ABSTRACT OF THE DISCLOSURE

In an insulated curtain wall construction having a horizontal structural frame member carrying a panel-backing member, a panel with an edge disposed between said panel-backing member and a panel-retaining member, a connector member bridging the space between said backing member and said retaining member and joining said backing and retaining members in assembled relation, and insulating material spaced said connector member from adjacent portions of said backing member, the improvement comprising a gutter flange carried on said retaining member and means of egress from said gutter flange to the exterior side of the wall for the purpose of weeping moisture and condensation from between said backing and retaining members.

BACKGROUND OF THE INVENTION

This invention relates to a wall construction and, in particular, to a novel division bar construction for weeping water from between the framing members of an insulated curtain wall.

In copending application, Ser. No. 671,270, assigned to the assignee of the present invention, there is disclosed an insulated curtain wall construction having horizontal and vertical members interconnected to form a frame with each frame member having an inwardly directed longitudinal mounting groove and means for supporting glazing strips. A panel is supported within each groove in engagement with a connector member. Each connector member has a first portion spaced from its associated framing member by the insulating material and a second portion extending forwardly and laterally out of the mounting groove and having formed on its distal end means for electrically securing thereto a panel-retaining member. A panel-retaining member is secured to the second portion of the connector member and has means formed in its opposite longitudinal edges for supporting glazing strips. A panel is disposed between the horizontal and vertical members and the panel-retaining members, and insulating glazing strips are disposed between the panel and the frame members and between the panel and the panel-retaining members to provide a thermally insulated wall construction.

The present invention is an improvement on the insulated wall construction disclosed in the above-mentioned copending application. The present invention provides an efficient weep system for the above-described wall structure by utilizing a panel-retaining member having a gutter flange and means of egress from said gutter flange to the exterior side of the wall for the purpose of removing water from interiorly of the panel-framing members. Implementing this gutter flange structure, the present invention also contemplates the use of a bridge member at each joint or intersection of a horizontal and vertical panel-framing member, as well as a dam member at the end of each gutter flange and a water stop member that prevents water from passing over the top of the gutter flange and thence rearwardly to the interior side of the wall structure where damage to interior furnishings, fixtures or the like could occur.

The foregoing and other features and advantages of this invention will be better understood when reference is had to the accompanying drawings, wherein similar parts are usually designated by the same numeral and in which:

FIG. 1 represents an outside elevation of a typical curtain wall constructed in accordance with the present invention;

FIG. 2 is a typical cross-section along the line II—II of FIG. 1 showing details of a horizontal framing member constructed in accordance with the present invention;

FIG. 3 is a typical cross-section along the line III—III of FIGS. 1 and 4 showing a side view of intersection or joint details of a framing system constructed in accordance with this invention;

FIG. 4 is a typical cross-section along the line IV—IV of FIG. 3 showing a top view of intersection or joint details of a framing system constructed in accordance with this invention;

FIG. 5 is a typical cross-section along the line V—V of FIG. 3 showing details of a vertical framing member constructed in accordance with the present invention; and

FIG. 6 is a front elevation of a joint intersection showing details of a typical expansion joint for a horizontal panel-retaining member of this invention, and wherein horizontal and vertical cover members have been removed for the sake of clarity.

The curtain wall 10, depicted in FIG. 1, consists of a plurality of panels 12, which are separated and supported along their peripheral edges by horizontal and vertical panel-framing members or grid members 14 and 16 of substantially identical cross-section. The vertical frame member shown in part at 18 in FIG. 5 is a split member. Split members are frequently employed to accommodate expansion in the walls of a building. For the purpose of the present invention, however, the frame member 18 may also be a one-piece extrusion or it may be a sectionalized member of cross-sectional configuration somewhat different from that shown in FIG. 5. In addition, unitary and/or sectionalized frame members 18 can be used in any desired combination. Notwithstanding the above, the essential requirements of the horizontal and vertical members 14 and 16 of the present invention are the same, and, thus, for the purpose of the following description, reference may be had to either FIG. 2 or 5 for details that are common and essential to both members.

Although FIG. 1 is intended to show horizontal and vertical framing members supporting a plurality of panels covering a complete wall section, it will be appreciated from the following description of the present invention is equally well adapted to single or multiple panel constructions. The panels 12 may be of an insulating or non-insulating type and of any suitable material or construction.

