

- [54] **STRUCTURAL CEMENT-WOOD FIBER PANEL**
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[22] Filed: Sept. 29, 1969
[21] Appl. No.: 861,578
[52] U.S. Cl. 52/589, 52/601, 52/627
[51] Int. Cl. E04c 1/10, E04c 2/10, E04c 2/38
[58] Field of Search..... 52/601, 589, 592, 627, 628, 52/656, 684

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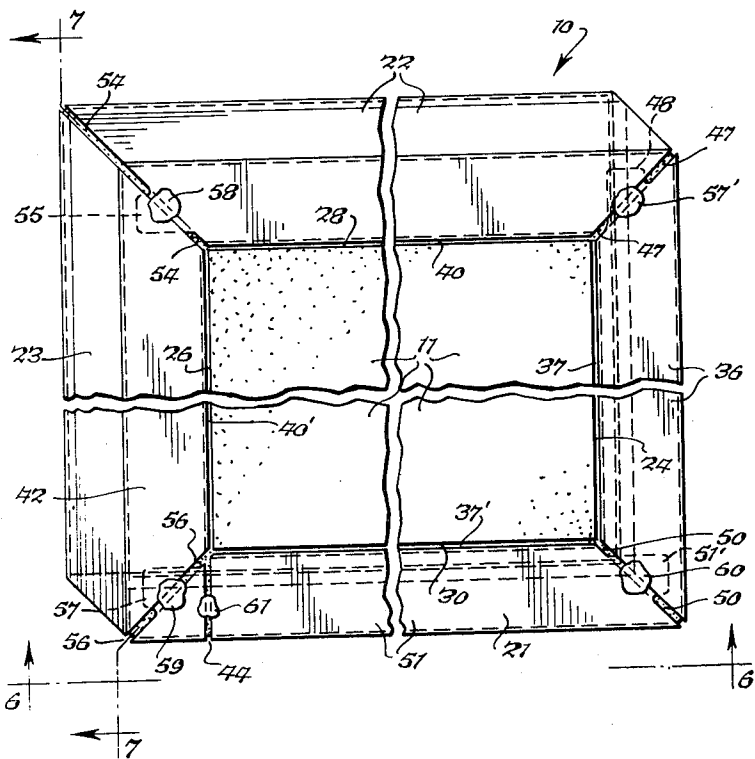
ABSTRACT

