United States Patent

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[54] **COMPOSITE CONCRETE AND CEMENT-WOOD FIBER PLANK**
9 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **161/37,** 52/309, 52/595, 161/44, 161/161
[51] **Int. Cl.** **B32b 3/10,** B32b 3/02
[50] **Field of Search** 161/37, 43–44, 159–161; 52/593, 595, 309

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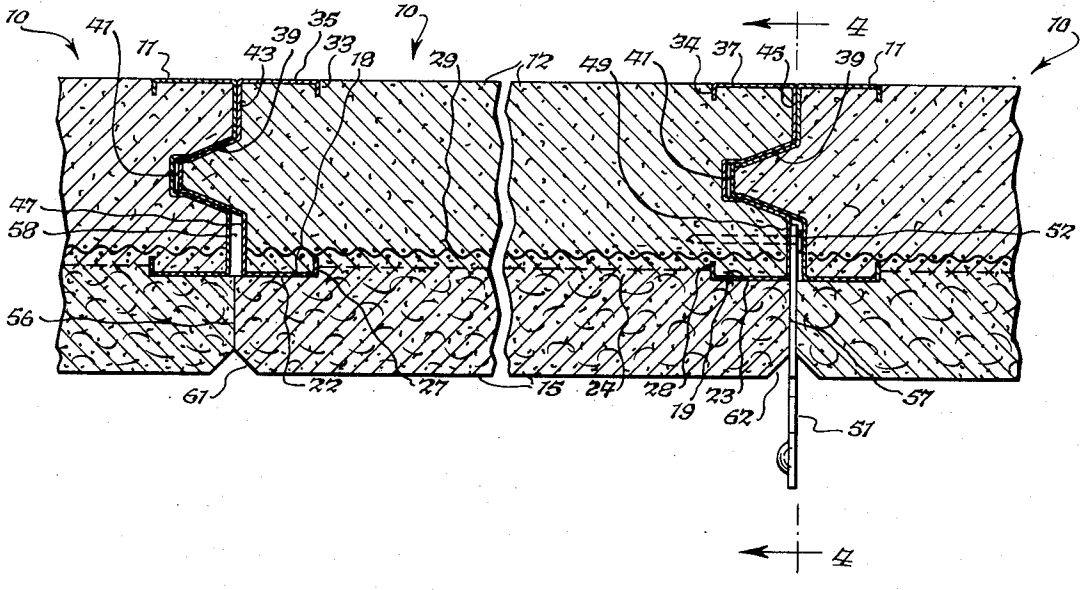
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ABSTRACT: A composite laminated concrete and cement-wood fiber plank consisting of a peripheral metal frame defining a substantially rectangular solid and having two edges with tongues and two edges with grooves, concrete in said frame, a cement-wood fiber plank portion having a first face extending slightly into said frame and a second face facing away from said frame and a border proximate the first face on which said frame rests, said concrete penetrating voids in the cement-wood fiber plank portion to effect a bond between the concrete and the cement-wood fiber portion, with the portion of the metal frame adjacent the cement-wood fiber plank portion being of a slightly smaller perimeter than the perimeter of the cement-wood fiber plank portion and the perimeter of the portion of the frame above the tongues and the grooves.