Referring to FIG. 1, horizontal framing members 14 and vertical framing members 16 are joined to form a rigid structural frame or framework. With particular reference being had to FIGS. 2 and 5, the horizontal and vertical framing members 14 and 16 are each composed essentially of a metal panel-backing member 18, insulating material 20, a metal connector 22, and a metal clamp member or panel-retaining member 24 to which connector 22 is adjustably joined. The metallic panel-backing member 18 and panel-retaining member 24 are spaced from an interposed panel member 12 by means of insulating glazing strips 26. The panel-retaining member 24, in the embodiment shown, is attached to connector member 22 by screw fasteners 28 and, in addition, is provided with a longitudinally extending gutter flange 30 and a pair of longitudinally extending ribs or flanges 32 over which a cover or cap member 32 is snapped into place.
3. Referring specifically to FIGS. 2 and 5 for further details, panel-backing member 18 is an elongated member composed of a tubular or channel-shaped structural frame or stiffening portion 34 that imparts rigidity and strength to the framing member and that carries thereon a panel-backing member or portion 36 which may be either formed integrally with the stiffening portion 34 or may be a separate member joined to the stiffening portion 34.

In the embodiment shown, panel-backing portion 36 is formed integrally with the stiffening portion 34 and comprises a pair of integral flanges 38 extending from the web 35 of stiffening portion 34. Panel-backing member 18 and panel-backing portion 36 each having a structure formed thereon, such as longitudinally extending flanges 40 that carry longitudinally extending grooves 42, adapted to support insulating glazing strips 26. Between longitudinally extending langes 38 and 40 and web 35, there is provided an inwardly directed, longitudinally extending C-shaped groove 44 which receives and retains one or more insulating members 20 and one or more connector members 22. Thus, it is contemplated that the insulating members 20 and/or connector members 22 may be continuous members that are essentially coextensive with the length of C-shaped groove 44 or one or both may comprise members of relatively shorter length, e.g., 1 1/2 inches to 4 inches, appropriately spaced along the length of C-shaped groove 44 and joined in assembled relation.

C-shaped groove 44, as aforementioned, is formed by longitudinally extending flanges 38 and 40 and web 35 or stiffening portion 34 of the panel-backing member. Flanges 40 extend toward each other from the free ends of flanges 38. The free ends of flanges 40 are in opposed, spaced relation to each other and provide means for positively resisting disengagement of insulating members 20 from C-shaped groove 44. The opening or access 46 into C-shaped groove 44 between flanges 40 provides means for extending connector member 22 forwardly or outwardly from the C-shaped groove 44 of panel-backing member 18. As shown, access opening 46 is larger than the corresponding linear dimension of the proximate portion of stem 48 of connector member 22 so that in the installed position of the connector member 22 there is no physical contact between connector member 22 and panel-backing member 18. As shown in FIG. 2, horizontal member 14 also has a longitudinally extending flange 41 extending forwardly or outwardly of panel-backing member 18 for the free end. Flange 41 is provided to support one or more conventional setting blocks 43 disposed between the lower edge surface of a panel 12 and the upper surface of flange 41.

Insulating member 20 shown in FIG. 2 is a generally C-shaped member of natural or synthetic rubber or other relatively low thermal connectivity insulating material that essentially corresponds in outer peripheral shape and size to the peripheral shape and size of C-shaped groove 44. Insulating member 20 shown in FIG. 5 is a similarly shaped and constructed member to that mentioned above except that, as shown, it is longitudinally split into two symmetrical halves. This split arrangement for insulating member 20 is preferred when it is desired to use relatively short or discontinuous lengths of the insulating member in connection with split vertical members. As will be apparent, each half of insulating member 20 may be properly positioned and cemented in place on corresponding half of vertical member prior to their being brought into assembled relation. By proceeding in this manner, any difficulty that might otherwise be encountered in supporting relatively short lengths of insulating member 20 in a vertical groove 44 is avoided.

C-shaped insulating member 20 has a longitudinally extending C-shaped groove 50 formed therein. In its installed position, the opening 52 into C-shaped groove 50 of insulating member 20 corresponds in location to the opening 46 in C-shaped groove 44 of the panel-backing portion 36 of the panel-backing member for the purpose of receiving connector member 22. C-shaped groove 50 of insulating member 20 essentially corresponds in shape and size to the outer peripheral shape and size of the companion portion 54 of connector member 22 which, as shown, is securely received and retained by insulating member 20.

Connector member 22 is an elongated metal member of essentially uniform cross-section, in the embodiment shown, has an interlocking or bulbous end portion 54 that essentially corresponds in outer peripheral shape and size to the shape and size of C-shaped groove 50 of insulating member 20. Integrally formed with the interlocking portion 54 of connector member 22 is a stem portion 48 that extends forwardly and outwardly from insulating member 20 and has a screw groove 56 formed in its distal end for the purpose of securing thereto panel-retaining member 24.

