MODULAR WALL CONSTRUCTION

Fig. 5

Fig. 4A

Fig. 4B

Fig. 6

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9 Claims

ABSTRACT OF THE DISCLOSURE

A prefabricated panel system for forming building walls using a plurality of basic, tongue-and-groove wall panels coupled with special panels to form door and window openings. The basic panel includes a core bonded to inner and outer layers and is made of standard lumber. Vertical raceways are formed in each basic panel and communicate with horizontal raceways running about the top of the wall to form continuous accommodation for wiring.

BACKGROUND OF THE INVENTION

This invention relates to modular wall constructions and more particularly to such a construction utilizing a prefabricated panel structure as its basic component. Heretofore, wall constructions utilizing prefabricated panels have been proposed in order to reduce the cost of home construction by mass production prefabrication techniques. Such proposed constructions have not been entirely satisfactory because of difficulties in obtaining standardized panel sizes economically and difficulty of obtaining weatherproof system. Furthermore, the previous proposals have not adequately provided for wiring raceway locations, corners, door and window sections, end panels and other requirements of a complete prefabricated system. There is, therefore, a need for a new improved modular wall construction.

It is a general object of the present invention to provide an improved modular wall construction which will overcome the above limitations and disadvantages within a comprehensive prefabricated construction system.

It is another object of the present invention to provide a construction of the above character which is economical to mass produce and which employs a basic panel into which nonstandard panels can be readily and easily incorporated for the purpose of providing window or door sections and the like.

Another object of the present invention is to provide a construction of the above character in which continuous raceways are provided throughout all standard wall panels and in which the raceways communicate throughout the wall construction to facilitate the installation of wiring.

Another object of the present invention is to provide a wall construction of the above character in which the basic panel is constructed in standard two foot widths from readily available lumber of standard dimensions.

In accordance with the above objects, there is provided a modular wall construction utilizing prefabricated panels adapted to be assembled together at the construction site to form the walls of a house. A plurality of basic panels form the principal portions of each wall by being arranged side by side in planar edge to edge relationship and fastened together. The edges of the basic panels are constructed in tongue and groove form so that the edge of one panel interfits with the adjacent edge of the next panel.

Each of the basic panels is identical and consists of elongate core means including separate strips of equal thickness positioned in parallel relationship to each other in a common plane. A first portion of the core means forms a central core for the panel and the remaining portions of the core strip means consist of elongate strips spaced apart from the first core means to form elongate spaces on either side thereof.

Rigid interior and exterior layers are secured on each side of the core means and overlie the elongate spaces formed thereby to define elongate raceways throughout the height of the panel. The exterior and interior layers are so positioned as to overlap beyond the core strip at one side of the panel approximately one-half the width of such core strip and to form therewith a groove for receiving a tongue portion of an adjacent panel. The other side of the exterior and interior layers terminate approximately one-half the width of the other core strip to form therewith a tongue portion for intermateing with the groove portion of the next adjacent panel. The upper ends of the exterior and interior panels terminate substantially below the upper ends of the core means.

Means is provided for forming a top plate consisting of a U-shaped channel adapted to overlie the upper ends of the core pieces. The channel has downwardly extending side portions terminating in spaced relation to the upper ends of the interior and exterior layers to form horizontally extending inner and outer slots between the layers and the side portions. The slots lies in communication with the raceways formed in the panel to facilitate wiring.

The basic tongue and groove panel just described is coupled with specially adapted panels for forming windows and door openings in the wall. In each case a header is provided which is of the desired width of the window or door opening and is supported above the opening on cripples which lie in opposed grooves formed in the adjacent wall panels on each side of the opening.

For a window opening, a sill panel having tongue and groove side edges supports the cripples and defines the lower boundary of the opening.

In a preferred embodiment the core means and the inner and outer layers are made from commonly available 2 x 6, 1 x 6 and 1 x 8 cedar wood strips which have been secured together and dipped in a suitable preservative.

These and other features and objects of the invention will be apparent from the following detailed description and claims when taken in conjunction with the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

FIGURE 1 is an isometric exploded view of a basic tongue and groove panel, door plate and roof plate connections of a modular wall constructed according to the invention.

