Dec. 22, 1942. T. J. FOSTER 2,305,684

METHOD OF MOLDING BUILDING PANELS

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Fig. 1.

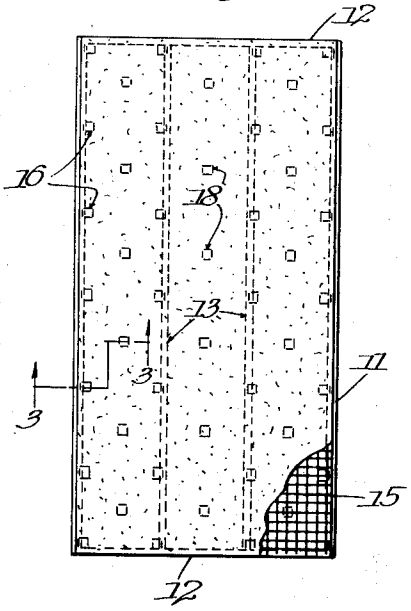

Fig. 2.

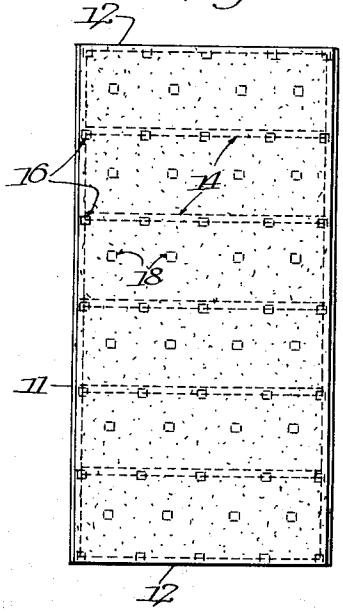

Fig. 3.

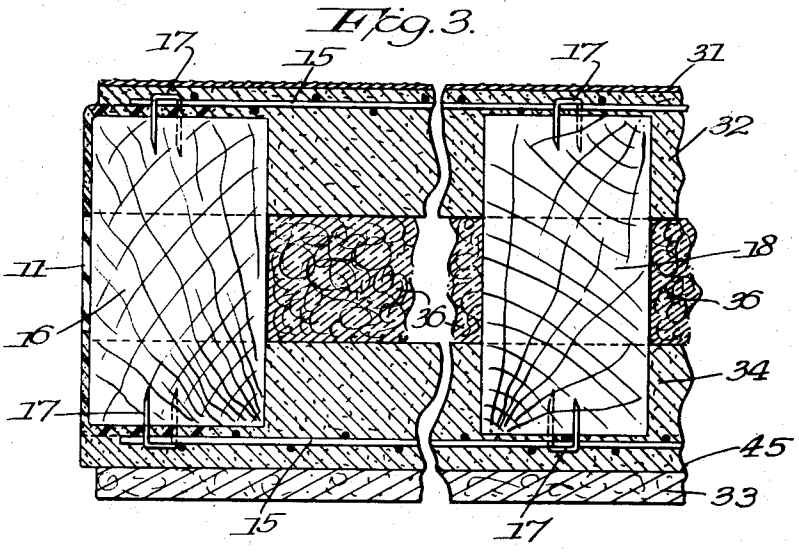

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Fig. 4.