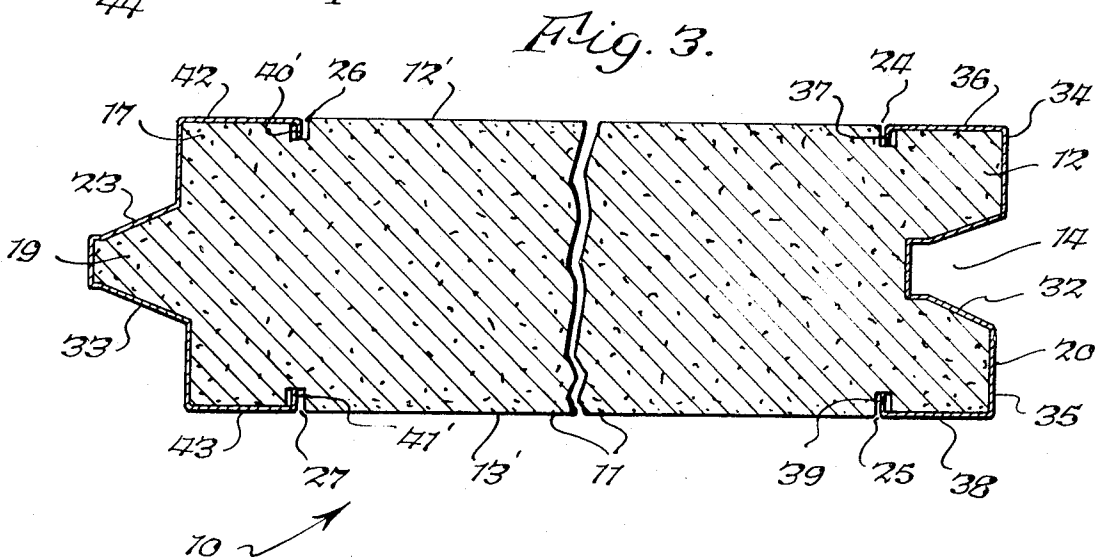
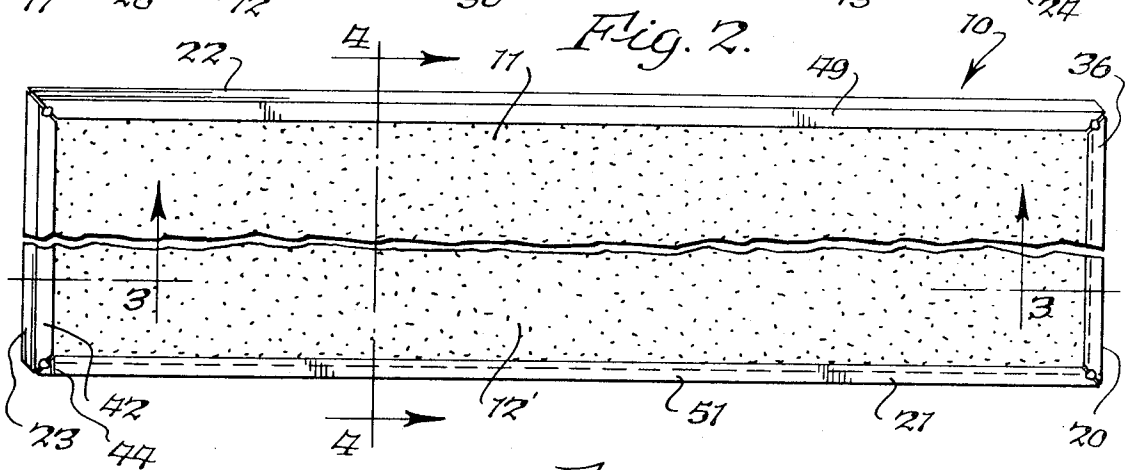
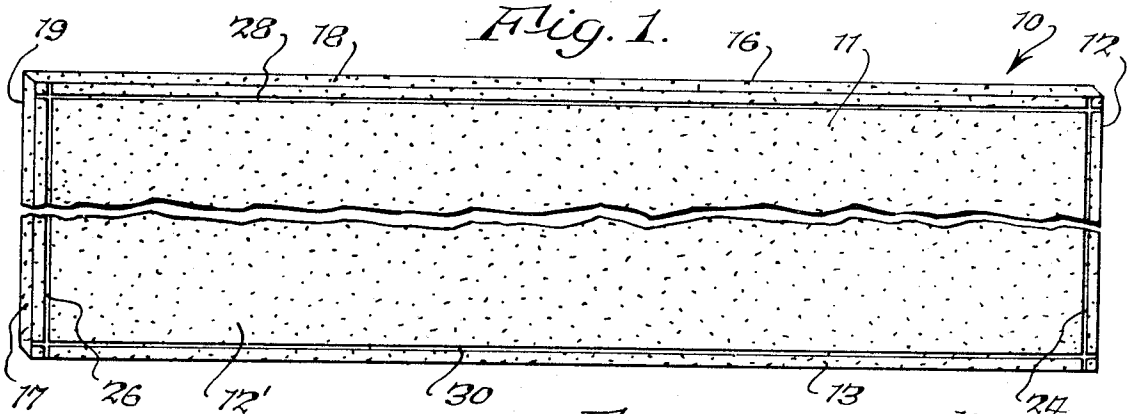
A cement-wood fiber panel comprising a body portion of substantially solid rectangular configuration having a pair of opposed faces and four edges, a grooved configuration formed in a pair of adjacent edges and a tongue configuration formed in another pair of adjacent edges, preformed metal edge members having portions which cover said edges in complementary mating relationship and have flanges thereon received in slots in the opposite faces of the body portion, and welded joints at adjacent mitered ends of the metal edge members.