FIGURE 2 is a cross sectional view taken along the lines 2—2 of FIGURE 1.

FIGURE 3 is a cross sectional view taken along the lines 3—3 of FIGURE 1.

FIGURE 4A is a horizontal cross sectional view of a corner wall joint formed between the first and last panels of the modular wall construction of the invention and include a detailed view of an interior modular wall construction of the invention.

FIGURE 4B is a horizontal cross sectional view of a modified corner wall joint similar to that shown in FIGURE 4A.

FIGURE 5 is an exploded, isometric view of a plurality of panels forming interior and exterior walls, together with window and door openings in accordance with the modular wall construction of the invention.

FIGURE 6 is a cross sectional view similar to that shown in FIGURE 3 of a groove and groove panel constructed in accordance with the invention.
FIGURE 7 is a perspective view partly in section and partly exploded of an exterior wall structure including a window opening, and of an interior wall joint to an exterior wall, constructed according to the invention.

FIGURE 8 is a detailed isometric view of an interior to exterior wall joint in a modular wall construction of the invention and emphasizing an interconnection of wiring pathways.

FIGURE 9 is a cross section view of a modified modular wall constructed in accordance with the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Standard tongue and groove panel

Referring particularly to FIGURES 1 through 3, there is shown the construction and assembly of a basic tongue and groove panel 16. Panel 16 consists of an elongate planar core 18 bonded to an exterior layer 20 and an interior layer 22 to form a unitary rigid structure.

The core of the standard panel consists of a central portion 24 and elongate strips 26, 28 vertically arranged and spaced apart from the central portion to form vertical elevated raceways or spaces 30, 32 on each side thereof. The parts of the core are arranged to lie in a common plane and are made of materials having the same thickness so as to provide spaced parallel planes of support for the exterior and interior layers 20, 22. Preferably, the core is approximately 2" thick and 2" wide, the central portion of the core being made of 2" x 6" pieces of construction lumber, and the core having a pair of 2" x 6" pieces arranged in abutting relation. Construction grade lumber of 2" x 6" nominal dimension, spaced edge-to-edge, does not extend two feet due to the milling process. Thus, the elongate vertical raceway spaces can be immediately provided from standard lumber at the same time that the two foot overall width requirement is satisfied, as will be further explained hereinafter.

Both the interior layer 22 and the exterior layer 20 are of the same width and terminate at one side edge of the panel approximately one-half the width of a core strip.

Beyond core strip 26 to form therewith a groove 34 for receiving a tongue portion of an adjacent panel. The other side edges of the exterior and interior layers terminate approximately one-half the width of core strip 28 and short of its outermost edge to form therewith a tongue for interconnecting with the groove of the next adjacent panel. The interior and exterior layers terminate in a manner that they do not take any of several decorative forms. As shown in the embodiment of FIGURES 1 through 3, the interior layer 20 forms notch rustic finish and the exterior is a lapped construction forming a channel rustic appearance.

It is particularly an important feature of the present invention that ordinary mill finish lumber of standard nominal size is used to assemble a basic panel having an exact two foot width. As mentioned, the core strips are of nominal 2" x 6" cross sectional dimension. The exterior and interior layers are formed from strips of 1" x 6", and 1" x 8" lumber arranged in alternating sequence.

The central core portion 24 is formed by a pair of edgeto-edge abutting 2" x 6" strips from which the outer core strips 26, 28 are spaced such that the outer edge distance between the outer strips is two feet. Since the actual width of the 2" x 6" core strips is about 5/8", the total interior width of the panel is the sum of the strip width (25.252") and of the spaces left between them. The spaces are accordingly approximately 1" in width which permits the overall width to be two feet exactly.

The exterior and interior layers 20, 22 are preferably overlapped 15°, so that using the actual milled dimensions of 5/8" and 7/8" widths, respectively, for the 1" x 6" and 1" x 8" width strips, a further shortening of about 2" in width occurs in assembly. Thus, the exterior and interior layers extend an effective 5" and 7", respectively, to again total the 2 foot desired width of the standard panel. The detailed dimensioning of the standard panel is set forth completely on the cross sectional view shown in FIGURE 3.

