EXTERNAL SHEATHING OR CURTAIN WALL

FIG. 10
EXTERNAL SHEATHING OR CURTAIN WALL
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This invention relates to external sheathing or curtain walls for buildings having a structural framework and, more particularly, to an improved and simplified sheathing or curtain wall comprising modular panels incorporated in an assembly of interfitting parts constituting the secondary framework, which allows the fitting of the parts which may be assembled including novel means for draining water to the exterior surface of the sheathing or curtain wall. It has become common practice in the construction of modern buildings to erect a steel or reinforced concrete framework and then to enclose this framework in an external sheathing or curtain wall comprising panels and window frames assembled to the components of the framework. In the case of known constructions of this type, sealing against the entrance of moisture flowing over the interior surface of the curtain wall or sheathing, has been obtainable only by the use of plastic joints. Furthermore, special fittings have been needed to mount the curtain walls on the framework, and these fittings severely limited the application of prefabricated panels in the erection of a building.

The principal object of the invention is to provide such an external sheathing or curtain wall in which rain water, drain water, or condensation is forced to drain off along the exterior surfaces of the curtain wall without being able to enter into the interior of the building or onto the interior surfaces of the curtain wall, said results being obtained by the geometrical shape of the secondary framework means.

A particular advantage of the present invention is the ability to obtain novel decorative effects without impairing any of the structural advantages of the invention curtain wall or sheathing. Another object of the present invention is to provide curtain wall or external sheathing as an assembly of interfitting parts from the interior of the building, without using external sheathings.

In accordance with the present invention, the foregoing objects are obtained by using panels which have longitudinal and vertical dimensions equal to multiples of a common modulus such as, a modulus of 25 cm. to 35 cm., for example. This makes possible to juxtapose these panels vertically or horizontally, in vertical planes, and to erect them in such a manner that the required apertures may be provided, for windows and the like, in accordance with the construction plans. This freedom of juxtaposition of the panels can be used wherein there is a provision of horizontally extending water deflecting strips inasmuch as the vertical fittings on the panels act merely as positioning components and may be formed appropriately to channel condensation, or inadvertently infiltrating water, to the nearest horizontally extending rail in the form of a water deflecting strip. In accordance with the invention, the planar projection of the several rails or rain deflecting strips lying in a generally horizontal plane represents a substantially continuous band. Although effective sealing against the entrance of moisture, rain water, drainage water, and condensation can be effected by the shape of the vertical fittings and of the horizontal deflecting strips, without the use of plastic joints, plastic strips nevertheless may be advantageously used in erecting the sheathing or curtain wall. These strips may be arranged in spaced relation along certain lengths of the horizontally extending rails, or in a continuous manner along the vertically extending components, so as to prevent excessive infiltration of air, but primarily for the purpose of preventing any metal to metal contact between the panels themselves and the rails.

Nevertheless, it is desirable to maintain limited air circulation along the horizontally extending water deflectors or drains so as to prevent any undesirable condensation between the outer panels and the inner panels arranged in parallel relation to the outer panels. A curtain wall designed in this manner can be conveniently designated as a "breathing curtain wall." The water does not fall off the surface of the panels mounted on the framework. Rather, it flows or trickles along the outer surface of the panels and over a very slight portion, if any, of the interior surface thereof before it encounters the horizontal rain deflector which returns the water to the outer surface of the panels.

For preventing efficiently the condensation of moisture, it is advantageous to spray on the inner surface of the panels a layer of an inert material containing asbestos, which moreover makes the panels soundproof.

The secondary framework formed by the water deflecting rails and the vertically extending positioning components furthermore acts as a sole support for the curtain wall. This secondary framework may be disposed over the primary framework of steel, reinforced concrete and the like of the conventional type and which does not, per se, come within the scope of the invention.

In an alternative embodiment of the invention, outward flow of water to the external surface of the curtain wall is facilitated to an advantageous degree by vertically extending profiled and hollow posts or struts each including a vertical channel on each of a pair of parallel faces, with these vertical channels returning all water that may have managed to pass through the conventional seal to the rain deflecting or water deflecting rails situated immediately beneath the components or struts, such water being impossible entering due to the failure of a seal through weaknesses, aging, deformation due shock or the like.

For an understanding of the principles of the invention, reference is made to the following description of typical embodiments thereof as illustrated in the accompanying drawings.