10 Claims, 8 Drawing Figures

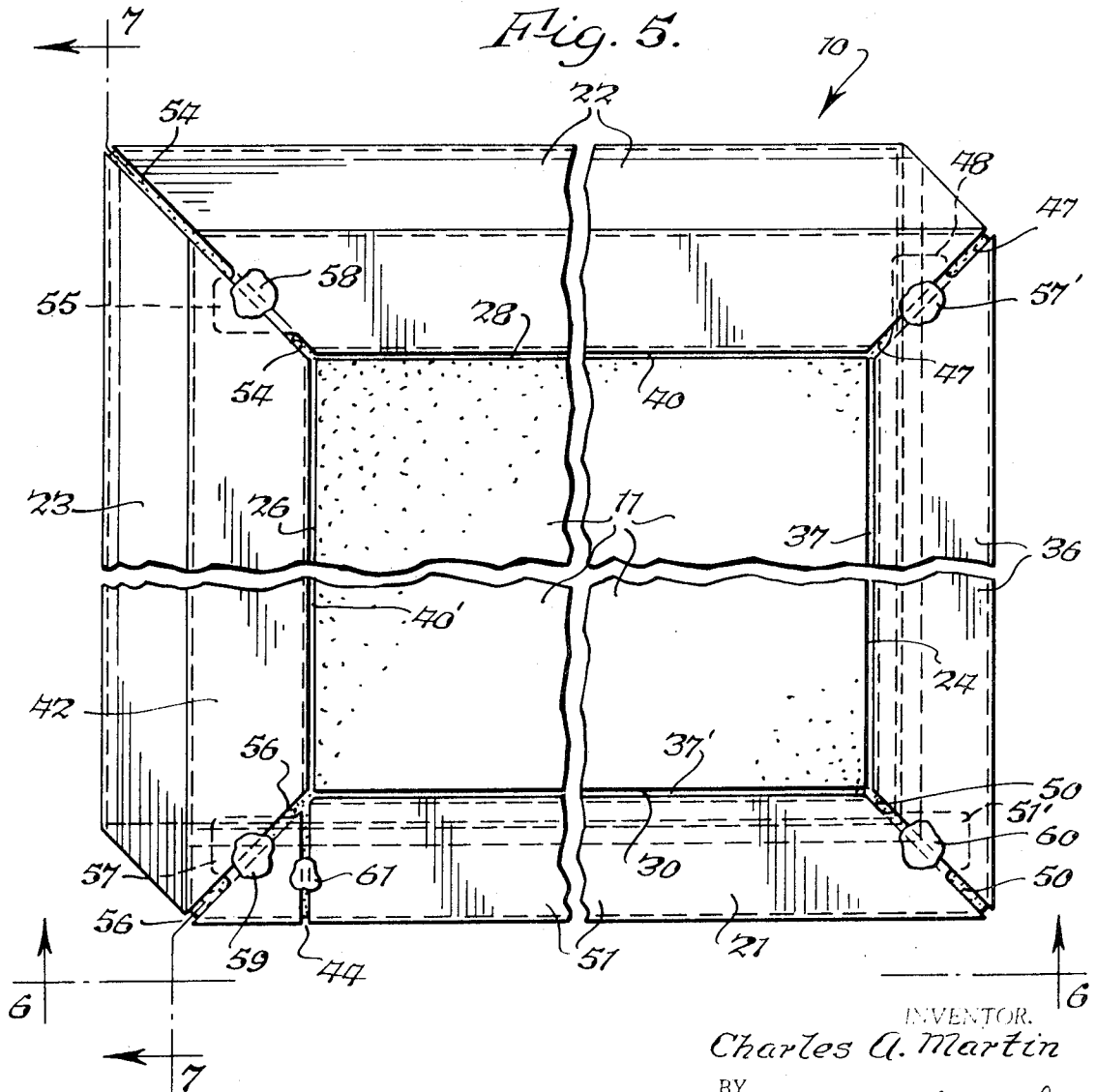
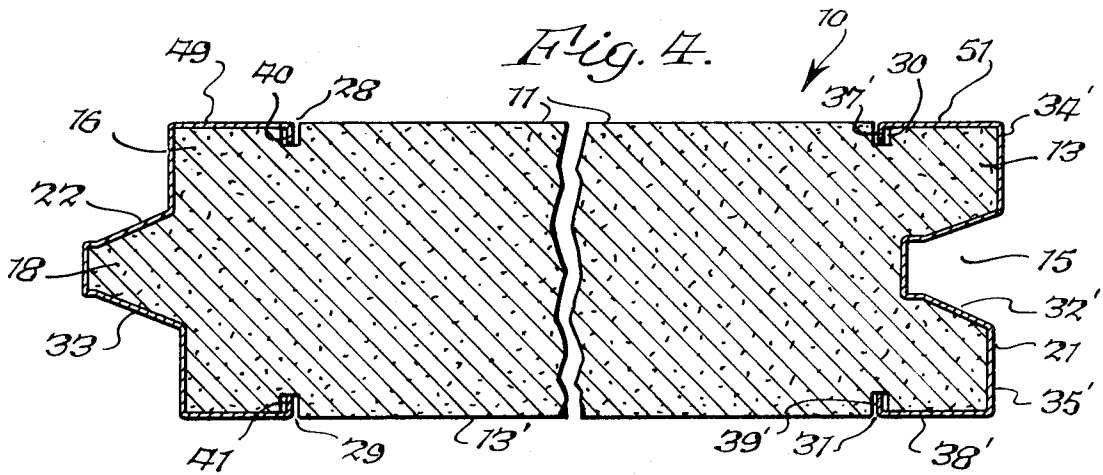
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