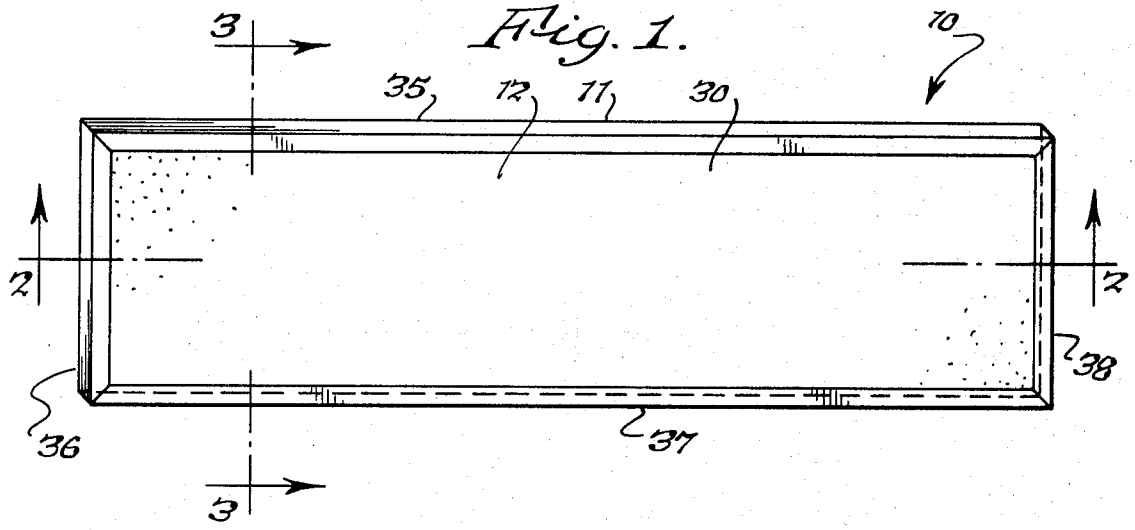


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SHEET 1 OF 2

Fig. 1.



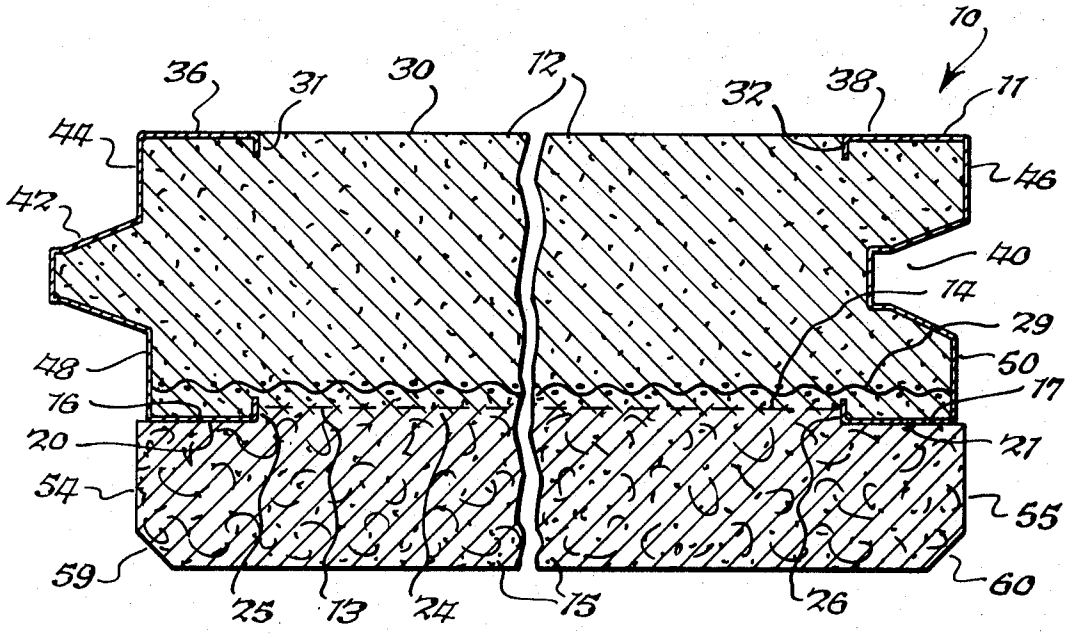


Fig. 2.