As should be apparent, interlocking portion 54 of connector member 22 need not necessarily assume the precise shape shown and other interlocking shapes than that shown are considered to be within the contemplation of this invention as well as the invention disclosed in co-pending application Ser. No. 671,270. In addition, insulating member 20 need not necessarily assume the precise shape shown and, in fact, as shown in the co-pending application Ser. No. 671,270, it is contemplated that insulating member 20 or insulating material of any shape could be molded onto or about or otherwise structurally associated with one end of connector member 22 so that metal connector member 22 can be supported on backing member 18 and spaced therefrom by insulating material.

The panel-retaining member 24 of the present invention is essentially an elongated clamp member having formed on opposite longitudinal edges thereof a structure, such as grooves 58, adapted to support insulating glazing strips 26. Intermediate said longitudinal edges there is provided on said retaining member 24 a longitudinally extending gutter or angle flange 60, which, in the installed position of retaining member 24, preferably engages with or is only separated a short distance from the surface or distal end of connector member 22 that has formed therein the opening to screw groove 56. Suitable apertures (not shown) are provided in panel-retaining member 24 for the purpose of adequately securing panel-retaining member 24 to connector member 22 and relative to panel-backing member 18 by means of screw fasteners 28 extending through said apertures and received in screw groove 56. Also formed at or near the longitudinal edges of panel-retaining member 24 is a side opposite that which is adapted to carry insulating glazing strips 26, are longitudinally extending flanges or ribs 30 over which a metal cover or cap member 32 is snapped and securely locked into place. Cover or cap members 32 can be of almost any desired shape, finish, color and depth of section. In the embodiment shown, cover member 32 is a U-shaped channel member having a web 31 that presents a flat outer surface parallel to the curtain wall panels and a pair of flanges 33 that present flat side surfaces which are coplanar with the side surfaces of the horizontal and vertical stiffening members.

Referring more particularly to FIGS. 2, 3 and 6, panel-retaining member 24, as used in combination with horizontal member 14, is disposed so that angle or gutter flange 60 defines with back surface 62 of panel-retaining member 24 an upwardly open U-shaped channel. As shown, in the installed position of horizontal panel-retaining member 24 this U-shaped channel receives the free end of the surface 64 of the panel 12 extending rearwardly of surface 62 along the plane of the back surface of panel 12. Formed on the free end of gutter flange 60 is a longitudinally extending, forwardly directed flange 66 which, as viewed in FIG. 3, supports thereon the lower half of an elongated reverse S-shaped water stop member 68. The upper half of this reverse S-shaped water stop member extends between the free
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end of gutter flange 60 and the lower surface of elongated flange 41 to prevent water from passing over the top of gutter flange 60 and thence rearwardly to the interior side of the wall structure. Reverse S-shaped water stop member 68 is preferably cemented to flange 66 by means of a conventional adhesive prior to placing horizontal panel-retaining member 24 in its installed position. Disposed at each end of gutter flange 60 and preferably cemented thereto is a water dam member 70 that essentially comprises a U-shaped channel member corresponding in exterior size and shape to the interior surfaces of U-shaped gutter 64 and having an end wall or web closing one end of the dam member.

As shown in FIG. 2, web holes comprising spaced apertures 72 are located in web 74 of horizontal panel-retaining member 24 immediately above the juncture of angle flange 60 with web 74. As also shown in FIG. 2, additional web holes or apertures 76 and 78 are also provided in the lower rib or flange 30 of horizontal panel-retaining member 24 and the lower one of the pair of flanges 33 of cover member 32. Apertures 72 and apertures 76 and 78 are preferably staggered with respect to each other to provide a continuous but tortuous path for water flowing from gutter 64 to the exterior side of the wall structure.

Referring to FIGS. 3, 4, and 5, there is shown a bridge member 80 provided at each intersection of a vertical frame member 16 with a horizontal frame member 14. Bridge member 80 is provided for the purpose of preventing water from the vertical frame members into the gutter 64 provided on the horizontal frame members and thence through apertures 72, 76, and 78 to the exterior side of the wall. Bridge member 80, as best shown in FIGS. 3 and 4, comprises a longitudinally extending integral member having a vertical flange 82, a horizontal flange 84, an upwardly open U-shaped gutter channel 86 formed on the free end of a vertical web or wall 87 that divides bridge member 80 transversely into two halves, a vertical flange 82, as shown in FIG. 4, has its vertical edges disposed between flanges 40 and glazing strips 26 of vertical panel-backing member 18. Horizontal flange 84 extends longitudinally of bridge member 80 beyond the longitudinal extremity of vertical flange 82 and beyond the sides of vertical panel-backing member 18, and is supported in overlapping relation on the upper surface of flange 41 of horizontal panel-backing member 18. U-shaped gutter channel 86 of bridge member 80 is coextensive in length with horizontal flange 84 of bridge member 80 and is disposed above and in overlapping relation with gutter 64 of horizontal panel-retaining member 24, as well as dam member 70 and water-stop member 68, are all preferably composed of a synthetic resinous material, such as rigid vinyl or the like.