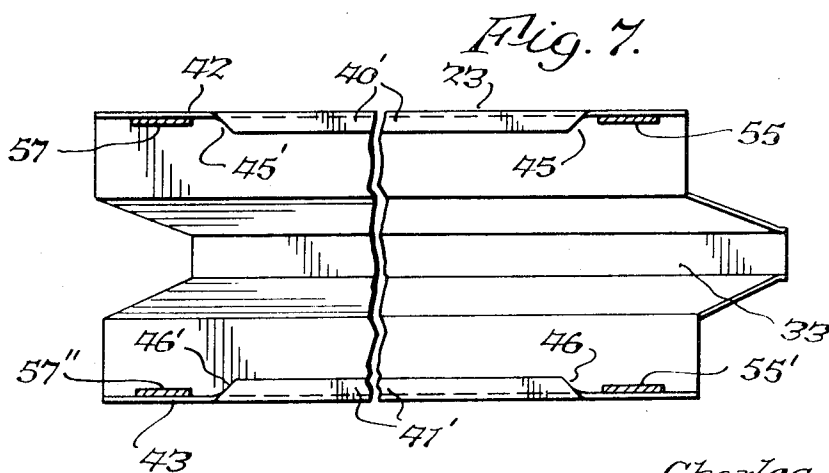
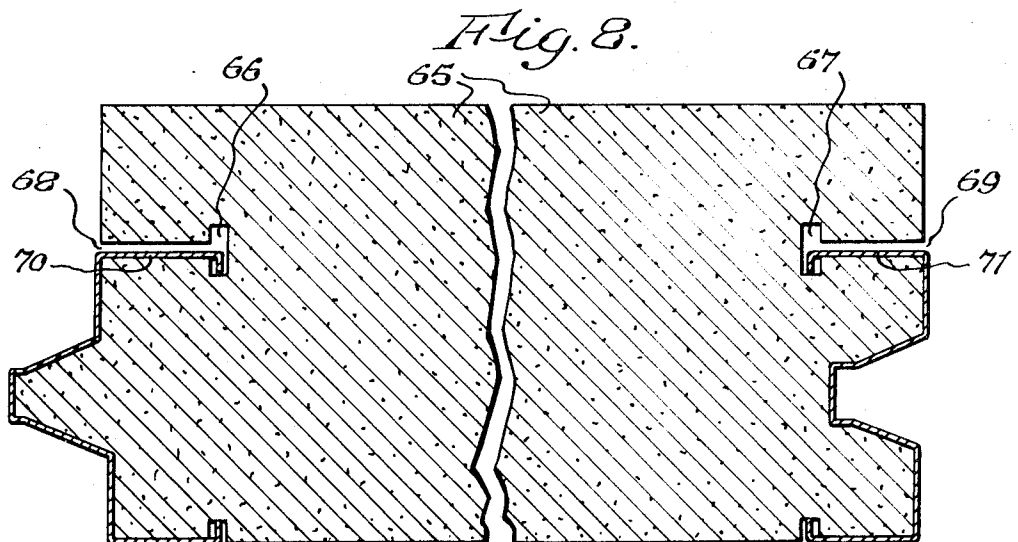
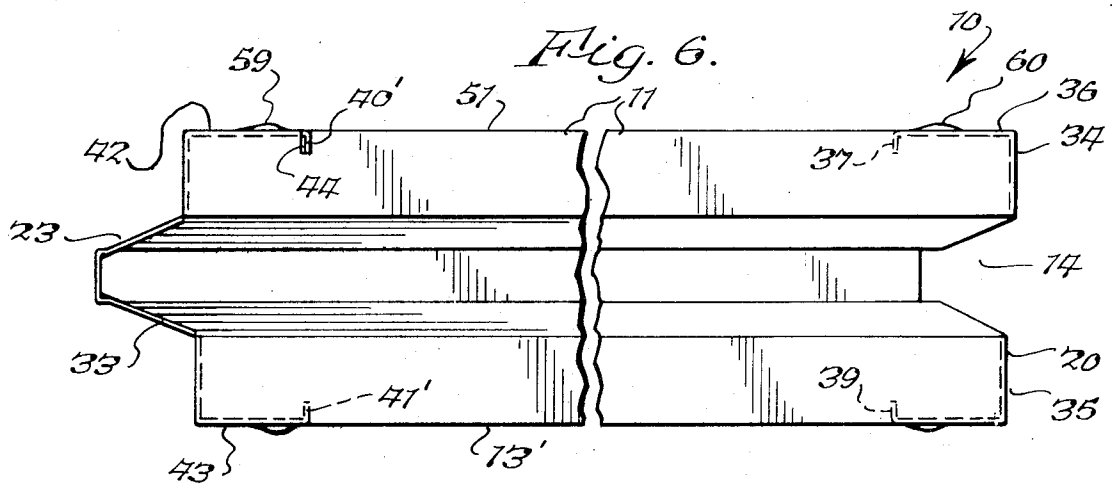