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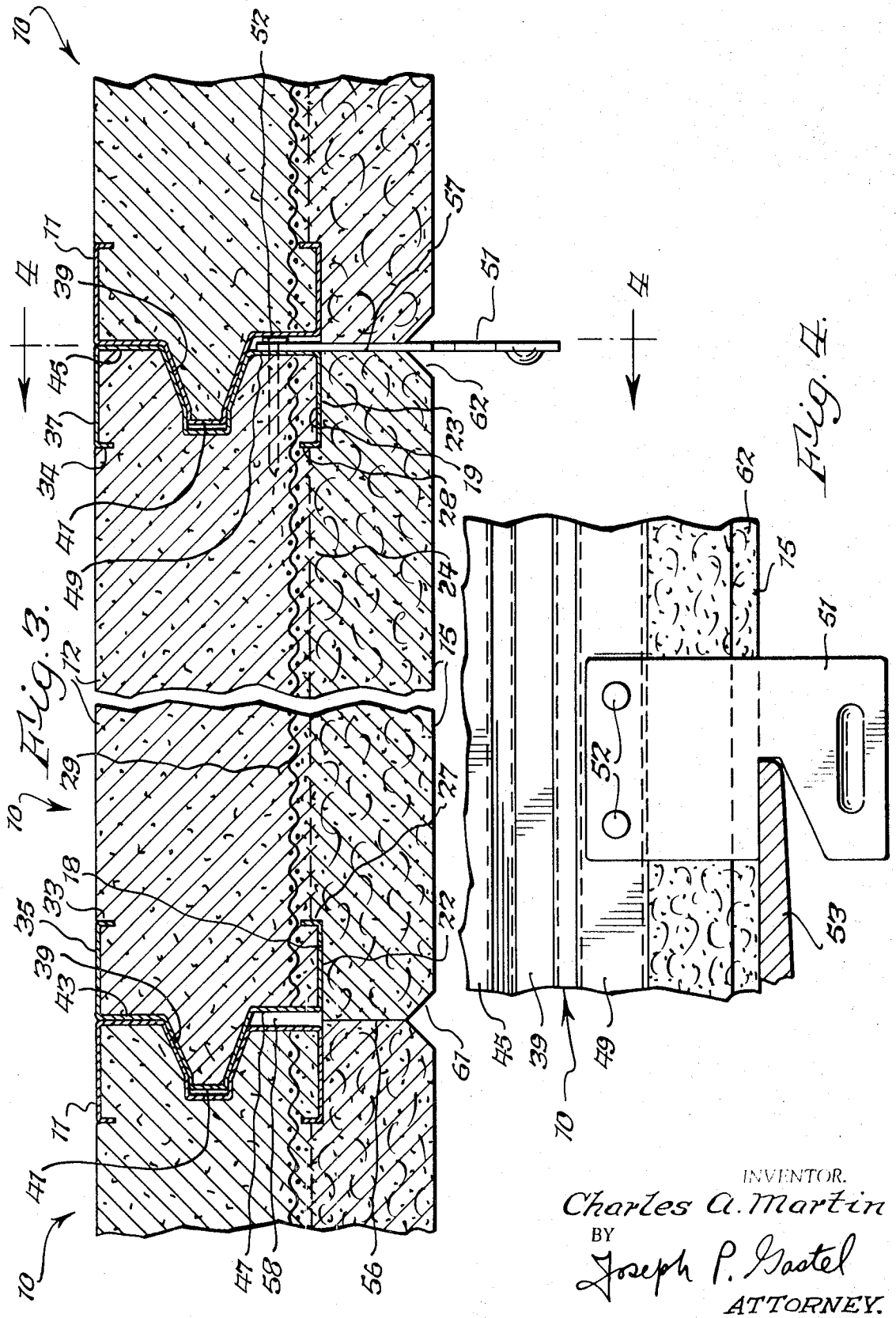


Fig. 3.

Fig. 4.

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COMPOSITE CONCRETE AND CEMENT-WOOD FIBER PLANK

The present invention relates to an improved plank construction which is a lamination of steel edged concrete with a facing of cement-wood fiber.

It is the primary object of the present invention to provide an improved plank construction which is a laminate of steel-edged concrete and cement-wood fiber which is fabricated in a highly efficient manner.

Another object of the present invention is to provide an improved plank construction which is a laminate of concrete with a cement-wood fiber facing which provides an extremely pleasing appearance by presenting a continuous decorative expanse of cement-wood fiber to the inside of a room which completely obscures both the cement portion of the plank and the metal edging associated therewith.

A further object of the present invention is to provide an improved plank construction which is a composite of steel-edged concrete laminated with a facing of cement-wood fiber which, in addition to having the structural strength of concrete, is installable as a unit in a single step to additionally provide a decorative ceiling, the desirable acoustical properties of cement-wood fiber, effective shielding of the steel edge from direct flame, and highly efficient insulation. Other objects and attendant advantages of the present invention will readily be perceived hereafter.

