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(54) METHOD OF CONSTRUCTING A WOOD PANEL

(71) We, FU SHING MFG. & LUMBER CO., LTD., Chinese corporation, of 53 Nanking E. Road, Sec. 2 Taipei, Taiwan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a method of constructing a wooden panel for use in a building structure. In this Specification, we define the term 'wood' as including both natural wood and artificial wood such as chipboard.

Among the wooden doors and wall panels widely used in architecture, is a flush door having a solid core or a hollow core, which is made by glueing together a whole sheet of plywood or a multiple layer of veneers on each surface. There is also V-grooved plywood wall panelling which is a number of grooved plywoods directly nailed to the wall. As the construction of the above-mentioned products is simple without the application of any mortise, tenon or dowel joints, and as substantial amount of low grade lumber, plywoods, chipboards, are used as inner core material in the case of flush doors, the products have two advantages. Firstly, manufacturing simplicity and secondly, low cost. However, they have the short-comings of being both plain and monotonous in appearance and may eventually be displeasing to a user. On the other hand, doors and wall panels made by a traditional wood joinery method using solid wood for stiles, rails and panel boards are still highly appreciated and cherished in the architectural field all over the world. However, this method of construction is expensive because the selection of wood material is quite difficult as only a few high quality wood species are suitable for stiles, rail and panel board purposes. It is also a disadvantage not to be able to utilize any low grade lumber for core stock on this type of construction. In addition to the disadvantages, it should be mentioned that mortise, tenon and dowel joints tend to get loose or will deform at the joints after a

period of time. As a result of the above shortcomings wooden window sashes have been gradually replaced by metallic ones. Although there are flush doors with attached mouldings and/or a carved surface for imitation of the traditional stile and rail construction, they are far from being true representations of those made of stile and rail construction by the conventional wood joinery method.

An object of this invention is to bring a solution to the problems mentioned above and to provide a constructional method that facilitates the utilization of small size members and low grade wood from any species of wood material. A further object of the invention is to provide an improved method for making wooden doors, windows and wall panels in such a manner that they appear to be made of stiles, rails and panel boards, of natural, one piece, solid lumber using mortise and tenon or dowel joints according to conventional wood joinery methods.

According to the present invention, there is provided a method of constructing a wood panel for use in a building structure, the term 'wood' being used as hereinbefore defined, which method comprises the steps of forming a panel element by securing a wooden moulding in a wooden panel core so that said moulding is exposed at a surface of said core; bounding said panel element by a wooden frame having a thickness dimension substantially equal to the thickness of said core, and bonding the one to the other; and bonding a wooden skin to each face of said panel to cover said core and said frame, said skin being shaped to expose at least a part of said moulding at a surface of said panel.

The invention will now be described by way of example only with reference to the accompanying drawings in which:—

Fig. 1 is a front view of a six-panel door, illustrating the position of plywoods, wood mouldings and wood strips for the exposed portions as well as the construction for the hidden portions which are densely filled (solid core) with lumber strips.

Fig. 2 is a front view of an eight-panel door where the upper part is sparsely filled with lumber strips (hollow core) while the lower part is densely filled with tubular chipboard core.

Figs. 3 and 4 are sectional views of Fig. 1 along line I—I, illustrating the construction of the inner portions and showing different arrangements for surface patterns.

Fig. 5 is a sectional view of Fig. 1 along line I—I, illustrating the construction of inner portions when carved panels are being inserted on the exposed portions.

Fig. 6 is a sectional view of Fig. 2 along line II—II.

Fig. 7 is a sectional view of Fig. 2 along line III—III.

Fig. 8 (A) 8 (B), and 8 (C) are three examples of surface pattern suitable for doors constructed according to this invention.

Fig. 9 is a view of the door of Fig. 8 (A) showing the arrangement of the inner core.

Fig. 10 is a front view of an eight-light window sash according to this invention.

Fig. 11 is a sectional view of Fig. 10 along line IV—IV.

Figs. 12 and 13 are partial enlargements of Fig. 10, illustrating details of the connections.

Figs. 14 (A), 14 (B) and 14 (C) are three examples of wall panel patterns suitable for use with this invention.

Fig. 15 is a sectional view of Fig. 14 (A) along line V—V.

Fig. 16 is an enlargement of part of Fig. 15, illustrating the details of connections.

Referring to Fig. 1, an upstanding wooden panel for use as a door comprises a rectangular wooden frame constituted by upright frame members 1a whose upper and lower ends are connected respectively by horizontally extending members 1b.

The frame 1 contains and is bonded to a wooden core 2 within which core 2 a plurality of wood mouldings 3 are mounted. Each moulding 3 is of a required configuration and may constitute, for example, a mounting for a glass panel, a solid carved wooden panel, a mounting for a louvre, or a mounting for a plain panel of wood. Referring to Figures 3, 4 and 5, it can be seen that each moulding 3 is received within the core 2 to constitute a panel element, adjacent parts of the moulding and the core being bonded together by any suitable adhesive. The core 2 is constituted by a plurality of wooden strips formed of low grade lumber packed closely together as shown in Fig. 1; or by a plurality of spaced strips as shown in the upper portion of Fig. 2, and Fig. 6; or by a compacted mass of wood material as shown in the lower portion of Fig. 2, such as chipboard, having a plurality of bores extending

parallel with upright frame members 1a as shown in Fig. 7.