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STRUCTURAL CEMENT-WOOD FIBER PANEL

The present invention relates to an improved cement-wood fiber panel construction of the type which is utilized for roof decks and walls, and more particularly to a panel of this type which possesses a steel edge construction for imparting exceptionally high structural strength thereto.

By way of background, cement-wood fiber panels have been known and used in the past. However, their use was restricted because they had limited structural strength and further because they generally had to be installed with supplementary steel supports and grouting which involved a relatively high labor cost. Furthermore, prior cement-wood fiber panels had fragile edges which could be easily damaged in handling and shipping before and during construction which resulted in exposed ceilings having irregular or patched panels. It is by way of overcoming the foregoing deficiencies of the prior art that the present invention is concerned.

It is accordingly one object of the present invention to provide cement-wood fiber panel which is extremely strong and therefore can be used under conditions where this type of panel could heretofore not be used.

It is another object of the present invention to provide an improved cement-wood fiber panel which includes a tongue and groove edging which permits it to be mated with both the ends and sides of like adjacent panels in an extremely simple and expedient manner, thereby eliminating need for supplementary supports due to its ability to span greater distances and obviating the time-consuming and costly supplementary supports which were required in the past for panels of this type.

A further object of the present invention is to provide an improved cement-wood fiber panel which is constructed under factory conditions to improve and simplify field installation, which, due to being performed on top of the steel skeleton of a building, is hazardous and extremely expensive and very difficult to maintain quality. Other objects and attendant advantages of the present invention will readily be perceived hereafter.

The cement-wood fiber panel of the present invention includes two edges having a tongue configuration and two edges having a groove configuration. Metal edging is mounted on the edges of the panel in substantially complementary mating relationship. The metal edging includes flanges which are received in grooves in the body portion of the panel. The ends of adjacent metal edgings are mitered and are secured to each other by welding. The continuous framework of metal edging about the cement-wood fiber panel imparts an extremely high degree of structural strength to the panel, so that it can support loads which are far in excess of that obtained from the panel alone without this combination.

The various aspects of the present invention will be perceived more readily hereafter when the following portions of the specification are read in conjunction with the accompanying drawings wherein:

FIG. 1 is a fragmentary plan view of the cement-wood fiber panel after it has been shaped but before the metal edge members have been mounted thereon;

FIG. 2 is a fragmentary plan view of the panel of FIG. 1 with the metal edge members mounted on the edges thereof;

FIG. 3 is a fragmentary cross-sectional view taken substantially along line 3—3 of FIG. 2;

FIG. 4 is a fragmentary cross-sectional view taken substantially along line 4—4 of FIG. 2;

FIG. 5 is an enlarged fragmentary plan view similar to FIG. 2 and showing in greater detail the manner in which the metal edge members are joined to each other;

FIG. 6 is an elevational view taken substantially in the direction of arrows 6—6 of FIG. 5;

FIG. 7 is a view taken generally along line 7—7 of FIG. 5 and showing the tapered leading edges of the flanges on the metal edge members; and

FIG. 8 is a view similar to FIG. 3 but showing a modified form of the present invention in which additional strength is achieved without having any steel members extending from

face to face through the panel thereby affording effective insulation and eliminating need to apply separate insulation of any kind on the roof top surface of the panel.

The improved structural cement-wood fiber panel 10 includes a body portion 11 having an upper face 12' and a lower face 13'. Body portion 11 is felted from extra-long wood fibers up to about 18 inches long and roughly about 1/16x1/32 inch rectangularly in cross section, which have been chemically processed against deterioration, coated with cement by mixing them in a Portland cement slurry, and bonded under pressure by the cement coating to provide a cast porous panel with numerous random voids between the cement-coated wood fibers which is thus lightweight (having a density of about 36 pounds per cubic foot), strong (after curing of the cement), noncombustible, and has excellent thermal insulating and acoustical properties. This material is known under the trademark Fibroplank of the Martin Fireproofing Corporation and is well known in the art.

In order to impart additional strength to the body portion 11 metal edge members comprising a frame are mounted on the edges. More specifically, body portion 11 includes edges 12 and 13 which include grooves 14 and 15, respectively. Edges 16 and 17 include tongues 18 and 19, respectively, formed thereon. At this point it is to be noted that the configurations of edges 12, 13, 16, and 17 are formed by suitable milling cutters. Edges 12 and 13 have metal edge members 20 and 21, respectively, mounted thereon in generally complementary mating relationship. Edges 16 and 17 have metal edge members 22 and 23, respectively, mounted thereon in generally complementary mating relationship. As can be seen from FIGS. 1, 3, and 4, the opposite faces 12' and 13' of body portion 11 includes grooves 24 and 25 which are milled parallel to edge portion 12; grooves 26 and 27 which are milled parallel to edge portion 17; grooves 28 and 29 which are milled parallel to edge portion 16; and grooves 30 and 31 which are milled parallel to edge portion 13.