In the drawings:

FIG. 1 is a partial external view of one wall of a building equipped with the curtain wall of the invention, and illustrating one possible ornamental arrangement of the panel;
FIG. 2 is a partial vertical sectional view of two vertically adjacent panels in operative association with the horizontally extending rail assembly which deflects water;
FIG. 3 is a partial perspective view of a front rail of the water deflecting rail member;
FIG. 4 is a partial horizontal sectional view taken along b--b of FIG. 2, of a pair of horizontally adjacent panels in operative association with a vertical component closing the space between the panels;
FIG. 5 is a partial external perspective view of a vertical fitting;
FIG. 6 is a perspective view of fitting fastening means;
FIG. 7 is an enlarged horizontal sectional view of a vertical fitting provided with springs;
FIG. 8 is a partial vertical sectional view of a water deflector;
FIG. 9 is a horizontal sectional view of a fitting equipped with upper and lower fastenings (detail of FIG. 4) and FIG. 9A is a perspective view of said fastenings;
FIG. 10 is a partial perspective view of the exterior of the curtain wall, some parts being cut to simplify the illustration;

and FIG. 11 is a view similar to FIG. 10, but showing the interior side of the curtain wall.

In applying the invention, the example chosen for illustration is a multi-level building having curtain wall panels which may be of enameled steel sheet and the framework components of stainless steel, although it should be understood that the panels and other parts may be made of any suitable material since a change in the material and various materials is encompassed by the scope of the invention.

Referring first to FIG. 1, the building therein illustrated is shown as having four levels. The quadrangular panels of the curtain wall have horizontal and vertical dimensions which are multiples of the same modulus M, such as 30 cm. Some panels are square and some are elongated, but all are related to the same modulus M. This relation of the horizontal and vertical dimensions of the panels, or stated another way, the relation of the longitudinal and transversal dimensions of the panels, makes it possible for the panels to be oriented either vertically with the larger dimension extending vertically, or horizontally with the larger dimension extending horizontally. Thus, the square panels P and the elongated rectangular panels P can be disposed in accordance with the particular architectural plans. The curtain wall is characterized by horizontally extending water deflecting moulding or rails such as H' and, viewed in horizontal plan as in the direction of the arrow Z, these water deflecting moulding or rails form continuous bands, while the continuous bands may not extend over the full length or width of the building, they do extend over substantial portions of the length or width.

As stated, FIG. 2 is a vertical section view through a pair of vertically adjacent panels P and P' shaped from a thin steel sheet. All these panels have identical shape and size, whatever may be the modulus, and their assembly provides the curtain wall or external sheathing according to the invention. Each panel P or P' comprises a vertical outer wall which is bound by an inwardly diverging peripheral flange p' terminating in a peripheral lip L or L' substantially parallel to the outer wall of the panel P or P'. The lips L and L' are vertically adjacent panels which lie one under the other in the same vertical plane, but are separated or spaced from each other to provide for air flow to counteract condensation of moisture between the outer panels and the inner panels of the building. The width of the free space between lips L and L' determines the vertical extent of the panels L and L'. The lower joint 9 of the panel P' (see FIG. 8) is provided so as to prevent any metal to metal engagement and to provide at the basis of said panel P', an air inlet to counteract condensation between said panels and the inner parallel panels, and to drain the waters which would infiltrate on the inner surface of the panels. The upper joint 9' of the panel P' (FIG. 8) prevents any seeping of the rain water on the slope P' of the panel P'.

The vertical edges L, L' of each panel are positioned and maintained in the same plane by at least two vertical posts or components 2 or 2'. These posts 2, 2' extend generally perpendicularly of the curtain wall and serve for positioning or locating the panels in a vertical direction.

Each vertical post is positioned horizontally by square holes 4d regularly spaced and formed, according to the chosen modulus, on the core 4c of the horizontal rail (FIG. 4). The water deflecting rails (FIG. 3) are formed so as to provide an outwardly sloping shelf 3e the external lip of which being vertically and downwardly bent as a front rail 3b, overlapping and guarding the upper lip L' of the lower adjacent panel P'.

The shelf 3c has on its inner surface an upwardly extending and downwardly opening U-shaped flange 3c overlapping the outer flange 4b of a horizontal support shown as a channel or moulding 4. The water deflector, when positioned, is held in position by fastening members 5 (FIG. 6), notches 5d of said fastening members interfiting with the flange 3c and preventing any shifting of the pieces. Though the water deflector 3 is only partially illustrated on the drawings, it is understood that it extends over the whole length of the horizontal edges of the panel P', as an inventive feature.

