CONNECTING MEANS FOR BUILDING STRUCTURES

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This invention relates generally to building constructions and more particularly to the formation of certain particular units formed for interfitting and interlocking to provide a building structure and to a novel weatherproof joint between the units.

The primary object of the present invention is to provide structural building units particularly and peculiarly formed for interfitting assemblage, with the interfitting parts of the units providing a positive interlock to prevent separation under any and all usual strains to which the building structure may be subjected in use.

A further object is to provide interlocking structural units that are so designed as to require a minimum of types or forms of such units, which, through their edge formations, are capable of interlocking assemblages for use in substantially all parts of the building structure, that is, the walls, the roof, the interior partitions and other main parts of the building, without material change in the forms of such units.

Another object of the invention is to provide a weatherproof joint seal between adjacent structural wall and roof units or panels.

For a further comprehension of the invention, and of the objects and advantages thereof, reference will be had to the following description and accompanying drawings, and to the appended claim in which the various novel features of the invention are more particularly set forth.

In the accompanying drawings forming a material part of this disclosure:

Fig. 1 is a cross-sectional view of a fragment of one form of wall structure embodying the invention.

Fig. 2 is a perspective view of a structural joint made in accordance with the invention, parts being broken away.

Fig. 3 is a plan view of the top plate of the structural joint.

Fig. 4 is a plan view of the base plate of the structural joint.

Fig. 5 is a side elevational view of one of the panels of Fig. 1 tied to the foundation and roof.

Fig. 6 is a sectional view taken on the plane of line 6—6 of Fig. 5.

Fig. 7 is a view similar to Fig. 1 showing a modified form of wall structure embodying the invention.

Fig. 7A is a similar view to Fig. 3 of a modified form of the top plate for the joint of Fig. 7.

Fig. 8 is a front elevational view of a fragment of a roof structure, showing roof panels embodying the invention, parts being broken away.

Fig. 9 is a fragmentary view similar to Fig. 5 of a modification of the invention.

Fig. 10 is a vertical sectional view taken on the plane of line 10—10 of Fig. 9.

Fig. 11 is a perspective view of the base plate.

Fig. 12 is a fragmentary view similar to Fig. 1 of another modified form of the invention.

Fig. 13 is a fragmentary detail view of yet another modified form of the invention.

Fig. 14 is another fragmentary detail view of yet another modified form of the invention.

A complete building, in accordance with the present invention, may be constructed from a plurality of prefabricated members that are formed from aluminum and plastic material and adapted to interlock to provide a rigid construction.

These prefabricated members may include panels or units and interlocking and sealing members. The panel or units compose the walls and roof of the construction as well as the interior partitions which define the inner rooms.

The inner walls or partitions of the building, defining the rooms thereof, a portion of one wall being shown in Fig. 1 and designated by the numeral 10, are composed of a number of aligned panels or units 12 with an interlocking and interfiting unit 14 between the adjacent ends of the panels connecting the same. The inner wall panels 12 are each approximately three inches thick and formed of polystyrene foam beads 16 enclosed on both sides by plastic plates 18 of Masonite. At one end, the body of the panel comprising the foam beads 16 is extended at its center forming an extension 20, substantially V-shaped in cross section. The extension extends the width of the panel. This end of the panel is capped by a cover plate 22 covering the body of the panel including the extension 20. The cover plate is formed with a central extension 23 substantially V-shaped in cross section and is complementary in shape to the V-shaped extension 20 of the body of the panel. The cover plate is also formed with a flange 24 along one long edge and with a flange 26 along the other long edge thereof. The flanges are seated in depressions 28 formed in the side surfaces of the body of the ends thereof, and serve as linings for the Masonite plates 18 of the panel and are secured thereto in any suitable manner.

At the opposite end of the panel 12, the body of the panel comprising the foam beads is formed with a central substantially V-shaped recess 30 complementary in shape to the V-shaped extension 20 at the other end of the panel. The V-shaped recess extends the width of the panel. This end of the panel is closed by a cover plate 22 substantially similar to cover plate 22 but formed with a central V-shaped recess 25 instead of an extension 23. The V-shaped recess 25 fits into the recess 30 in the end of the panel.