Edge members 20 and 21 (FIGS. 2, 3 and 4) include hollow central portions 32 and 32', respectively, which receive outwardly extending central portions 33' and 33, respectively, of edge members 22 and 23, respectively, of adjacent panels in complementary mating relationship when there are assembled to form a roof, or the like. In other words, in fabricating a roof or the like, the long sides of adjacent panels are connected to each other by a tongue and groove connection. The same is true of the short sides. On opposite sides of portion 32 (FIG. 3) are upper portion 34 and lower portion 35. Upper portion 34 merges into face-covering portion 36 which in turn merges into flange 37. Lower edge-covering portion 35 merges into face-covering portion 38 which in turn merges into flange 39. On opposite sides of portion 32' of member 21 (FIG. 4) are upper portion 34' and lower portion 35'. Upper portion 34' merges in face-covering portion 36 which merges into flange 37'. Lower portion 35' merges in portion 38' which merges into flange 39'. The flanges extend substantially throughout the entire length of the members on which they are located.

In order to mount metal edge member 20 it is merely necessary to align flanges 37 and 39 with grooves 24 and 25, respectively, while edge member 20 is held to the side of body portion 11, and thereafter slide the flanges into said grooves until member 20 occupies the position shown in FIG. 2. Thereafter flanges 37' and 39' of metal edge member 21 are aligned with grooves 30 and 31, respectively, while edge member 21 is held to the side of body portion 11, and member 21 is thereafter slide into the position shown in FIG. 2. Metal edge members 22 and 23 have the cross-sectional configuration shown in FIGS. 3 and 4 which is substantially identical to that described above relative to metal edge members 20 and 21, except for the central portion, as noted above. Therefore, insofar as pertinent here, it is only necessary to note that metal edge member 22 includes flanges 40 and 41 throughout its length, and member 23 includes flanges 40' and 41' throughout its length, these flanges being analogous to flanges such as 37 and 39 discussed above. After metal edge members 20 and 21

have been mounted in the above-described manner, member 22 is mounted by aligning flanges 40 and 41 with slots 28 and 29, respectively, while edge member 22 is held to the side of body portion 11, and thereafter sliding member 22 into the position shown in FIG. 2.

After the three members 20, 21 and 22 have been installed on body portion 11, members 23 must be installed. However, as can best be seen from FIG. 5, the left ends of members 21 and 22 obstruct slots 26 and 27, and therefore sliding flanges 40 and 41 of member 23 into these slots in the same manner as the other edge members would be an impossibility without excessively springing portions 42 and 43 apart. Therefore, a slot 44 (FIGS. 2, 5, and 6) is provided in top portion 51 of member 21, this slot being in alignment with groove 26. The edges 45 and 46 of flanges 40' and 41' (FIG. 7) are tapered or inclined to provide a camming action which causes the side portions 42 and 43 to spring apart slightly as flanges 40' and 41' ride through slot 44 and over side 43, respectively, to reach the position shown in FIGS. 2 and 5. The other ends of these flanges are also tapered at 45' and 46'. The flanges of each of the other edge members have a similar tapered construction at both ends to facilitate sliding them into the grooves.

After members 20, 21, 22, and 23 have been installed on body portion 11 in the above-described manner, they are positioned relative to each other with their mitered ends spaced apart slightly as shown in FIG. 5. More specifically, a space 47 exists between the mitered ends of members 20 and 22. However, a tab 48 which is an extension of upper portion 36 of member 20 lies under the upper side 49 of member 22, as shown in FIG. 5. A space 50 is located between the mitered ends of members 20 and 21 as shown in FIG. 5. A tab 51', which forms an extension of upper portion 51 of member 21, lies under side 36 of member 20. A space 54 is located between the mitered ends of members 22 and 23, and a tab 55 which forms an extension of upper side 49 of member 22 lies under upper side 42 of member 23. A space 56 is located between the mitered ends of members 21 and 23 and a tab 57, which forms an extension of upper side 51 of member 21 lies under upper side 42 of member 23. The foregoing spaces 47, 50, 54, and 56 facilitate the assembling of the edge members into proper position. A weld 57' joins members 20 and 22 at tab 48. A weld 58 joins members 22 and 23 at tab 55. A weld 59 joins members 21 and 23 at tab 57, and a weld 60 joins members 20 and 21 at tab 51. Spaces 47, 54, 56, and 50 extend about the entire corners of the body portion 11, that is, between all portions of the adjacent channels. Tabs (generally not shown) are provided on the lower sides of each metal edge member in corresponding relationship to the tabs described above relative to FIG. 5. In other words, as noted above, tab 48 extends from side 36 and a corresponding tab extends from side 38 directly below tab 48. The same is true relative to the remainder of the tabs. For example, in FIG. 27, tabs 55 and 57 have counterparts 55' and 57', respectively. Welds analogous to welds 57', 58, 59, and 60 are located at the junctions of the metal edge members on the lower face 13' to provide a total of eight welds at the junctions, four on the upper face 12' and four on the lower face 13'.