The materials from which the standard panel 16 is constructed will vary according to what is generally available in the area of manufacture. By way of example, a large quantity of relatively nonconstruction grade cedar wood is available in certain parts of the United States, such as in California. This wood, when properly treated and assembled into a panel of the type and dimension shown in FIGURES 1 through 3, has been found to result in a very satisfactory structure. Accordingly, common cedar strips of standard milled dimensions can be formed into a basic panel of the invention.

Other materials will also be found to be suitable and include substitution of the exterior and interior layers 20, 22 of the panel with two foot wide plywood sheet which can be provided with any type of surface decoration desired. The core 18 must include structural end strips to provide the necessary rigidity to the unit and to provide vertical support between floor and ceiling, as hereinafter described. However, the central portion 24 of the core can be made of materials other than wood provided that suitable fireproofing qualities are maintained. By way of example, a rigid lightweight styrofoam strip of 12" width has been substituted for the central portion with satisfactory results.

In general, when using cedar or other porous grain wood materials, it is desirable that the entire panel be dipped in a suitable wood preservative to enhance its thermal properties and to increase its weather resistance. One such preservative is of a penetrating type containing resin and metallic materials dispersed in a petroleum solvent carrier and sold under the name Houston #3 by Port Costa Clay Products Company, Houston Division, of San Francisco, Calif.

Floor and ceiling connections

Referring particularly to FIGURE 2, the longitudinal structure and interconnections of the panel 16 with the floor 38 and ceiling 40 portions of a house are shown. The core 18 at the lower end of the panel is stepped on a sole plate 42 affixed to and flush with the outer edge of the floor. The interior layer 22 extends over the inside of the sole plate and terminating with a slight gap to the floor so that the load is carried solely by the core. The interior layer 20 overlaps the floor and other side of the sole plate to thereby provide a gravity resistance to entry of water.

The core 18 at the upper end of the panel extends a substantial distance above the upper ends of the exterior and interior layers. This portion of the core interferes with a separate downwardly facing U-shaped channel member 44 including a top plate 46 which overlies the upper ends of the core and downwardly extending outer and inner side portions 48, 50 terminating in spaced vertical relation to the exterior and interior layers to form horizontally extending channels or gaps 52, 54 therebetween which are in communicating with the raceways 30, 32 in the panel.

The roof structure itself is supported by the top channel 42 so that supporting forces are carried from the sole plate 42 through the core structure 18 and the top plate in the channel member to the roof.

It will be noted that the gap is provided between the lower edge of the interior layer of the panel and the floor and the gaps 52, 54, provided between the channel members and the upper ends of the interior and exterior layers 20, 22, are sufficient to assure that the load is carried by the core 18 of the panel and not by its exterior and interior layers. The horizontal channels 52, 54 at the upper end are exposed when the wall is constructed and are later covered after wiring of the wall by suitable exterior molding 56 and ceiling molding 58 on the outer and inner sides, respectively; and, the lower connection between the inner lower edge of the wall and the ceiling floor is also trimmed with a suitable floor molding 60.

The above will be appreciated that the panel and its upper end connection with the roof provide both an in-
ner and outer horizontal raceways 52, 54 for wiring which are in continuous communication with each of the spaced parallel vertical wiring raceways 30, 32 located in the panel. When referring to FIGURE 1, it will be noted that when channel rustic interior strips are utilized for the interior layer that the vertical raceway will be located at approximately the midpoint between each of the wider of the strips (i.e., the strip having nominal dimension of 1 1/4 x 8") to facilitate location and installation of wiring and outlets and the like in the panel.

Corner and interior walls

FIGURE 4A illustrates the corner detail at the juncture of wall sections and also illustrates a manner of providing interior walls utilizing the construction of the invention. Thus, the corner consists of a groove end 34a of a standard panel 16a, the interior layer at the groove having been removed to laterally open it toward the inside of the panel. The tongue 36b of another standard panel 16b intersects at right angles into the laterally opened groove and is nailed in place through the core strips 26a, 28b of each panel and through a facing strip 62.