Each panel has first and second panel faces, each face having inner and outer surfaces with respect to the panel, and including a plurality of pre-shaped skin pieces of plywood indicated by reference numerals 4a, 4b, for surrounding each moulding. Each moulding 3 has a lip around its outer periphery, the outer surface of the lip providing a surface to which the inner surface of an associated skin piece can be bonded. (See Figs. 3, 4 and 5).

To give a panel further rigidity, a reinforcement member 5 can be introduced into the core between two layers of core 2 as shown in Figs. 3, 4 and 5, the reinforcement member being bonded to the core 2 and the frame 1.

As shown in Figs. 4 and 5, a panel may have mouldings on both the first and second panel faces unlike the mouldings shown on one panel face only in Fig. 3 where the skin 4 extends across the whole of the other face.

Referring to Figure 10, a panel comprises a plurality of mouldings 3a¹ in which glass 6¹ is mounted. Adjacent mouldings are interconnected by strips 4a¹—4e¹ bonded to associated mouldings, core 2 and the frame 1, the strips constituting the skin pieces for forming the panel faces as previously described.

When it is required to fit panels as wall panelling in a room, the panels are mounted on wall spacer blocks 11 as shown in Fig. 15. In this case, only one panel face need include panel elements, formed of core 12 and mouldings 13, the other face opposite the wall being formed of a skin piece 14c. Adjacent panels are bridged by skin pieces 14a to provide continuity of the panelling whilst covering the wall spacer blocks. The space between skin piece 14a and the block 11 may be filled with core.

The method of making a wood panel comprises the following steps. Firstly, the required mouldings 3 are mounted in, and bonded with, a core 2 of the required packing density to form the appropriate number of panel elements which are disposed in the desired pattern within the frame 1. Any spaces within the frame are then filled by further core, the frame, panel elements and further core being bonded the one to the other.

Suitably dimensioned and shaped skin pieces are positioned to form first and second panel faces on each side of the panel, each skin piece being bonded to its associated frame member, and/or moulding, and/or the core as required.

It will be understood that small size wood members of any species may be used as raw material for all exposed surfaces, and substantial amount of wood waste for example,

low grade lumber, plywoods and chipboards, may be used for filling the inner empty spaces. Therefore, the cost of material is low not only because it is possible to select from a wide range of species, but also because wood can be utilized to the fullest extent thereby achieving full utilization of raw material.

Although the exposed surfaces of this product are composed of a number of pre-sized plywoods or thin boards with wood mouldings, strips, it does not look any different from a product constructed with solid lumber stile, rail and panel board according to conventional wood joinery method.

Since all members are glued together to form a compact whole unit, instead of being connected by mortise, tenon or dowelled joints, the strength of wood member is unimpaired as no mortise holes or dowel holes are made. As the inner members are inter-linked and bonded with the outer members, the panel has high rigidity and durability. Shortcomings such as deformation and loose joints, which occur on products made by conventional joinery methods, will not occur on this panel.

A great variety of surface patterns for the panel may be arranged as desired. It is simple to adjust the shape of the cross section and end angle of the wood mouldings and also the length of the mouldings with corresponding size of the pre-sized plywoods. Alternatively, one may arrange mouldings which are curved along their length (instead of straight ones) by using corresponding curved plywoods. Not only is it possible to arrange the panel with the same variety of surface patterns as usually made by conventional joinery method, but it is also possible to arrange on the surface of the panel surface patterns in a variety of sizes as well as numerous panel shapes such as square, rectangular, hexagonal, polygonal and irregular shapes.

All members can be made according to the drawings and specifications as desired, and be assembled in conformity with the appropriate process. Therefore large scale production is always feasible.

As to the wall panels, all members may be prefabricated into groups of components for assembly on the job site. Assembling

the panels is simple such that they can be put together without the need of any carpenter or other skilled worker.

WHAT WE CLAIM IS:—

1. A method of constructing a wood panel for use in a building structure, the term 'wood' being used as hereinbefore defined, which method comprises the steps of forming a panel element by securing a wooden moulding in a wooden panel core so that said moulding is exposed at a surface of said core; bounding said panel element by a wooden frame having a thickness dimension substantially equal to the thickness of said core, and bonding the one to the other; and bonding a wooden skin to each face of said panel to cover said core and said frame, said skin being shaped to expose at least a part of said moulding at a surface of said panel.
2. The method as claimed in Claim 1 and including the step of filling a space between said frame and said element with further core.
3. The method as claimed in Claim 1 or Claim 2 wherein said core includes a plurality of wooden strips.
4. The method as claimed in Claim 1 or Claim 2 wherein said core includes a compacted mass of wood material having a plurality of bores extending parallel with said wooden skin.
5. The method as claimed in any one of the preceding claims wherein said core includes a reinforcement member.
6. A method of constructing a wooden panel substantially as herein described with reference to the accompanying drawings.
7. A wooden panel when constructed by a method as claimed in any one of the preceding claims.
8. A wooden panel substantially as herein described with reference to, and as shown in, the accompanying drawings.

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