements each having a body portion, a rearwardly disposed flange extending transversely inwardly from said body portion and a forwardly disposed flange generally parallel to said rearwardly disposed flange extending transversely inwardly from said body portion to define a generally channel shaped mullion element, each said first and second mullion element body portion having a generally Z-shaped configuration with a forward section, a rear section and a connecting transition section, each said mullion element body portion having at least one rearwardly disposed outwardly facing recessed portion,

said generally channel shaped mullion elements disposed with their openings facing each other with said flanges cooperating to define a closed hollow mullion, each said mullion having a substantially rigid generally L-shaped framing member having a first portion disposed adjacent one said mullion body portion with at least a portion thereof extending into said rearwardly disposed recessed portion and a second portion disposed generally perpendicular to said first portion and projecting away from said mullion element body portion, said generally L-shaped framing member disposed in contact with said rear section, whereby said first portion of said generally L-shaped framing member is at least partially recessed with respect to the outer surface of said forward section, first panel retaining means cooperatively associated with said generally L-shaped framing member securing a panel to said hollow load bearing mullion, one of said flanges of said first and second mullion elements terminating in a transversely inwardly open channel and an adjacent flange of the other said mullion element having a tongue portion extending into said channel, said mullion elements being secured to each other so as to permit relative longitudinal sliding movement responsive to expansion and contraction caused by changes in thermal conditions, said generally L-shaped framing member having said second portion positioned adjacent a marginal portion of said panel, a first compressible gasket element secured to said second portion in contact with a surface of said panel, said first portion of said L-shaped member having recesses for receipt of a panel retaining clip, said first panel retaining means having a panel retaining clip secured to said L-shaped member, a second compressible gasket secured to said panel retaining clip with said gasket in contact with a surface of said panel, second panel retaining means generally horizontally disposed securing horizontal marginal portions of said panel and having ends secured to said mullions, whereby said panel is substantially continuously secured in position by said L-shaped framing member and said first and second panel retaining means and is supported by said mullions, an upwardly open weepage channel defined within said second panel retaining means and extends to at least one said adjacent mullion, a passageway through said mullion wall aligned with said weepage channel to permit water flowing in said channel to pass through said mullion wall and into the hollow interior of said mullion, a sill element underlying and supporting said mullion adapted to receive water flowing downwardly within said hollow mullion and discharge the same exteriorly of said wall structure, a vertically disposed weepage conduit disposed within the interior of said hollow mullion and communicating with said horizontal weepage channel through said mullion passageway, whereby weepage water entering the interior of said mullion will be confined within said conduit,

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said weepage conduit integrally formed with one said mullion element, and vertical splice joints between a pair of vertically axially aligned weepage conduits by means of a tubular splice element received partially within each of 5

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said conduits, whereby relative sliding movement responsive to thermal expansion and contraction is permitted.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,844,077 Dated October 29, 1974

Inventor(s) Lawrence T. Vance

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In item [76] on the first page, delete "Rd., Pittsburgh, Pa." and insert --Neck Rd., Merrick, New York--

Col. 1, line 8 Change "3678,625" to --3,678,625--

Col. 4, line 12 Change "The" to --The--

Col. 4, line 63 After "receiving" delete "a"

Col. 12, line 51 After "the" change "member" to --manner--

Signed and sealed this 21st day of January 1975.

(SEAL)

Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents