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Fig. 13

Fig. 14

Fig. 15

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This invention relates to panel wall structures, and more particularly to joint structures of panel walls and bases and caps thereof.

Panel wall structures have been used extensively for exterior walls of buildings. A typical wall known hitherto has included a plurality of metal panels having interlocking edge portions provided with interlocking flanges which hold adjacent panels together, and at the juncture of the flanges and the front walls of the panels, at both the tops and the bottoms thereof, vertically extending notches are cut out and the notches are adapted to fit over flanges of angle irons which form bases and caps and secure the assembly of panels at the top and bottom thereof to the floor and ceiling structure of the building. Such notches do not fit closely over the flanges of the angle irons, and the resulting joints are not weathertight, let in light, and have ragged edges at the exterior of the walls of the panels. These joints are subject to rust and present, because of their ragged appearance, a rough and unfinished appearance at the corners of the panels both at the top and at the bottom thereof. The panels are secured to the flanges of the angle irons by rivets extending through the flanges and the wall portions of the panel. This leaves rivet ends exposed at the flanges, which detract from the appearance of the inside of the wall structure.

An object of the invention is to provide new and improved panel wall structures.

Another object of the invention is to provide new and improved joints between bases, caps and panels.

Another object of the invention is to provide panel wall structures in which the corner portions of the panels have no ragged edges and are strong.

A further object of the invention is to provide prefabri- cated panel wall structures having pipes and conduits assembled therewith.

Yet another object of the invention is to provide panel wall structures having smooth, lightweight and weathertight joints.

Still another object of the invention is to provide panel wall structures having smooth, appearing panel wall structures having improved joints.

The invention provides panel wall structures each including a plurality of panels having inwardly projecting, interlocking side flanges provided with notches at least one end. The notches are spaced inwardly from the front walls of the panels to leave keys. A base or top angle member having a base portion adapted to be secured to the floor or ceiling structure of a building of which the panels form a part has a U-shaped flange providing two spaced flange or wall portions, one abutting the front walls of the panels and the other spaced inwardly from the front walls of the panels and covering the first flange portion. The first flange portion is slotted to receive the keys of the flanges of the panels adjacent the slots, and the notches in the panels are assembled together and are secured against movement relative to each other by base or sill transverse angle member 12 and top or cap transverse angle member 15.
which secure the panel members 10 to the floor and base angle member 12 of upper wall 11, respectively, the lower angle member 12 being fastened to the floor, the upper angle member 12 being fastened to the angle member 13, and the uppermost angle member (not shown) corresponding to the angle member 13 being fastened to the ceiling or roof structure (not shown). The top member 13 also is adapted to be secured to the roof or ceiling of the building. The members 12 and 13 are identical with but are inverted relative to each other, and only the angle member 13 will be described in detail.

As illustrated in FIG. 2, each panel 10 includes a central web or wall 14 having an inner face 15 and an outer face 18. Adjoined to the side edges of the walls 14 are inwardly extending, side flanges 16 at one side edge of each of the walls 14 and inwardly extending, side flanges 17 at the other side edge of each of the walls 14. At the free edges of the flanges 16 and 17, there are provided adjacent, interlocking hook end portions 20 and 21, respectively, which interfit with one another, and the panels 10 form a continuous wall. At the top and bottom of the side flanges 16 and 17, there are provided vertically extending notches 29 and 30 which are laterally aligned with one another and are spaced to the left, as viewed in FIG. 5, from the walls 14 of the panels.

The angle member 12 includes a horizontal flange or base portion 31 which is suitably secured by known methods to the building, and the angle member 12 also includes a first vertical flange or wall portion 32 extending at right angles to the horizontal base portion 31 and second, return flange or wall portion 34. The flange portions 32 and 34 are spaced from one another and are joined by a curved portion 36. In effect, the flange portions 32 and 34 and the curved portion 36 form a U-shaped flange of the angle member 12. About one-half of the width of the curved portion 36 and the flange portion 34 are provided with vertical slots 37 spaced along the angle member on centers spaced apart a distance equal to the width of the front walls 14 of the panels 10.

The notches 29 and 30 fit over the flange portions 32 and unslotted portions of curved portions 36, and are spaced from the walls 14 so as to leave reinforcing wall portions or keys 38 and 39 of the flanges 16 and 17. The portions 38 and 39 form the forward edges of the notches 29 and 30 and fit into the slots 37. The portions 38 and 39 reinforce the upper and lower corner portions of the panel walls 14 so that these corner portions are not easily bent. Also, the notches 29 and 30 are spaced inwardly from the exposed exterior faces of the walls 14 sufficiently that the panel portions cannot be removed from the exterior of the building and the flange portions 32 of the angle member 12 cover the edges of the portions 38 and 39 so that these may not be seen from the interior of the building.

The panels are secured to the angle members 12 and 13 through drilled holes formed in the flange portion 34 and the panel wall 14 to rigidly secure the wall to the flange portion 34. The holes are drilled through the lower and upper edges of the panel walls and flange portions 34 after the panels have been assembled and placed upon the members 12 and 13, and the inserted through and fastened in place to secure the panels to the upper and lower members 12 and 13. It will be apparent that by this structure none of the raw edges of the notches 29 and 30 are visible from the front of the wall so that the smooth appearance of the wall along the upper and lower portions of the assembly is provided. Also, the edges of the notches are protected from the weather and the keys 38 and 39 are sufficiently wide to hold calking compound therebetween. The calking compound may be of strip form placed between the keys during assembly or may be mixed with the keys. In addition to providing airtightness, weathertightness and this smooth appearance, the portions 38 and 39 of the flanges 16 and 17, respectively, are interlocked in the slots 37 in the angle members 12 and 13, to rigidly interconnect the panels and the angle members.

Such interconnections also facilitate fastening the panels to the angle members 12 and 13.

**Panel Wall Structure of FIG. 7**

As shown in FIG. 7, a base angle member 50 having a generally U-shaped, or channel-like, beam structure is provided. The member 50 includes U-shaped flanges 52 and 54 at opposite sides of base 56. The U-shaped flanges 52 and 54 are identical to the U-shaped flanges of the member 12 (FIG. 4). The flanges 52 and 54 are oppositely disposed, are provided with slots (not shown) like the slots 37, and are adapted to interlock with outer panels 62 and inner panels 64. The panels 62 are identical with the panels 10 except for one being reversed, side flanges 80 of the panels 62 and 64 have no hook end portions corresponding to the hook end portions 20 and 21, and the side flanges include two notches 66 and 68 therein rather than only the notches 29 or 30 of the flange 16 or 17. The slots 58 and 60 receive narrow wall portions or keys 76 and 78 of the panels 62 and 64, it being understood that each of the panels 62 and 64 includes both a notch 66 and a notch 68 and both a narrow wall portion 76 and a narrow wall portion 78. By this structure both the outer and inner wall present finished appearances. If desired, the side flanges 80 of the panels 62 and 64 may be provided with cut-out portions or cleat edge notches 82 for conduits 84 and pipes 86, which preferably are fixed to the base 56 of the angle member 50 prior to assembly of the panels 62 and 64 with the angle member 50. The panels also are provided with brackets 88 secured by rivets 90 thereto and welded to the base 56 so that the front of the panels need not be marred by rivet holes or the like, which structure is of particular importance in using porcelainized or enameled panels. The panel wall structure of FIG. 7 is assembled by fixing the conduits 84 and pipes 86 on the angle member 50, assembling the panels 62 thereon, welding the brackets 88 to the angle member 50, then assembling the rear wall on the angle member and then placing the upper angle member (not shown) on the tops of the panels 62 and 64.

**Panel Wall Structure of FIG. 8**

In the panel wall structure of FIG. 8, which forms an alternate embodiment of the invention, there is provided an angle member 100 which is substantially identical with the angle member 50 except that rectangular, generally U-shaped flanges 102 are provided thereon with the front and rear panels 104 to be used thereon having rectangular notches 106 cut therein to the notches 66 and 68 and formed in side flanges 108 of panels 110.

**Panel Wall Structure of FIG. 9**

In the panel wall structure of FIG. 9 forming an alternate embodiment of the invention, there is provided a base angle member 111 interlocking with panels 112 substantially identical with the panels 10 (FIG. 1). The member 111 is identical with the member 12 except that front or return flange portion 114 thereof is substantially narrower than un-notched, flange portion or structural wall 116, and front walls 118 of the panels 112 extend substantially to the lower edge of the flange portion 114.

**Panel Wall Structure of FIG. 10**

The panel wall structure of FIG. 10 forming an alternate embodiment of the invention is generally similar to that of FIG. 1 except that front flange portion 122 of base angle member 124 is substantially longer than structural rear flange portion or wall 126, and base 128 of the angle member 124 is secured to a concrete base 130. Panels 134 are provided with skirt portions 136 extending downward below main portions of flanges 138 thereof, the flanges 138 being provided with notches 140 and the angle member 124 being provided with slots (not shown) like the slots 37 for receiving keys 144.
5 PANEL WALL STRUCTURE OF FIG. 11

The panel wall structure of FIG. 11 forms an alternate embodiment of the invention and is generally similar to that of FIG. 1 except that base angle member 150 is provided with a base 152 having offset portions adapted to fit a particular floor structure, and bottom 154 of flange 156 of panel 158 is shaped to fit on the base 152.

5 PANEL WALL STRUCTURE OF FIG. 12

A panel wall structure shown in FIG. 12 forms an alternate embodiment of the invention, and is generally similar to the panel wall structure of FIG. 1, except that base 160 of base angle member 162 includes a raised portion 164 to provide clearance for any obstructions on a floor. Bottom portion 166 of panel 167 is shaped complementarily to the base portion 164.

10 PANEL WALL STRUCTURE OF FIG. 13

The panel wall structure of FIG. 13 forming an alternate embodiment of the invention is substantially identical with that of FIG. 1 except for fastening tabs 161 formed on sides 163 of panels 165. The tabs are integral with the side flanges and are formed by cutting notches 157 completely along two sides only and bending the tabs out of the notches. The tabs are welded to flange portion 169 of base angle member 171.

15 PANEL WALL STRUCTURE OF FIG. 14

In FIG. 14 there is shown a panel wall structure forming an alternate embodiment of the invention which is generally similar to the panel wall structure of FIG. 1 except as brought out hereinbelow. The panel wall structure of FIG. 14 includes a base angle member 210 identical with the member 12 and panels 212 identical with the panels 10 except for the provision of hook-shaped lower end portions 214 of the front walls 216 of the panels and enlarged, arcuate clearance portions 218 of notches 219 in side flanges 220 of the panels. The hook-shaped portions 214 extend under the lower edges of the panels and up into the notches 219. Slots (not shown) like the slots 37 are formed in U-shaped flanges 226 of the member 210. The clearance portions 218 permit the panels to be asayed on the member 210 with a rolling action, and a cap angle member (not shown) identical with the member 210 can be placed on the upper portions of the panels, which may be provided with portions corresponding to the hook portions 214 and clearance portions corresponding to the clearance portions 218 at the tops of the flanges 220, the cap angle member being inserted on the tops of the panels 212 with a rolling action. The clearance portions 218 are adapted to clear a pipe or conduit 229 fixed to base 221 and flange 226 of the angle member 210.

20 PANEL WALL STRUCTURE OF FIG. 15

The panel wall structure shown in FIG. 15 forming an alternate embodiment of the invention includes a cap angle member 170 identical with the angle member 13 and the base angle member 12 together with full length panels 172 identical with the panels 10 and short length panels 181 and 183. Flanged drip leg member 174 having a flange portion 176 is secured to the wall structure by inserting the flange 176 in notches 178 formed in the flanges 180 of the panels 172 and 181 and the groove in U-shaped flange 182 of the member 170. The ledge member 174 is, in effect, hooked into the top of the wall structure below roof or ceiling structure 184 and is held against extreme horizontal movement relative thereto. Rivets 186 serve to lock the member 174 in position. Base angle member 188 supports the panels 172 and 183, and the panels 183 support a sill angle member 192 identical with the angle member 13, positioned so as to form the bottom of a window 193. The member 192 has groove 194 therein for receiving flangey flanges 243 and 244 fitting into continuous grooves 246 and 248 of slotted U-shaped flanges 250 and 252 of angle members 254 and 256. The band 240 and the member 254 are supported on beam structure 258, and panels 260 and 262 are fastened to the angle members. Calking strips 264 and 266 seal the joints of the panels and the band. The flange 242 is secured to rear wall or flange portion 268 of the flange 250, and the flange 244 is secured to key portions 270 of side edge flanges 272 of the panels 262 by welding or the like. Notches 274 and 276 are formed in said edge flanges 272 and 278, respectively.

25 PANEL WALL STRUCTURE OF FIG. 16

The panel wall structure shown in FIG. 16 forms an alternate embodiment of the invention and includes a continuous band 240 having vertical flanges 243 and 244 fitting into continuous grooves 246 and 248 of slotted U-shaped flanges 250 and 252 of angle members 254 and 256. The band 240 and the member 254 are supported on beam structure 258, and panels 260 and 262 are fastened to the angle members. Calking strips 264 and 266 seal the joints of the panels and the band. The flange 242 is secured to rear wall or flange portion 268 of the flange 250, and the flange 244 is secured to key portions 270 of side edge flanges 272 of the panels 262 by welding or the like. Notches 274 and 276 are formed in said edge flanges 272 and 278, respectively.

30 It is to be understood that the above-described arrangements are simply illustrative of the application of the principles of the invention. Numerous other arrangements may be readily devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

What is claimed is:

1. In a panel wall structure, a plurality of panels provided with wall portions and flanges extending inwardly from wall portions thereof, means securing the flange at one edge of one of the panels to the flange of one edge of another of the panels, the ends of the flanges being provided with notches which are laterally aligned with one another and are spaced inwardly from the wall portions of the panels, an angle member provided with a double walled vertical flange having slots positioned therein receiving the portions of the flanges between the notches and the wall portions of the panels, and means securing the panels to the angle member.

2. In a panel wall structure, an angle member including a base and a U-shaped flange portion having a forward flange and a rear flange spaced from each other and also being provided with a top portion joining the forward wall and the rearward wall, the forward flange at the top portion being provided with slots spaced uniformly therealong, and a plurality of panels having front walls and also having interlocking side edge flanges, the side edge flanges being provided with notches extending vertically from the bottoms thereof fitting over the rear flanges of the angle members and also having narrow key portions forming the forward edge of each of the notches in the side edge flanges and fitting into the slots and interlocking with the angle member.
3. In a panel wall structure, a base angle member provided with a base portion and a vertical flange having a rear wall and a return wall spaced from the rear wall, the return wall portion being provided with vertical slots spaced positions thereof, a plurality of panels having front walls and side edge flanges, means securing the side edge flanges of the panels together, the lower ends of the side edge flanges being provided with aligned, vertically extending notches open at the bottom ends thereof and spaced inwardly from the front walls of the panels to provide keying portions, the keying portions being fitted into the slots in the return wall and the notches in the side edge flanges fitting over the rear wall of the base angle member.

4. In a panel wall structure, an elongated angle member having a base portion, and a U-shaped flange having an outer wall provided with slots, and a plurality of panels having front wall portions and also being provided with side edge flanges having end notches receiving the slotted portions of the U-shaped flange of the angle member, the notches being spaced substantially from the front walls and the side edge flanges having narrow keys forming one edge of each notch and fitting into the slots in the U-shaped flange of the angle member, the notches being relieved to provide clearance for the flange members in assembling the panels and angle member.

5. The panel wall structure of claim 4 and including means fastening the panels to the angle member.

6. In a panel wall structure, a U-shaped panel having a front wall and side flanges, the side flanges having deep end notches therein spaced substantially from the front wall to provide corner flange portions, and an elongated angle member having a base and a flange means extending angularly from the base and fitting into the end notches, the flanges means having recessed portions at one side thereof receiving the corner flange portions of the side flanges.

7. In a panel wall structure, an elongated angle member having a base and a flange at one edge of the base, conduit means secured to the angle member in the corner formed by the base and the flange, a panel member having a front wall and side edge flange portions, the side edge flange portions having end notches therein providing clearance for the conduit means and the flange.

8. In a building structure, a plurality of panels having front walls and interlocking side edge flanges provided with laterally aligned notches spaced from the front walls and opening on the ends thereof to define corner key portions, and an angle member having a base portion and a generally U-shaped flange member provided with a rear flange extending angularly from one edge of the base, a front flange parallel to the rear flange and spaced from said one edge of the base and the rear wall and a bridge portion joining the edges of the rear and front flanges, the front flange and the bridge portion having slots extending across the entire width of the front flange and only partially across the bridge portion receiving the corner key portions, the notches providing clearance for the rear flange and the adjacent unslotted portions of the bridge portion.

9. The panel wall structure of claim 8 wherein the front walls of the panels have end flange portions hooking under the front flanges, the notches being relieved to provide clearance for the flange members in assembling the panels and angle member.

10. In a panel wall structure, a member having a U-shaped portion having spaced, parallel slots extending across one wall thereof, a panel member having a front wall and side flanges provided with end slots spaced from the front wall providing keys fitting into the first-mentioned slots, the width of the space between the walls of the U-shaped portion being greater than the width of the keys to define a groove extending along the U-shaped portion, and a frame member having a tongue portion extending into the groove.

11. In a panel wall structure, a first member having an upwardly facing U-shaped portion having spaced, parallel slots extending across one wall thereof, a panel member positioned below and supporting the first member and having a front wall and side flanges provided with end slots spaced from the front wall to provide keys fitting into the first-mentioned slots, the width of the space between the walls of the U-shaped portion being greater than the width of the keys to define a groove extending along the U-shaped portion, and a drip ledge member having a flange portion extending into the groove.

12. In a panel wall structure, an elongated angle member having a base and a pair of U-shaped flanges at the edges of the base, the outer walls of the U-shaped flanges having slots therein, a panel member having a front wall and side edge flange portions, each side edge flange portion having a pair of end notches therein providing clearance for the slotted portions of the U-shaped flanges.

13. The panel wall structure of claim 12 including conduit means supported by the base, the side edge flange portions having clearance portions fitting over the conduit means.

14. The panel wall structure of claim 12 wherein the U-shaped flanges are substantially rectangular in transverse cross-section.

15. In a panel wall structure, a lower group of vertical panels provided with side edge flanges having laterally aligned upwardly facing notches at the upper ends thereof, a first angle member having a U-shaped portion forming a continuous groove and fitting into the notches, a continuous band having a lower flange fitting into the groove and also having an upper flange, a second angle member having a U-shaped portion forming a continuous groove receiving the upper flange, an upper group of vertical panels provided with side edge flanges having laterally aligned downwardly facing notches at the lower ends thereof receiving the U-shaped portion of the second angle member, and support means positioned between the angle members.

16. In a panel wall structure, a plurality of panels provided with wall portions, the end portions of the panels being provided with key portions which are laterally aligned with one another and extend inwardly from the wall portions of the panels, and an angle member positioned at one end of the panels and provided with a base portion and a flange portion, the angle member being provided with locking means extending transversely of the flange portion and having keying slots receiving the key portions and interlocking therewith.

17. In a panel wall structure, a plurality of panels provided with wall portions and
flanges extending inwardly from wall portions thereof, the end portions of the flanges being provided with notches which are laterally aligned with one another and are spaced inwardly from the wall portions of the panels to define key portions, and an angle member provided with a horizontal base, a first vertical flange portion, a second vertical flange portion and a bridge portion joining the flange portions, the second vertical flange portion and the bridge portion having slots poisioned therein receiving the key portions of the flanges, the first vertical flange portion fitting into the notches.

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