At each end, the panel is formed with a cut-away portion 32 at its bottom end and with a recess 34 midway its ends at the bottom. Furthermore, two elongated U-shaped aluminum plates 36 are aligned and secured between and inside the Masonite plates 18 at the bottom of the panel forming a metal base for the panel. Each plate 36 is formed with an extension 38 at each end thereof and each extension has an elongated slot 40 therein. A plate 42 extends along the outside surface of each side Masonite plate 18 at its bottom and is formed with a horizontally disposed flange 44. The plates 42 are preferably formed of plastic material, such as Vynilite, and form a cove or moulding.

At the top edge of the panel 12, along the top edge of each Masonite plate 18, there is fastened an angle iron or angular moulding strip 46 preferably formed of aluminum. Each moulding strip extends the width of the panel and the outer edge of its horizontally disposed leg is enlarged as indicated at 48.

In assembling the panels 12 for constructing a wall structure such as shown in Fig. 1, the ends of the panels with the extensions 20 are aligned with and placed adjacent to the ends of the panels with the grooves 30. In accordance with the present invention, the adjacent ends of the panels are tied together by the interlocking and
interfitting structural units 14. The interlocking unit comprises an elongated tubular column or post 50 formed of sheet metal material, such as aluminum. The column is substantially rectangular in cross section and on one side thereof is formed with a central extension 52, substantially V-shaped in cross section, complementary to the groove 54 in the end of panel 12. The other side of the column is formed with a central groove 54 complementary in shape to the extension 20 at the end of panel 12.

The extension 52 and groove 54 extend the length of the column and are in alignment with each other. One end of the column is closed by a flat plate 62 which protrudes on both sides thereof and which is formed with a substantially V-shaped notch 58 aligned with the groove 54 and is formed with a central substantially V-shaped extension 60 over the V-shaped extension arm 52 of the column. The other end of the column is closed by a rectangular-shaped plate 62 which projects forwardly and backwardly of the column as viewed in Fig. 2, with elongated slots 64 formed in the projecting portions. The slots 64 are adapted to receive bolt and nut assemblies for adjusting the columns to a foundation. The slots 64 and 62 are preferably welded to the ends of the column but may be fastened thereto in any suitable manner.

In forming a wall from the above described members, the interlocking and interfitting units 14 are utilized as the connecting media between adjacent panels or units 12. When assembling these panels or units to form an inner wall for a building as shown in Fig. 1, an elongated flexible sealing gasket 70 is seated on the base of the groove 25 of the cap 22 of one panel 12. The extension 52 of an interlocking unit 14 is inserted into the groove 54 of the panel 12 and pressed against the gasket 70 thereby flattening the gasket to the condition shown in Fig. 1 thereby forming a seal thereat. A similar gasket 70 is seated on the base of the groove 54 in the interlocking unit 14 and the extension 23 of a panel 12 is inserted into the groove 54 of the interlocking unit and pressed against the gasket 70 therein, thereby flattening the gasket and forming a seal thereat.

In Figs. 5 and 6, a fragment of an inner wall structure is shown mounted on and secured to a foundation 84 and supporting a roof structure 76. The foundation is formed of reinforced concrete and the U-shaped base or closure plates 36 of the panels 12 rest on the top surface of the concrete and are fastened thereto by bolt and nut assemblies 86, the bolts extending through the slots 40 in the extension 38 of the closure plates. The cut-out portions 32 and the middle recesses 34 of the panels 12 permit ready manipulation of the bolt and nut assemblies. The roof panel 76 rest upon and are supported by the top plates 56 of the columns 50 and upon the enlarged end portions 48 of the angular moulding pieces 46 at the top of the panels and are secured thereto in any suitable manner.