The interior panels 16c deviate little from the standard panel 16 and are begun with an interior runner strip 64 which is nailed to the inside of the exterior wall and which supports the groove portion of the tongue and groove panel 16c. Other panels 16c are assembled to the interior wall panel as also shown in FIGURE 5. Each interior wall panel is provided with interior layers on both sides which terminate at their lower ends to leave a small gap with the floor in the same manner as the interior layer of the panels 16.

Door and window sections

Means are provided for forming door and window openings 60, 65 in the wall and include a groove and groove panel 66 positioned immediately to one side of the window or door opening and from which the groove side of a basic tongue and groove panel 16 is positioned on the other side of the opening. Referring to FIGURE 6, groove and groove panel 66 includes core pieces 65 equally spaced in parallel relation to each other within the panel and overlapped at each side by interior and exterior layers 70, 72 to form a groove 74 at each side edge. Otherwise, the structure and construction of the panel of FIGURE 6 follows that shown and described in connection with panel 16 of FIGURE 3.

Each of said door and window openings is bounded at its upper extreme by a tongue and groove header panel 76 which is constructed from a solid horizontally running header piece (2 x W x L) therein surfaced with interior and exterior layers 78, 80 which terminates about 2" short of the ends of the header at each side to form in tongue portions for insertion and intermatting in the groove portions of adjacent panels of the wall. The specific W, L dimensions of the header are determined by its received height and length, respectively. Header panel 76 is supported on cripples 82 which are inserted in the grooves of the adjacent panels and which are vertically supported by the floor sole plate for a door opening 60 or in the case of a window opening 65, by a lower panel 84 which is also constructed in tongue and groove form.

Any usual door or window widths can be accommodated in the modular system of the invention by speciality constructing the header and lower panels. However, in the case of the modular ceilings, the header panels are commonly of standard door widths which are usually not of standard one foot increments. On the other hand, the window openings are commonly three and four feet in length and are easily created in standard widths by the modular system of the present invention. This can be seen by referring to the structure shown at 86, 88 in FIGURE 3 in which it will be seen that the structure is repetitive about the heavy line indicated at 86, the portions on either representing a one foot tongue and groove panel section. By assembling a combination of two foot panels with a one foot section, a wall section having any incremental length in feet can be formed. Each one foot section is provided with structural core strips at and is characterized by the same roadway channel and location as the two foot panel.

Referring to FIGURE 4B, an alternate inner connection of adjacent exterior wall panels at a corner is illustrated in detail. Thus, assuming a clockwise assembly of panels starting from the corner, the first panel 16d starts with a groove 34d and terminates at its rightmost end with a tongue 36d. The interior and exterior layers of groove 34d are removed or sawn off so that they lie flush with the end of the core strip at that side. A vertical mounting runner 87 is screwed at right angles to that end of the panel and into the core strip being spaced the width of the exterior layer from the end so that it can serve as a tongue portion for receiving and supporting one side of a groove and groove panel used as the last panel of the adjacent wall as shown. Facing strips 88, 90 are preferably overlaid at the corner to cover the exposed ends of the panels and to provide additional weatherproofing. Arbitrary wall lengths can be accommodated with the corner joint of FIGURE 4B by merely ripping each panel to the correct length.

Assembly

The modular panel system of the invention is assembled as illustrated in the exploded views of FIGURES 1 and 5 and the assembled pairs of FIGURES 7 and 8. Beginning at a corner and proceeding clockwise from above, the groove portion of a tongue and groove panel 16-1 is mounted to the corner and subsequent panels are added to its tongue side. As shown, the next adjacent panel 66-1 is next to a window opening 65 and is, accordingly, a groove and groove panel 66 by opening 65 present opposite grooves for receiving cripples 82-1 to support the header 76-1 on sill panel 84.

The door opening 60 is readily assembled from the long cripples 82-2, header 76-2, and supported between panel 66-2 and the next adjacent panel 16-2.

FIGURE 7 emphasizes the details of assembly of the window opening panels and shows how panel is brought in and may be slid into position adjacent the next wall panel. Interior wall panels 16c are dropped into position over an interiorly extending sole plate 42a beginning with exterior wall and the upright runner strip 64 and proceeding inwardly to any desired point at which the panel may be terminated as by being ripped at the desired width and a facing trim piece (not shown) secured to that end.