Referring to FIGS. 4 and 5, the juncture between a pair of horizontally adjacent panels P and P' is masked by a T-shaped element 2a-2b having a stem-like part 2c-2c'. The width of the vertical gap between the lips L1 and L1' is the same as the width of the vertical post. Said panels are assembled by the vertical post 2. Said fastening member (see FIG. 5) is formed from a thin steel sheet; it is generally hollow and generally T-shaped, as previously noted. The lateral parts 2a and 2b of its hollow head act as a butt strap while the parallel surfaces 2c and 2c' extend normally to the panels; each of said surfaces terminates in a vertical gutter 2d, 2d' the convex outer surface of which engaging the vertical U-shaped flange 3c of the water deflecting rail 3. Said gutters deflect and guide to the adjacent inclined lower rail 3 any water which may have leaked past a conventional joint, due for instance to a breaking, wearing, decay, deformation or the like.

Said vertical posts are fixed by fastening members 5.

Each of the members (FIG. 6) is made of two resistance welded sheet steel flanges, and comprises:

(a) A double sheet steel web 5b;
(b) Two transversal front flanges 5a and 5a', perpendicular to said web 5b;
(c) Two transversal rear flanges (5c).

The rear flanges of the lower fastening elements (5c), when engaging the rear flange 4c of the moulding 4, secure a strictly perpendicular positioning of said elements with regard to the general plane of the panels.

The front flanges and the web may slide in the posts 2. The web 5b has a notch 5f to receive the water deflector 3, as previously explained. A second notch 5e is cut in said web, in accurate alignment with the hole 2e located near the upper or lower end of the post 2 and a bolt 8 makes integral said post and said web. A square tube 5f is formed by bending the flanges of said web and a corresponding square bolt 6, passing through the square hole 4d, fastens the webs 5 and 5' on the horizontal rail 4, said three pieces being made integral. When assembling the panels from the inner of the building, there is no need of any adjusting, as the square holes 4d, accurately and regularly spaced according to the chosen modulus, provide the required horizontal and vertical positioning of the vertical post.

FIGS. 10 and 11 illustrate the assembly of four panels (P, P', P1 and P1') and a horizontal water deflector 3 meeting two vertical posts 2, 2'.

In FIG. 10, the panel P' has been cut away to facilitate the understanding of the drawings.

In FIG. 11, the panel P1 is masked by various foreground elements.

FIGS. 10 and 11 illustrate the process of assembling the curtain wall and the final positioning of its various parts.

The curtain wall is assembled firstly from its lower stories. Mouldings 4 are first put on the framework, then adjusted and finally fastened by bolts. Said mouldings then receive their water deflectors 3. Next, the assembling of the panels is effected from the lower set, either from the right or from the left, for example by fastening a vertical post 2, then a panel P, and so on till the other end of this lower set. The same process is used for the following sets until the end of the highest one.
If one panel is damaged by an eventual shock, it can be easily replaced whatever be its level, by merely removing a portion of the opposite counter-wall, then removing from the interior of the building the fastening members and springs 10 and 11. The panel is then easily and quickly removed and replaced.

The method of fastening panels is illustrated on FIG. 11, where the fastening element 10 (see FIG. 9) at the base of the upper vertical post 2 on one hand, and the upper fastening element on the lower post 2' (hidden on the drawings by the horizontal moulding 4) on the other hand, are similar.

Each panel P is held fast at these four corners by said elements 10, the latter being fastened on the vertical post 2, each pair of elements 10 being held by a bolt 8 passing through said post and the fastening member 9. Each fastening element 10 consists of two bent pieces of sheet steel (see FIG. 9). The element 10 is a square-shaped piece having a central hole 10a, the diameter of said hole being the same as of the hole 2e of the vertical post 2; one side 10o of said element 10 extends upwardly. This element 10 is engaged on the vertical post 2 and the threaded stem of the bolt 8 passes through the hole 10c, thus preventing any side motion.

The element "a" is a steel angle-member; its flat side 10a has an oblong hole 10d, the breadth of said hole being equal to the diameter of the bolt 8, while the terminal edge of the side 10e of the element 10 is bent outwardly at an angle equal to the slope p of the panels P.