In Fig. 7 the interlocking and interfitting unit 14' is shown connecting panels or units 12' of an outer wall of the building. The outer wall panels 12' are each approximately three inches thick and formed of polystyrene foam beads 16' enclosed on both sides by plate 18' and 18''. Plate 18' is formed of plastic material such as Masonite and the other plate 18'' is formed of sheet metal material, such as aluminum. At both ends, the body of the panel 12' is formed with a central V-shaped recess 30'. The recess extends the width of the panel. Each end of the panel is capped by a cover plate 23' having a V-shaped recess 25' fitting into the recess 30'. The cover plate 23' is also formed with a flange 24' along one long edge and with a flange 26' along the other long edge thereof. The flanges are seated in depressions 28' formed in the side surface of the body at the ends thereof and serve as linings for the plates 18' and 18'' and are secured thereto in any suitable manner. Furthermore, the long edge of the cover plate 23' mounting the flange 26' is formed with a hook portion 72 extending the width of the panel.

The hook portion 72 together with the adjacent flange 26' defines a groove 74' to receive fittingly the end of the aluminum plate 18'' of the panel. The interlocking and interfitting unit 14' is similar to the unit 14 of the form of Fig. 1. Elongated tubular gaskets 70' are interposed between the extensions 52' and the recesses 25' and are flattened out by the extensions.

In Fig. 7A there is shown a closure plate 56' for closing one end of the interlocking unit 14'. The closure plate 56' is shown with a pair of opposite disposed V-shaped extensions 60' adapted to extend over the V-shaped extensions 52' of the unit 14'. The other end of the unit 14' is closed by a plate similar to plate 62.

In Fig. 8, a roof structure 76 composed of panels 12'' in nested relation is shown. The panels 12'' are similar in construction and arrangement. In the roof structure, however, no interlocking unit, such as unit 14, is used to lock the adjacent panels but a tubular plastic gasket 70'' is interposed between the contiguous bases of the extensions 23'' on the caps 22'' and the grooves 25'' of the caps 23''. The gaskets form seals between contiguous panels. A weather strip 78 is secured over the juncture between contiguous panels. A facing plate 80 extends along the face of the roof panels and is secured thereto by an edge flange 82 resting on the top surfaces of the panels. The facing plate extends slightly below the roof panels.

The modified form of inner wall structure shown in Figs. 9 and 10 is similar to the form shown in Figs. 5 and 6 except that the U-shaped base plates 36a of the panels 12a which rest upon the top surface of the concrete foundation 84 are wider than the panels so that the side plates 18a of the panel 12a fit inside the side walls 88 of the closure plates as shown in Fig. 10, instead of outside side walls as shown in Fig. 6. The upper or outer ends of the bottom moulding plates 42a are formed with inwardly extending bent portions 89 engaging the Masonite plates 18a so as to provide spaces 90 between the plates to receive said side walls 88. In all other respects, the wall structure shown in Figs. 9 and 10 is similar to the form shown in Figs. 5 and 6 and similar reference numerals are used to indicate similar parts.

In the modification shown in Fig. 12, the interlocking and interfitting unit 14'' is shown connecting a panel or unit 12'' of an outer wall of the building and a filler piece 90 adapted to be inserted before a trove air louver or a door. The panel or unit 12'' is similar to the unit 12' shown in Fig. 7 being formed of polystyrene foam beads 16' enclosed on both sides by plates 18'a and 18''a. Plate 18'a is formed of plastic material such as Masonite and the opposite plate 18''a is formed of sheet metal material, such as aluminum.

The body of the panel or unit 12'' is formed with a central substantially V-shaped groove or recess 30''. The V-shaped groove extends the width of the panel or unit. This end of the panel or unit is capped by a cover plate 22'' covering the body of the panel. The cover plate is formed with a V-shaped groove or recess 91 in the center complementary to the V-shaped groove 30'' in the end wall of the body of the panel.