The improved plank construction of the present invention comprises a peripheral frame defining a substantially rectangular solid and having two edges with tongues and two edges with grooves, concrete in the peripheral frame and bonded thereto with the concrete having a first side and a second side, a cement-wood fiber plank portion having voids therein and having a first face and a second face, with the edge of said first face of the cement-wood fiber portion providing a base for receiving the frame with a portion of said first face of the cement-wood fiber portion extending into the frame to provide a locking engagement therewith, and the concrete penetrating the voids in the cement-wood fiber plank portion to effect a bond therewith.

The present invention will be more fully understood when the following portions of the specification are read in conjunction with the accompanying drawings wherein:

FIG. 1 is a plan view of the composite laminated concrete and cement-wood fiber plank;

FIG. 2 is a fragmentary cross-sectional view taken substantially along line 2—2 of FIG. 1;

FIG 3 is a fragmentary cross-sectional view taken substantially along line 3—3 of FIG. 1 and showing the relationship between the plank shown in FIG. 1 and adjacent planks with which it is assembled; and

FIG. 4 is a fragmentary cross-sectional view taken substantially along line 4—4 of FIG. 3 and showing the manner in which a clip is secured to the plank.

The composite laminated concrete and cement-wood fiber plank **10** includes a metal frame **11** mounted on the periphery of a concrete plank portion **12** which has its lower face **13** bonded to the upper face **14** of a cement-wood fiber plank portion **15**, the bonding being effected by the diffusion of a certain amount of the concrete at the interface into the voids of the cement-wood fiber plank portion **15**.

The cement-wood fiber plank portion **15** is fabricated from extra long wood fibers up to about 18 inches long and roughly about one-sixteenth inch by one thirty-second inch rectangularly in cross section, which have been chemically processed against deterioration, coated with cement by mixing them in a cement slurry, and bonded under pressure to provide a cast porous plank having numerous random voids between felted Portland cement-bonded fibers which is therefore lightweight (having a density of about 36 pounds per cubic foot), strong, 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.

After plank portion **15** has been formed in the foregoing manner, it is sized by milling a border thereon which includes surfaces **16**, **17**, **18** and **19** thereon to provide a level portion on which sides **20**, **21**, **22** and **23** of frame **11** rest. The plank portion **15**, after the foregoing sizing operation, is left with a central protuberance **24** of a size which fits snugly between flanges **25**, **26**, **27** and **28**, respectively, adjacent sides **20**, **21**, **22** and **23**, respectively, of the assembled frame. Because of this relationship, the frame **11** can be mounted accurately in its final position on plank portion **15**.

Thereafter metal-reinforcing mesh **29** is laid into frame **11** as far down as it will go and the concrete which forms body portion **12** is poured into the frame and troweled to cause top surface **30** to be flat as shown in FIGS. **2** and **3**. The troweling, as well as the weight of the concrete, will cause a certain amount of the concrete proximate the interface between the body portion **12** and the plank **15** to penetrate the voids of the latter, and when it dries, it will form the bond which securely attaches the plank **15** to the remainder of the structure. It will also be noted that the concrete also fully fills the frame **11**, as can be seen from FIGS. **2** and **3**, the flanges **25–28** and **31–34** securely locking the frame **11** to the body **12**. At this point it is to be noted that the flanges **31**, **32**, **33** and **34**, as well as the flanges **25**, **26**, **27** and **28** extend for substantially the entire length of the metal edge member which they form a part of.

The frame **11** consists of metal edge members **35**, **36**, **37** and **38** which are suitably joined to each other as by welding at their junctions. Edge members **37** and **38** are of a construction which includes grooves **39** and **40**, respectively. Edge members **35** and **36** are of a construction which includes tongues **41** and **42**, respectively. Edge members **35**, **36**, **37** and **38** include upper side portions **43**, **44**, **45** and **46**, respectively, which lie above the tongue and groove portions and define the outer upper peripheral side of the concrete portion of the plank. Edge members **35**, **36**, **37** and **38** also include lower side portions **47**, **48**, **49** and **50**, respectively, which define the periphery of the lower portion of the concrete portion of the plank below the ridges and the grooves, as can be seen from FIGS. **2** and **3**.