A weld 61 is applied onto slot 44, as shown in FIG. 5, to rigidize this area after edge member 22 has been slid to its final position shown, it being appreciated that slot 44 was solely for the purpose of permitting the sliding of member 23 into position, as described in detail above.

If desired, spaces 47, 54, 56, and 50, at the mitered edges of the channels, may be reduced in size if a perfect butt joint is desired. However, this would require closer manufacturing and assembling tolerances.

In FIG. 8 an alternate embodiment of the present invention is disclosed. This embodiment is identical in all respects to the embodiment described above with respect to FIGS. 1 to 7. However, in this embodiment a thicker body portion 65 is utilized with preformed metal edging of the same dimensions shown with respect to FIGS. 1 to 7. In order to achieve this, slots 68 and 69 are initially milled into the body portion, and

thereafter slots 66 and 67 are milled into the body portion, these slots being in communication with slots 68 and 69, respectively, which receive the upper portions 70 and 71, respectively, of the steel edging. Slots such as 66, 67, 68, and 69 are formed along the four edges of the body member and the mode of assembly of the preformed metal edges onto the body member 65 is the same as described above relative to FIGS. 1 to 7.

The panel depicted in FIGS. 1-7 is 2 inches thick, 32 inches wide and 10 feet long, and the metal edging is 20-gauge rolled steel. The weight of the body portion is 6 pounds per square foot for a 2-inch thickness. The use of the metal edging in conjunction with the cement-wood fiber body has given highly dramatic results in the nature of increased strength. More specifically, testing has revealed that panels having a 20-gauge steel edging of the configuration shown and 2 inches thick were able to support a safe load of 58 pounds per square foot on a 7-foot span, this including a safety factor of 4. In this respect, the maximum load capable of being supported was 231 pounds per square foot. In contrast to this, the normal cement-wood fiber plank without the steel edging and of comparable thickness would only support a safe load of 56 pounds per square foot for a 3-foot span. Thus the construction of the present invention gave approximately the same support over a 7-foot span as was heretofore capable of achievement only on a 3-foot span. In fact, the previous construction without the steel edging would rupture before the loading applied to the present device could be achieved. The improved results come from the combination of the steel edging with the cement-wood fiber body whereby each contributes to the other so that the result which is achieved is greater than would be expected from either of the elements considered individually.

The various slots such as 24, 25, 26, and 27 have been shown considerably wider than the flanges which they receive. This is for purposes of illustration only, as it is desirable that such slots be only wide enough to conveniently receive the flanges associated therewith.

I claim:

1. A cement-wood fiber panel comprising a body portion of cement-wood fiber of generally rectangular solid configuration having opposed faces and first, second, third, and fourth peripheral edges; a grooved configuration formed in certain of said edges, a tongue configuration formed in the other of said edges, first and second grooves in said opposed faces of said body portion parallel to each of said first and second edges, a first metal edge member mounted in complementary mating engagement with said first edge and having first flange portions received with a sliding fit in said first and second grooves associated with said first edge, a second metal edge member mounted in complementary mating engagement with said second edge and having second flange portions received with a sliding fit in said first and second grooves associated with said second edge, a third metal edge member mounted in complementary mating engagement with said third edge, first means at the junctions of said first, second, and third metal edge members to maintain said first and third metal edge members connected to each other and to maintain said second and third members connected to each other, a fourth metal edge member mounted in complementary mating engagement with said fourth edge, second means at the junctions of said fourth, second, and third metal edge members to maintain said third and fourth metal edge members connected to each other and to maintain said second and fourth members connected to each other, third and fourth grooves in said opposed faces parallel to said third edge, said third metal edge member including third flange portions received in said third and fourth grooves, and a slot in said second metal edge member in alignment with said third groove to permit said third flange portion of said third metal edge member to slide therethrough prior to being located in spaced relationship to said second metal edge member.

2. A cement-wood fiber panel as set forth in claim 1 including a weld on said slot to rigidize said second metal edge

member after said third metal edge member has been placed in final position.

3. A cement-wood fiber panel as set forth in claim 2 wherein said flange portions of said third metal edge member have tapered leading portions to permit said third metal edge member to ride over said second metal edge member when being mounted.

