June 25, 1946. MacMILLIAN CLEMENTS 2,402,731

BUILDING CONSTRUCTION

Filed Dec. 7, 1944

Fig. 1.

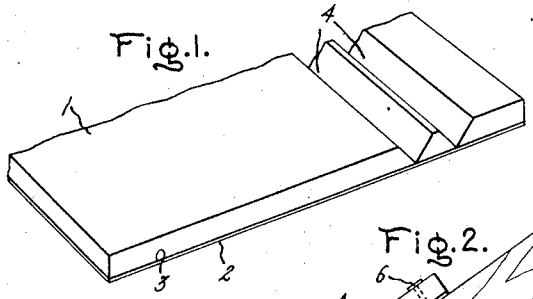


Fig. 2.

Fig. 3.

Fig. 4.

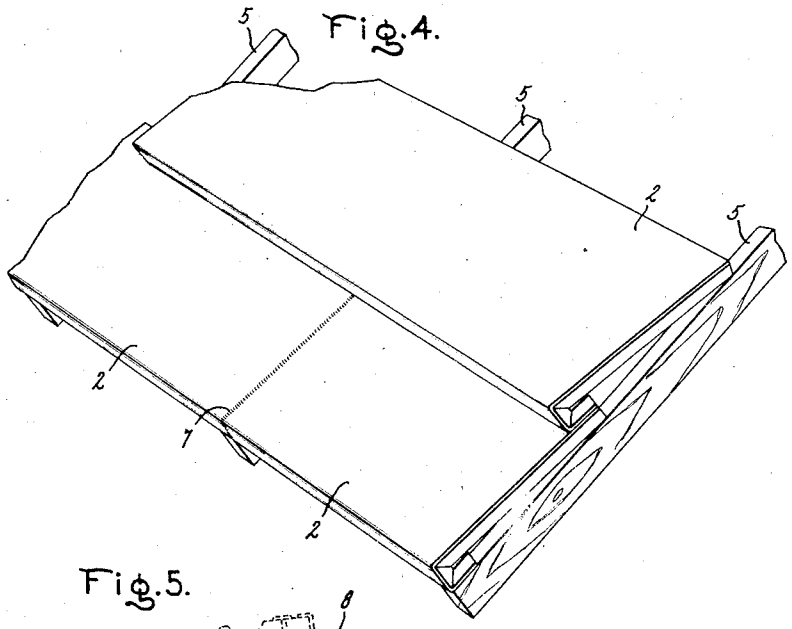
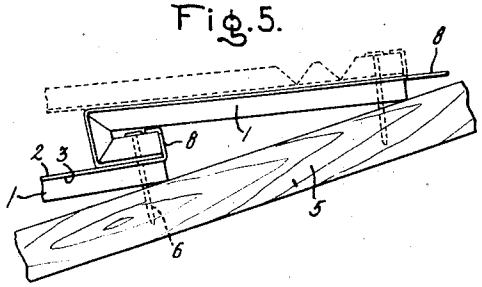


Fig. 5.



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BUILDING CONSTRUCTION

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8 Claims. (Cl. 20—5)

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This invention relates to building construction and more particularly to improvements in the sheathing and surfacing of frame buildings.

A frame building usually has wooden studs to which the sides are fastened and wooden rafters to which the roof is fastened. Usually both the sides and roof consist of two parts, one being sheathing, such as ship lap or insulating board which gives strength and structural unity to the building, and the other being surfacing, such as clapboards, which provide a weather-resistant surface of pleasing appearance but of relatively little structural strength. The sheathing and surfacing are applied in separate operations which require about the same time.

In accordance with this invention the sheathing and surfacing are pre-bonded by means of a strong adhesive material and are applied to the building in one operation. The bonding also serves to distribute stresses over relatively large areas of both the sheathing and the surfacing so that they re-enforce each other and provide increased strength and rigidity for the building with a lesser over-all thickness or amount of material.

An object of the invention is to provide a new and improved building construction.

Another object of the invention is to provide a new and improved building material.

A further object of the invention is to provide a strong, light integral sheathing and surfacing unit for building construction.

An additional object of the invention is to provide a new and improved method of making building and building construction units.

The invention will be better understood from the following description taken in connection with the accompanying drawing and its scope will be pointed out in the appended claims.

In the drawing Fig. 1 is a perspective view of one end of a building unit made in accordance with the invention, Fig. 2 shows the first step in applying this unit to the frame of an unsheathed building, Fig. 3 shows the second step in the application of this unit to the building frame and shows how the second unit is added in overlapping relation to the first unit, Fig. 4 is a perspective view of the two units shown in Fig. 3, and Fig. 5 illustrates a modification for providing a water-tight seal at the overlap of the units, particularly for low pitch roofs.

Referring now to the drawing, and more particularly to Fig. 1, the unit consists of a sheet of backing or sheathing material 1 and a sheet of weather-resistant surfacing material 2, the sheets 1 and 2 being bonded by a strong adhesive 3.