The perimeter of upper portions **43**, **44**, **45** and **46** is greater than the perimeter of portions **47**, **48**, **49** and **50**. In other words, the upper edges extend outwardly a bit more than the lower edges on all sides. Thus, as can be seen from FIG. **3**, all of the upper edge portions of adjacent planks are in abutting relationship when they are mated by means of the tongues and grooves and the lower edge portions will be spaced a sufficient amount so as to accommodate the clips such as **51** and the heads **52** of the nails which secure the clips to the lower edge portion **49** of the metal edges, the clips **51** being for the purpose of securing the planks to purlins **53**, as shown in FIG. **4**.

As can be seen from FIGS. **2** and **3**, the plank portion **15** has a perimeter which is equal to the perimeter of the upper edge portions of the metal frame. In other words, the perimeter of sides **54**, **55**, **56** and **57** of plank portion **15** is the same as the perimeter of upper edge portions **43**, **44**, **45** and **46** of the frame and in line therewith. Therefore, when adjacent planks are mated, as shown in FIG. **3**, the edge portions of adjacent plank portions **15** will abut each other to cover or obscure the spaces such as **58** between the lower edge portions of the frames. However, since the plank portion **15** is somewhat compressible, it will compress in the areas where clips **51** are located, thereby to accommodate such clips. As can be seen, the edges of the planks **15** are chamfered at **59**, **60**, **61** and **62** so as to provide a pleasing configuration where adjacent planks meet.

It will be appreciated of course that bonding agents other than Portland cement can be used for bonding the wood fibers if desired.

The improved plank of the present invention incorporates effective insulation, acoustic properties and a decorative ceiling in a plank unit having a concrete portion. This has a number of advantages, The improved plank of the present invention can be installed in a single step in a simple and highly

efficient manner, thereby obviating the costly and inefficient prior practice of either installing separate insulation on the top of the concrete and/or a decorative ceiling below the concrete. Furthermore, because the cement-wood fiber portion of the plank provides a continuous expanse on the inside of the room, there is no direct conductive path between the inside of the room and the outside of the roof through the concrete or the steel frame which bounds the concrete, thereby providing highly efficient insulation and flame retardation, as well as the aforementioned decorative ceiling. In addition, since there is no separate insulation on the top of the concrete which forms the top of a roof deck, the exposed concrete portion will be capable of taking the abuse of the elements during construction, as well as permitting traffic thereon during the construction process.

I claim:

1. A composite laminated concrete and cement-wood fiber plank construction comprising a peripheral frame defining a substantially rectangular solid, concrete in said peripheral frame and bonded thereto with said concrete having a first face and a second face, a cement-wood fiber plank portion including voids therein and having a third face and a fourth face with said third face of said cement-wood fiber plank in contiguous relationship to said first face of said concrete, and edge portions on said third face in contiguous relationship with said frame, said concrete penetrating said voids in said cement-wood fiber plank portion to effect a bond therebetween, said second face of said cement-wood fiber plank portion and said fourth face of said concrete defining the outer faces of said plank, said frame including two sides having tongues and two sides having grooves, with said tongues and grooves being located substantially on the central portions of the sides of said frame, said frame including an upper side portion above said tongues and grooves and a lower side portion below said tongues and grooves, said upper side portions extending laterally outwardly beyond said lower side portions to provide spaces between lower side portions of assembled adjacent planks for accommodating mounting clips, said cement-wood fiber plank having a peripheral dimension which is approximately equal to the peripheral dimension of said upper side portions and in line therewith so as to conceal said spaces between said lower side portions of assembled adjacent planks.