Further, the long edge of the cover plate 22'' mounting the flange 26'' is formed with a hook portion 72'' extending the width of the panel. The hook portion 72'' together with the adjacent flange 26'' defines a groove 74'' to receive fittingly the end of the aluminum plate 18'' of the panel.
In mounting doors and tropic air louvers, the filler piece 90 is provided and this filler piece is connected to the adjacent unit or panel 12\(^5\) by means of an interlocking and interfitting structural unit 14\(^5\). The filler piece 90 comprises an aluminum plate 92 extending the width of the unit or panel and is formed along its long edges with flanges 94 extending at right angles to the plate 92, which flanges terminate in inwardly extending bent portions 96 extending parallel to the plate.

The interlocking unit 14\(^5\) comprises an elongated tubular column or post 50\(^*\) formed of sheet metal material, such as aluminum. The column is substantially rectangular in cross-section and on both sides thereof is formed with opposed central extensions 52\(^*\) and 52\(^*\) substantially V-shapped in cross-section. The extensions extend the length of the column. The ends of the column are closed with plates similar to the plates of the form of column 50 shown in Fig. 1.

In forming the wall, the extension 52\(^*\) of the column is inserted into the V-shaped recess 91 of the cover 22\(^*\) and an elongated flexible sealing gasket 70\(^*\) is seated in the base of the groove 91 of the cover. The extension 52\(^*\) is pressed against the gasket thereby flattening out the gasket and forming a seal thereat. The opposed extension 52\(^*\) of the column is inserted into the filler piece 90 and into contact with the plate 92. The bent terminals 96 of the filler piece engage the outer surfaces of the column and may be secured thereto by welding or in any other suitable manner.

In this form of wall, both sides of the column or post 50\(^*\) of the interlocking and interfitting unit 14\(^5\) are formed with semicircular grooves 98 extending the length of the column, and the cover 22\(^*\) is formed with opposed semicircular grooves 100 opposed to the grooves 98, the space defined by the opposed grooves constituting ducts for releasing air and water vapor trapped between the column 50\(^*\) and cover 22\(^*\).

The grooves 98 and 100 may be provided in all column and post connections indicated in the various figures.

Fig. 13 illustrates a modified form of column 102 with a continuous plate 104 welded to the enlarged end portions 106 of the moulding plates 108. The plate 104 is disposed in a recess 110 in the roof panel 112.

In the modified form of column 114 shown in Fig. 14, the top of the column is closed by a plate 116 having lateral flanges 118, only one side of the column and one flange being shown. A continuous plate 120 is welded to the top of the plate 116 and to the flanges 118, the plate 120 being disposed in a recess 122 in the roof panel 124.

One of the advantages of the present invention resides in the adaptability of the units for cooperation to form all of the planar surfaces in a building, that is, the inner walls, the partitions, the roof, as well as the outer wall. The interlocking units 14 are readily placed in position between the panels or units. Consequently, the parts, without the use of additional fastening or securing members are locked against separation, maintaining them in their fixed desired position against any usual strain to which the walls may be subjected. Thus, the interlocking members 14 when in applied position become a part of the wall structure locking the panels thereof together preventing the possibility of their casual separation or movement in any direction.

While I have illustrated and described the preferred embodiments of my invention, it is to be understood that I do not limit myself to the precise construction herein disclosed and that various changes and modifications may be made within the scope of the invention as defined in the appended claims.

Having thus described my invention, what I claim as new, and desire to secure by United States Letters Patent is:

In a building surface structure for forming a wall of a building, a plurality of structural units of various types, one type of unit having spaced plates and a filling of plastic beads in the space between the plates, the filling at one end having a central groove substantially V-shaped in cross-section extending from top to bottom of the plates, a metal cover for said one end and shaped and grooved to conform to the shape of said one end, a U-shaped plate forming a base for said unit, another type of unit comprising a tubular locking column extending transversely of said one type of unit, said locking column having opposed central extensions substantially V-shaped in cross-section, one of said central extensions projecting into the central groove in the metal cover of said one type of unit, an elongated gasket interposed between said central groove in the cover and said extension, the adjacent surfaces of said locking column and metal cover having opposed semi-circular grooves constituting ducts for releasing air and water vapor trapped between said cover and column.

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