The threaded stem of the bolt 8 passes through the element 10, which engages the bent lip 10a of the element 8. When tightening the nut on said stem, the stress is acting on the side 10a and the element 10 is forced to slide on the bolt 8 and moves said element 10 toward the panel (side motion D). The side 10f consequently urges outwardly the edge of the panel and compresses the joint 9” between the inner surface of the edges of the vertical post 2 and the outer surface of the lip L.

Furthermore, the fastening of the panels and the compressing of the vertical joints are reinforced by compression springs 11 evenly spaced on both sides of the posts 2 (see FIG. 7). Said springs are engaged in the gutter 2d of each post 2 and urge outwardly the vertical lips L1 and L2 of the panels P in such a manner that said lips compress the water-tight joint 9” between them.

While specific embodiments of the invention have been shown and described in detail to illustrate the application of the principles of the invention, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. An external sheathing or curtain wall for the framework of a building having horizontally extending framework components including a horizontal support having an upwardly projecting flange, a plurality of panels having longitudinal and vertical dimensions equal to multiples of a common modulus, each panel including a vertical outer wall bounded by an inwardly diverging peripheral flange terminating in a peripheral lip substantially parallel to said outer wall, said plurality of panels including upper and lower panels having adjacent horizontal edges at about the level of said horizontal support, a horizontal deflector having a downwardly opening U-shaped flange along its inner edge interlocking with said flange of said horizontal support, a downwardly and outwardly sloping shelf portion extending under the lower lip of an upper panel and a downwardly extending flange overlapping the upper lip of a lower panel, vertically extending posts each having a web portion extending between the vertical edges of two adjacent panels and oppositely extending flange portions overlying vertically extending lips of said panels, and means for securing each said post to said horizontal support, said shelf portion of said deflector extending under the lower ends of said posts to deflect outwardly any water entering between said panels and said posts.

2. An external sheathing or curtain wall according to claim 1, in which the web portion and flange portions of each said vertical post are hollow with spaced wall portions.

3. An external sheathing or curtain wall according to claim 2 in which rear edge portions of spaced walls of said web portion are bent laterally outwardly to form vertically extending gutters for directing water downwardly onto the shelf of the deflector below the respective post.

4. An external sheathing or curtain wall according to claim 3, in which spring means positioned between said gutters and lips of adjacent panels act to press said lips resiliently outwardly against flange portions of said post.

5. An external sheathing or curtain wall according to claim 2, in which said securing means comprises a fastening member having a web portion and flange portions received respectively in said hollow and flange portions of said post and means for securing said fastening member to said horizontal support.

6. An external sheathing or curtain wall according to claim 5 in which a fastener extends through mating apertures in said web portions of said post and said fastening member.

7. An external sheathing or curtain wall according to claim 6, in which fastening elements secured by said fastener press against inner faces of lips of adjacent panels to press said lips against inner faces of said flange portions of said post.

8. An external sheathing or curtain wall according to claim 5 in which the web portion of said fastening member is notched to interlock with said flange of said horizontal support.

9. An external sheathing or curtain wall according to claim 1 in which said horizontal support has a horizontal bottom portion and in which said securing means comprises a fastening member having a web portion secured to said vertical post and extending rearwardly from said post, said rearwardly extending web being notched, to receive said flange of said horizontal support and U-shaped flange of said deflector.

10. An external sheathing or curtain wall according to claim 9 in which two said fastening members are disposed respectively above and below said horizontal support and are secured to said horizontal support by bolt means extending through mating holes in said fastening members and said horizontal support.

11. An external sheathing or curtain wall according to claim 1 in which said horizontal support is an upwardly opening channel with a second flange spaced rearwardly from said upwardly projecting flange and in which said web and flange portions of each said vertical post are hollow, said securing means comprising a fastening member having forward and rearward flange portions connected by a web portion, said forward flange portions received in said hollow flange portions of said post, said web portion of said fastening member received in said hollow web portion of said post and extending rearwardly thereof over said horizontal support, said web portion of said fastening member being notched to receive said first mentioned flange of said support, and said rearward flange portions abutting said second flange of said horizontal support.

12. An external sheathing or curtain wall according to claim 11 in which a second like fastening member is positioned below said horizontal support, both of said fastening members secured to said horizontal support by fastening means extending through mating holes in said fastening members and said horizontal support.

13. An external sheathing or curtain wall according to claim 1, in which non-metallic strip material is interposed between said lips of said panels and said vertical posts.

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DAVID J. WILLIAMOWSKY, Primary Examiner
HARRISON R. MOSELEY, Examiner.
PHILIP C. KANNAN, Assistant Examiner.