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Sheet 1 is relatively stiff and may be made of many different materials, such as lumber or any of the various trade-marked building and insulating boards, but the material which I at present prefer is plywood. Likewise, the surfacing sheet may be made of many different kinds of material, such as metal, canvas or any material which has substantial tensile properties. However, the material which I prefer is thin sheet metal, such as sheet copper, although stainless steel, aluminum and magnesium, zinc or nickel alloys are almost equally suitable.

The backing material 1 is ordinarily of relatively low tensile strength in comparison with the tensile strength of the surfacing material 2 but it is ordinarily relatively thick in comparison with the thickness of the surfacing material so that its actual strength may be greater than that of the surfacing material. For example, ¼" plywood has greater strength than .008" thick copper but copper has greater tensile strength in pounds per square inch.

The stiffness factor of the backing efficiently utilizes and complements the tensile properties of the surface through a bond which is equal or greater in shear strength than the backing. Research in this field has shown unsuspected structural values when components are properly balanced and assembled in the following manner. Many readily obtainable commercial glues and adhesive materials are suitable.

In the form of the invention which is at present preferred and which is illustrated in Fig. 1 one edge of the unit is straight and the backing material is provided with two adjacent V grooves 4 which extend all the way through the backing material to the surfacing material and which are relatively close to the straight edge of the unit. The V's of these grooves have angles of substantially ninety degrees and the purpose of the grooves is to facilitate bending a part of the unit so as to form a thickened lower edge when the unit is in place on the building, which thickened edge corresponds to the butt end of a shingle or clapboard.

In Fig. 2 the unit shown in Fig. 1 is shown nailed in place to the rafter 5 of the building, although it will of course be understood that if the rafter 5 were vertical it would comprise a stud for supporting the side wall of the building. As shown, the unit is fastened to the rafter or stud by a nail 6 between its straight edge and the first one of the V grooves.

In Fig. 3 the unit has been bent along the lines defined by the bottoms of the grooves so as to

occupy the position shown in Fig. 3 and it will be observed that in this manner the fastening means, such as the nail head, is effectively concealed and protected against corrosion and failure.

A second unit is applied in overlapping relation to the other edge of the first one in the manner similar to the way the first one is applied so that after the second unit has been nailed in place and bent up its butt end occupies the position shown. A perspective view of these units in position is shown in Fig. 4.

The units shown in the drawing are preferably of a length corresponding to a clapboard or roofing strip.

It will be observed that by means of the above-described construction the units are fastened to the studs or rafters at both top and bottom so as to establish strength and rigidity.

Abutting edges of the units are easily made watertight in any suitable manner, a preferred manner being by soldering the abutting metal edges together, as shown at 7 in Fig. 4. In some cases it is preferable to extend the metal at the ends to get a tight lap with calking underneath.

As an example of the strength obtainable with the construction of this invention a roof was made of units of the invention consisting of a backing of ¼" thick plywood surfaced with a light copper skin of .004" thickness, the units being set on rafters which were 20" on centers. This roof was walked on without any sign of sagging and, in fact, it will support over 100 pounds per square foot of dead weight.

It will also be observed that the above-described units when in place form an integral part of the structural unity of the building, rather than being mere sheathing or being mere surfacing which is applied to the surface of an already structurally complete building.

Another important result of the invention is that when metal surfacing is used it almost entirely prevents warping, swelling, shrinking and checking such as occurs when ordinary wood sheathing or siding is used.

In some cases, such as on low pitch roofs, water will be driven in between the units of the invention where they overlap. This may readily be prevented by the construction shown in Fig. 5 in which the surfacing material has an extension 8 on the opposite edge from the edge which is near the V grooves. This extension is bent up and clamped between the folded-over portion of the succeeding unit, as shown in Fig. 5, so as to provide an effective seal. This permits roof pitch as low as one/forty, highly desirable in many forms of architecture as no comparatively flat roof construction of such light weight is in use.

The building units of my invention may also be applied over old siding or roofing without requiring furring strips. The relatively large air spaces under the units caused by the folding over of the lower edge of each unit when it is mounted on top of the preceding unit eliminates the hazard of dry rot.

While there have been shown and described particular embodiments of this invention, it will be obvious to those skilled in the art that various changes and modifications can be made therein without departing from the invention and, therefore, it is aimed in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A composite building construction unit for application directly to a conventional unsheathed building frame for performing the stiffening and insulating function of sheathing and the weather-resistant function of roofing and siding, said unit consisting of a flat uniformly thick body portion having strength and insulating properties comparable to conventional sheathing bonded to an outer skin having weather-resistant properties, said backing material being of a density and stiffness comparable to wood, said skin being of material having higher tensile strength than wood, the bond between said backing material and skin being made by an adhesive having a shear strength of the same order of magnitude as said backing material, said backing material being completely severed along parallel V grooves along which said unit is bent back on itself through more than 180 degrees for concealing and protecting its fastening means and forming a double thickness strength producing and butt simulating lower edge.