When assembled, the channel members 44 are positioned over the tops of the core of the various panels to complete the wall section. The roof structure is then assembled on the completed wall section.

FIGURE 8 illustrates the detail of raceway interchange between the exterior wall and an interior wall and shows that the raceways 30c in an interior wall communicate on both sides with the inner horizontal channel 54 formed between the channel member 44 and the outer wall to permit wiring 90 to be brought into panel 16c and down inner wall panel raceways 30c for providing electrical outlets and the like.

FIGURE 9 shows a modified embodiment of a modular wall of the same general construction as that shown previously but having a top plate 102 which is a single straight wooden member with fastening brackets 104 formed by extending the interior and exterior layers 106, 108 upwardly beyond the core pieces 110. With this construction, no ceiling trim is required since the interior layer 106 extends right up to the ceiling. Wiring can be introduced there through the top plate in alignment with the raceways as previously described.
We claim:
1. In a modular panel system for use in constructing a portion of a wall, a plurality of panels arranged side by side in edge to edge planar relationship, a substantial portion of said panels being constructed in identical, basic form and comprising an elongate planar core, a first portion of the core forming central means for the panel and the remaining portion of the core consisting of elongate strips spaced apart from the central core to form elongate channels on either side thereof, rigid interior layer fastened on one side of the core and a rigid exterior layer fastened on the other side of the core, said interior and exterior layers and said core strips forming a unitary structure and covering said elongate channels to provide wiring raceways in said panel, said interior and exterior layers being positioned to overlap one side of the panel by approximately one-half the width of one of said core strips and to form therewith at that side a groove receiving a tongue of an adjacent panel, and the other side of said interior and exterior layers terminating approximately one-half of the width of said other side core strip to form therewith a tongue for intermuting with a groove portion of the next adjacent panel, the upper edges of said exterior and interior panels terminating substantially below the upper ends of said core pieces, and means forming a top plate consisting of a U-shaped channel member adapted to lie over the upper ends of said core pieces, said channel member having downwardly extending portions terminating in spaced relation to the upper ends of said interior and exterior layers to form horizontally extending channel between which lies in communication with said raceways in said panel.

2. A modular panel system as in claim 1 further including a sole plate adapted to be fastened to the floor of a building and having a thickness corresponding to the thickness of the core members, the lower end of said wall panel being constructed and dimensioned to accommodate said sole plate such that the exterior and interior layers overlap the side of said sole plate.

3. A modular panel system as in claim 1 further including a means forming an opening, said means comprising spaced apart side panels positioned immediately to each side of said opening and presenting groove edges thereto, a cripple positioned and supported within each of said grooves, a tongue and tongue header panel mounted for support on said cripples and forming therewith the upper and side borders of said opening.

4. A modular panel system as in claim 3 wherein one of said side panels is a groove and groove panel including core pieces arranged in equally spaced parallel relationship to each other within said panel and being overlapped at each side by said interior and exterior layers to form grooves thereat.

5. A modular panel system as in claim 3 wherein said opening is a window opening and further including a tongue and tongue sill panel positioned as between said side panels, said sill panel having a predetermined height corresponding to the sill height of said window opening, and in which said cripples are positioned and supported on the sill panel.

6. A modular panel system as in claim 1 wherein said core and interior and exterior layers are made of lumber of standard dimensions.

7. A modular panel system as in claim 4 wherein each panel of basic form is 2' x 6' nominal size.

8. A modular panel system as in claim 5 wherein said interior and exterior layers are 1" x 6" and 1" x 8" nominal dimension and overlapped ¾".

References Cited

UNITED STATES PATENTS
2,129,441 9/1938 Otto 52—90
2,332,732 10/1943 Laucks 52—210
2,521,381 9/1950 Linck 52—262
3,339,327 9/1967 Kempf 52—347

FOREIGN PATENTS
553,622 5/1943 Great Britain
270,760 12/1950 Switzerland.

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U.S. Cl. X.R.
52—220, 241, 300, 593, 615