4. A cement-wood fiber panel comprising a body portion of cement-wood fiber of generally rectangular solid configuration having opposed faces and first, second, third, and fourth peripheral edges, a grooved configuration formed in certain of said edges, a tongue configuration formed in the other of said edges, first and second grooves in said opposed faces of said body portion parallel to each of said first and second edges, a first metal edge member mounted in complementary mating engagement with said first edge and having first flange portions received with a sliding fit in said first and second grooves associated with said first edge, a second metal edge member mounted in complementary mating engagement with said second edge and having second flange portions received with a sliding fit in said first and second grooves associated with said second edge, a third metal edge member mounted in complementary mating engagement with said third edge, first means at the junctions of said first, second and third metal edge members to maintain said first and third metal edge members connected to each other and to maintain said second and third members connected to each other, a fourth metal edge member mounted in complementary mating engagement with said fourth edge, second means at the junctions of said fourth, second and third metal edge members to maintain said third and fourth metal edge members connected to each other and to maintain said second and fourth members connected to each other, and third and fourth grooves in said opposed faces parallel to said third edge, said third metal edge member including third flange portions received in said third and fourth grooves, said third flange portions of said third metal edge member having tapered leading portions to permit said third metal edge member to ride over said second metal edge member when being mounted on said second end.

5. A building panel having a rigid body portion composed of elongated wood fibers felted to provide a multiplicity of voids in the panel and bonded by cured Portland cement and having opposed broad faces and a plurality of straight peripheral edges, wherein the improvement comprises each pair of opposite edges being provided, respectively, with longitudinal tongues and grooves cut in said body panel while in the solid state, a continuous metal edging fitting said tongues and grooves of all of said edges and permitting a succession of said panels to have metal tongue and groove connections with one another both at their side edges and at their end edges, first grooves milled in one of said faces parallel to each of said edges, second grooves milled in the other of said faces parallel to each of said edges, and flange means on said metal edging received in said first and second grooves, said metal edging comprising a frame composed of individual edge members mounted on each of said edges and joined at their junctions, said metal edge members being mounted on said body member by a sliding fit between said flange means and said first and second grooves, one of said metal edge members including a slot therein in alignment with one of said first grooves to permit one of said flange means of one of said edge members to slide therethrough when being mounted in said one of said first grooves prior to being located in spaced relationship to said second metal edge member.

6. A building panel as set forth in claim 5 wherein each of said junctions include a tab formed on one of said edge members lying under a portion of an adjacent edge member and

wherein said means joining said edge members at their junctions comprise weld means at each of said junctions on said tabs.

7. A cement-wood fiber panel comprising a body portion of cement-wood fiber of generally rectangular solid configuration having opposed faces and first, second, third, and fourth peripheral edges, a grooved configuration formed in certain of said edges, a tongue configuration formed in the other of said edges, first and second grooves in said opposed faces of said body portion parallel to each of said first and second edges, a first metal edge member mounted in complementary mating engagement with said first edge and having first flange portions received with a sliding fit in said first and second grooves associated with said first edge, a second metal edge member mounted in complementary mating engagement with said second edge and having second flange portions received with a sliding fit in said first and second grooves associated with said second edge, a third metal edge member mounted in complementary mating engagement with said third edge, first means at the junctions of said first, second and third metal edge members to maintain said first and third metal edge members connected to each other and to maintain said second and third members connected to each other, a fourth metal edge member mounted in complementary mating engagement with said fourth edge, second means at the junctions of said fourth, second and third metal edge members to maintain said third and fourth metal edge members connected to each other and to maintain said second and fourth members connected to each other, third and fourth grooves in said opposed faces parallel to said third edge, said third metal edge member including third flange portions received in said third and fourth grooves, said first and second means comprising welds, and said junctions between said metal edge members including a tab formed integrally on one of said members and being located adjacent said junction, said tab extending outwardly beyond the end portion of said one of said members and underlying a portion of an adjacent metal edge member, and said welds being located on said tabs.

8. A cement-wood fiber panel as set forth in claim 7 wherein adjacent metal edge members are slightly spaced at said junctions to permit latitude in alignment therebetween.

9. A cement-wood fiber panel comprising a body portion of cement-wood fiber having opposed faces and a plurality of peripheral edges, a continuous frame of metal edging mounted on said peripheral edges for imparting strength to said body portion, said body portion being of rectangular solid configuration and said peripheral edges comprising four peripheral edges, groove configurations on two of said peripheral edges, tongue configurations on the other two of said peripheral edges, said continuous frame including edge members mounted in substantially complementary mating relationship of said four peripheral edges, first and second grooves in said opposed faces of said body portion parallel to at least one of said edges and proximate thereto, flange portions on at least one of said edge members received in said first and second grooves with a sliding fit, said continuous frame comprising individual edge members on each of said peripheral edges, and weld means joining said edge members at their junctions, certain of said junctions between said metal edge members including a tab formed integrally on one of said members and being located adjacent said junction, said tab extending outwardly beyond the end portion of said one of said members and underlying a portion of an adjacent metal edge member, and said weld means being located on said tab.

10. A cement-wood fiber panel as set forth in claim 9 wherein said metal edge members are slightly spaced at said junctions to permit latitude in alignment therebetween.

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