FIG. 6 shows a front elevation of a typical expansion joint for a horizontal panel-retaining member of this invention. It will be noted that in FIG. 6 horizontal and vertical cover members 32 have been removed for the sake of clarity, and only the dashed profiles of these members, as indicated by reference numeral 32', have been shown. It will also be understood that treatment at intermediate vertical members where no expansion joint occurs is identical except for the joint in the horizontal panel-retaining member and the inclusion of dam members. Referring then to FIG. 6, at each intersection the vertical panel-retaining member 24 is discontinuous and terminates just short of the horizontal panel-retaining member. Horizontal panel-retaining member 24 passes through or between the vertical panel-retaining member at the center of each expansion joint is discontinuous to provide sufficient space for expansion. Generally, such an expansion joint should occur at least every 16 to 20 feet. Flanges or ribs 30 provided on the horizontal panel-retaining member for the purpose of supporting self-on cover member 32 are milled off on the horizontal panel-retaining member to permit the vertical cover member to pass therebetween. As will be noted by their profiles, on each side of an intersection, horizontal cover member 32 terminates short of vertical cover member 32 to provide for its expansion coincident with the expansion of the horizontal panel-retaining member to which it is secured. A flashing member, not shown, that generally conforms in shape to the profile of the outer surface of the horizontal panel-retaining member is preferably adhered by an elastic bonding medium in bridging relation across each expansion joint to prevent penetration of water through the expansion joint to the interior side of horizontal panel-retaining member 24.

It will be appreciated from the foregoing that, among other novel features, the construction of this invention provides for the ultimate in both performance and design capability of a weep system for use in connection with an insulated curtain wall construction such as that disclosed in copending application Ser. No. 671,270. By reason of the fully integrated use of a gutter flange on the horizontal panel-retaining members, in combination with a unique bridge member, water dam and water stop member, there is provided a continuous weep system that assures complete water control in all horizontal and vertical panel-framing members. Also, the curtain wall system of this invention provides for full expansion and contraction of all panel-retaining members, while completely maintaining the integrity of its novel weep system.

While the preferred embodiment of this invention has been illustrated and described, it will be understood that various changes and modifications in the materials, structural shapes, arrangement of parts and components within the range of equivalents of those specifically mentioned may be made without departing from the spirit of the invention.

What is claimed is:

1. An insulated curtain wall construction having a horizontal panel-backing member with a longitudinal mounting groove, a panel with an edge disposed between said panel-backing member and a panel-retaining member, a connector member mounted within said groove and joining said backing and retaining members in assembled relation, and insulating material spacing said connector member from adjacent portions of said backing member, the improvement comprising a gutter flange carried on said retaining member and means of egress from said gutter flange to the exterior side of said retaining member for the purpose of weeping moisture and condensation from between said backing and retaining members.

2. An insulated curtain wall construction according to claim 1 wherein said panel-retaining member comprises an elongated member having formed on opposite longitudinal edges thereof a structure adapted to support insulating glazing strips and said gutter flange comprises an angle flange located intermediate said supporting structure and providing with said elongated member an upwardly open gutter.

3. An insulated curtain wall construction having a horizontal structural frame member carrying a panel-backing member, a panel with an edge disposed between said panel-backing member and a panel-retaining member, a connector member joining said backing and retaining members in assembled relation, insulating material spacing said connector member from adjacent portions of said backing member, a gutter flange carried on said retaining member, means of egress from said gutter flange to the exterior side of the wall for the purpose of weeping moisture and condensation from between said backing and retaining members, a vertical panel-backing member and a vertical panel-retaining member joined in assembled relation with an edge of said panel disposed therebetween, said vertical panel-backing and panel-retaining members forming an intersection with said horizontal panel-backing and panel-retaining members, a horizontally
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7. A disposed bridge member supported in said intersection between said horizontal panel-backing and panel-retaining members comprising a longitudinally extending integral member that spans the width of said vertical members and is disposed in overlapping relation with said gutter flange carried on said horizontal panel-retaining member, said horizontal and vertical panel-backing members each having a longitudinal mounting groove defined by a web and a pair of spaced flanges extending from said web toward said panel with each said flange carrying a further flange on its free end, said further flanges having their free ends in opposed, spaced relation to each other means formed on said further flanges adapted to support an insulating glazing strip, said further flanges on said horizontal panel-backing member being disposed in an upper and lower position, respectively, and the upper one of said further flanges carries on its free end a longitudinally extending setting block flange that extends transversely of the edge surface of said panel.