2. An integral sheathing and surfacing unit for building construction comprising, in combination, a uniform relatively thick stiff sheet of relatively low tensile strength sheathing material, a relatively thin flexible sheet of relatively high tensile strength weather resistant surfacing material, a strong adhesive material for permanently bonding said sheets together so that shearing stress is distributed by said sheathing material to a relatively large area of said surfacing material so as to utilize the full tensile strength of the thin surfacing material at all outdoor temperatures, said unit having a straight edge, and a pair of substantially 90-degree V grooves in the backing material near said edge and parallel thereto for permitting folding of said unit so as to form a thickened butt end thereof, the distance between said grooves being substantially equal to the thickness of said unit.

3. The combination, with a plurality of rafters for the roof of a building, of a plurality of rectangular laminated roofing strips, each of said strips comprising a uniformly thick backing layer of relatively low tensile strength material bonded throughout its area to a relatively thin weather resistant skin of relatively high tensile strength material, each of said strips having a pair of substantially 90-degree V grooves in the backing layer extending through the full thickness of said backing layer, said grooves being parallel to and adjacent one of the long sides of said strip, said strips extending transversely across said rafters in overlapping relation, said strips being folded through substantially 180 degrees along said V grooves whereby said grooves are closed, the folded side of each strip being in overlapping relation to the other side of the strip below it, and fastening means extending through the under part of each folded side and through the other side of the strip below it and into said rafters so as to provide diagonal bracing.

4. The combination, with a plurality of rafters for the roof of a building, of a plurality of rectangular laminated roofing strips, each of said strips comprising a uniformly thick backing layer of plywood which has been bonded at room temperature throughout its area to a relatively thin weather resistant skin of sheet metal, each of said strips having a pair of substantially 90-degree V grooves in the backing layer extending through the full thickness of said backing layer,

said grooves being parallel to and adjacent one of the long sides of said strip, said strips extending transversely across said rafters in overlapping relation, said strips being folded through substantially 180 degrees along said V grooves whereby said grooves are closed, the folded edge of each strip being in overlapping relation to the opposite edge of the strip below it, fastening means extending through the under part of each folded edge and through the opposite edge of the strip below it and into said rafters so as to provide diagonal bracing, and a weather-tight metal bond between adjacent ends of said strips.

5. The combination, with a plurality of studs for the side of a building, of a plurality of rectangular laminated sheathing and siding strips, each of said strips comprising a uniformly thick backing layer of relatively low tensile strength material bonded throughout its area to a relatively thin weather resistant skin of relatively high tensile strength material, each of said strips having a pair of substantially 90-degree V grooves in the backing layer extending through the full thickness of said backing layer, said grooves being parallel to and adjacent one of the long sides of said strip, said strips extending transversely across said studs in overlapping relation, said strips being folded through substantially 180 degrees along said V grooves whereby said grooves are closed, the folded side of each strip being in overlapping relation with the other side of the strip below it, and fastening means extending through the under part of each folded side and through the other side of the strip below it and into said studs so as to provide diagonal bracing.

6. The combination, with a plurality of studs for the side of a building, of a plurality of rectangular laminated sheathing and siding strips, each of said strips comprising a uniformly thick backing layer of plywood bonded at room temperature throughout its area to a relatively thin weather resistant skin of sheet metal, each of said strips having a pair of substantially 90-degree V grooves in the backing layer extending through the full thickness of said backing layer, said grooves being parallel to and adjacent one of the long sides of said strip, said strips extending parallel across said studs in overlapping relation, said strips being folded through substantially 180 degrees along said V grooves whereby said grooves are closed, the folded edge of each strip being in overlapping relation to the opposite edge of the strip below it, and fastening means extending through the under part only of each folded edge and through the opposite edge of the strip below it and into said studs so as to provide diagonal bracing of said building and complete concealment of said fastening means, and a weather-tight metal seal between abutting ends of said strips.

7. The combination, with a frame of a building, of a plurality of relatively thin elongated laminated covering and bracing members, each of said members comprising a uniformly thick backing piece of relatively low tensile strength material bonded throughout its area to a relatively thin skin of relatively high tensile strength weather-resistant material, one long edge of each of said pieces being folded under with the skin on the outside to form a double thick butt edge, said butt edge of each of said pieces being in overlapping relation with the opposite edge of the piece below it, and fastening means extending through each corner of each piece and into said frame, the same fastening means extending only through the under half of the thickened double edge of each upper piece and the thin edge of the piece below it whereby the head of each fastening means is completely concealed and protected from the weather.

8. The combination, with a frame of a building, of a plurality of relatively thin elongated laminated covering and bracing members, each of said members comprising a uniformly thick backing piece of plywood bonded at room temperature throughout its area to a relatively thin skin of metal, one long edge of each of said pieces being folded under with the skin on the outside to form a double thick butt edge, said butt edge of each of said pieces being in overlapping relation with the opposite edge of the piece below it, and fastening means extending through each corner of each piece and into said frame, the same fastening means extending through only the under half of the thickened double edge of each upper piece and the thin edge of the piece below it whereby the head of each fastening means is completely concealed and protected from the weather.

MacMILLAN CLEMENTS.