2. A composite laminated concrete and cement-wood fiber plank construction comprising a peripheral frame defining a substantially rectangular solid, concrete in said peripheral frame and bonded thereto with said concrete having a first face and a second face, a cement-wood fiber plank portion including voids therein and having a third face and a fourth face with said third face of said cement-wood fiber plank in contiguous relationship to said first face of said concrete, edge portions on said third face in contiguous relationship with said frame, said concrete penetrating said voids in said cement-wood fiber plank portion to effect a bond therebetween, said second face of said cement-wood fiber plank portion and said fourth face of said concrete defining the outer faces of said plank, said frame including outer edge portions substantially coextensive with said first face of said concrete, said outer edge portions defining an inner perimeter, and a protuberance on said cement-wood fiber plank portion having an outer perimeter of substantially the same size as said inner perimeter, said protuberance extending into said inner perimeter to locate said frame on said cement-wood fiber plank portion.

3. A composite laminated concrete and cement-wood fiber plank construction as set forth in claim 2 wherein said frame includes two sides having tongues and two sides having grooves, with said tongues and grooves being located substantially on the central portion of the sides of said frame, said frame including an upper side portion above said tongues and grooves and a lower side portion below said tongues and grooves, said upper side portions extending laterally outwardly beyond said lower side portions to provide spaces between lower side portions of assembled adjacent planks for accommodating mounting clips, said cement-wood fiber plank having a peripheral dimension which is approximately equal to the peripheral dimension of said upper side portions and in line therewith so as to conceal said spaces between said lower side portions of assembled adjacent planks.

4. A composite laminated concrete and cement-wood fiber plank construction as set forth in claim 2 wherein said edge portions of said third face are in abutting relationship with said frame.

5. A composite laminated concrete and cement-wood fiber plank construction as set forth in claim 4 including a metal reinforcing mesh embedded in said concrete proximate said first face thereof.

6. A composite laminated concrete and cement-wood fiber plank construction as set forth in claim 5 wherein said frame includes two sides having tongues and two sides having grooves, with said tongues and grooves being located substantially on the central portion of the sides of said frame, said frame including an upper side portion above said tongues and grooves and a lower side portion below said tongues and grooves, said upper side portions extending laterally outwardly beyond said lower side portions to provide spaces between lower side portions of assembled adjacent planks for accommodating mounting clips, said cement-wood fiber plank having a peripheral dimension which is approximately equal to the peripheral dimension of said upper side portions and in line therewith so as to conceal said spaces between said lower side portions of assembled adjacent planks.

7. A composite laminated concrete and cement-wood fiber plank construction comprising a peripheral frame defining a substantially rectangular solid, concrete in said peripheral frame and bonded thereto with said concrete having a first face and a second face, a cement-wood fiber plank portion including voids therein and having a third face and a fourth face with said third face of said cement-wood fiber plank in contiguous relationship to said first face of said concrete, and edge portions on said third face in contiguous relationship with said frame, means bonding said cement-wood fiber plank portion relative to said concrete, said second face of said cement-wood fiber plank portion and said fourth face of said concrete defining the outer faces of said plank, said frame including outer edge portions substantially coextensive with said first face of said concrete, said outer edge portions defining an inner perimeter, and a protuberance on said cement-wood fiber plank portion having an outer perimeter of substantially the same size as said inner perimeter, said protuberance extending into said inner perimeter to locate said frame on said cement-wood fiber plank portion.

8. A composite laminated concrete and cement-wood fiber plank construction as set forth in claim 7 wherein said edge portions of said third face are in abutting relationship with said frame.

9. A composite laminated concrete and cement-wood fiber plank construction comprising a peripheral frame defining a substantially rectangular solid, said frame having an inner portion and an outer portion, concrete within said inner portion of said peripheral frame and bonded thereto with said concrete having a first face, a cement-wood fiber plank portion including voids therein and having a second face and a third face with said second face of said cement-wood fiber plank being in contiguous relationship to said first face of said concrete, said concrete penetrating said voids in said cement-wood fiber plank portion to effect a bond therebetween in the area of said first and second faces, said cement-wood fiber plank portion including a portion lying outside of said peripheral frame and covering a portion of said outer portion of said frame thereby to obstruct said outer portion of said frame from view when said plank is installed, and said third face of said cement-wood fiber plank portion defining an outer surface of said plank.

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