4. An insulated curtain wall construction according to claim 3 wherein said bridge member comprises a vertical flange connected to a horizontal flange, an upwardly open channel formed on the free end of said horizontal flange and a vertical web that divides said bridge member transversely into two halves.

5. An insulated curtain wall construction according to claim 4 wherein said vertical flange of said bridge member is supported on said further flanges of said vertical panel-backing member and said horizontal flange of said bridge member is supported on the upper surface of said setting block flange of said horizontal panel-backing member.

6. An insulated curtain wall construction according to claim 5 wherein said vertical panel-retaining member carrying said gutter flange is discontinuous across said intersection to provide for expansion and a dam member supported on said gutter flange closing the end thereof at said discontinuity.

7. An insulated curtain wall construction according to claim 6 wherein said gutter flange is an angle flange that provides an upwardly open gutter and a water stop member that is essentially coextensive in length with said horizontal panel-retaining member bridges a space between the free end of said angle flange and said setting block flange on said horizontal panel-backing member.

8. A structural support for a curtain wall comprising horizontal and vertical panel-backing members interconnected to form a frame, with each panel-backing member having a longitudinal mounting groove and means formed on opposite longitudinal edges thereof to support insulating glazing strips, insulating material supported within said groove in engagement with a connector member having a first portion spaced from said panel-backing member by said insulating material and a second portion extending forwardly and outwardly of said mounting groove and having formed, on its distal end, means for securing thereto a panel-retaining member, a panel-retaining member secured to said second portion of said connector member, said panel-retaining member being an elongated member having means formed on opposite longitudinal edges thereof to support insulating glazing strips, the horizontal panel-retaining member having an elongated angle flange located intermediate said supporting means to provide with said elongated member an upwardly open gutter, means providing egress for water from said gutter to the exterior side of said horizontal panel-retaining member, a panel disposed between said panel-backing members and said panel-retaining members and insulating glazing material disposed between said panel and said backing and retaining members.

9. An insulated curtain wall construction according to claim 8 which further includes a horizontally disposed bridge member supported at an intersection of said frame members and comprising an upwardly open channel member that extends widthwise of the vertical panel-backing member and is disposed in overlapping relation with the gutter flange carried on the horizontal panel-retaining member.

10. An insulated curtain wall construction according to claim 9 wherein the horizontal panel-retaining member carrying said gutter flange is discontinuous across said intersection to provide for expansion and a dam member is supported on said gutter flange closing the end thereof at said discontinuity.

11. An insulated curtain wall construction according to claim 10 wherein each panel-retaining member has formed on the side thereof, opposite that which is adapted to carry insulating glazing strips, means for supporting a cover member and a cover member is affixed to said cover member supporting means, the horizontal cover member having means providing egress therefrom to the exterior side of the wall.

12. A wall construction comprising horizontal and vertical panel-backing members joined with horizontal and vertical panel-retaining members and having edge portions of a panel disposed therebetween, said vertical members forming an intersection with said horizontal members, an elongated gutter flange supported between said horizontal members, means of egress from said gutter flange to the outside of said wall, an upwardly open channel member supported in said intersection and between said panel-backing and panel-retaining members, said channel member extending widthwise of said vertical members and being disposed in overlapping relation with said gutter flange.

13. A wall construction according to claim 12 wherein said horizontal panel-retaining member has formed thereon means for supporting a cover member and a cover member is affixed to said cover member supporting means, said cover member having means providing egress therefrom to the outside of said wall.

14. A wall construction according to claim 12 wherein said horizontal panel-retaining member comprises an elongated member having formed on opposite longitudinal edges thereof a structure adapted to support insulating glazing strips and said gutter flange comprises an angle flange located intermediate said supporting structure and providing with said elongated member an upwardly open gutter.

15. A wall construction according to claim 14 wherein said horizontal panel-retaining member carrying said gutter flange is discontinuous across said intersection and a dam member is supported on said gutter flange closing the end thereof at each discontinuity.

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