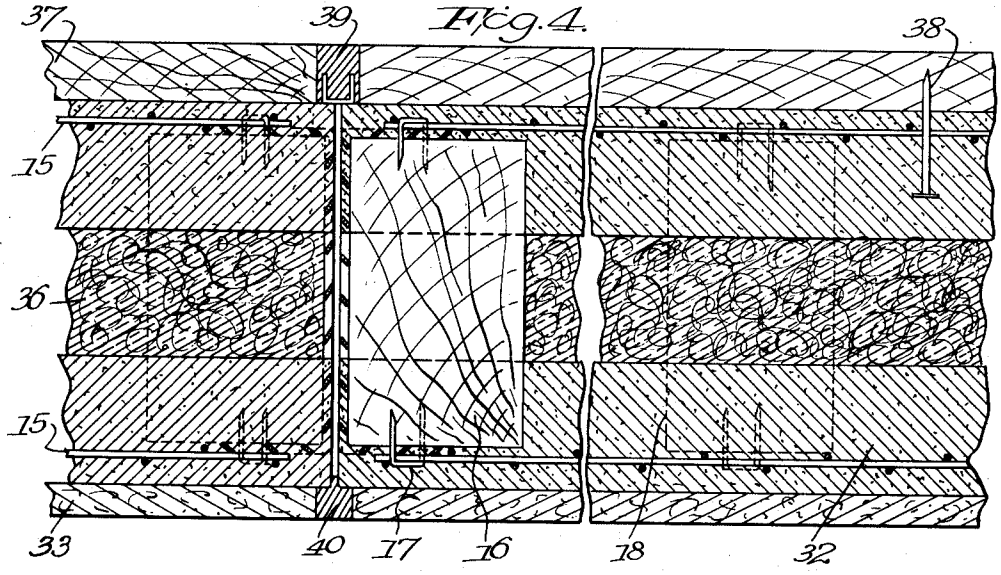


Fig. 5.

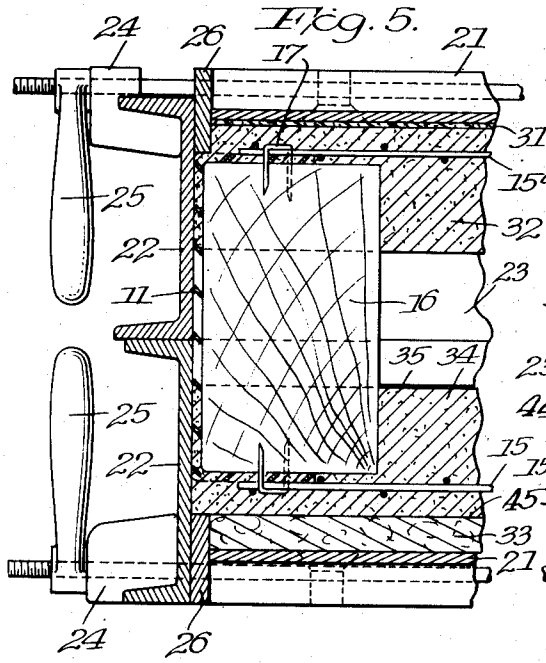
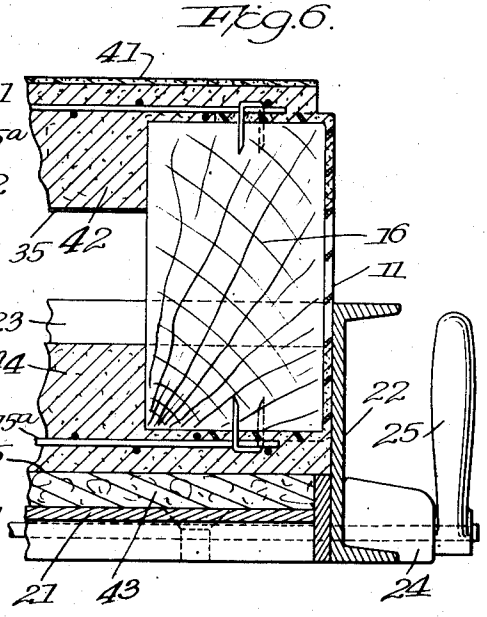


Fig. 6.



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METHOD OF MOLDING BUILDING PANELS

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Application January 24, 1939, Serial No. 252,650

13 Claims. (Cl. 25—154)

This invention relates to floor, roof and wall panels for low cost dwellings and fire resisting buildings, and is an improvement on the method of my patent, No. 2,040,732, dated May 12, 1936.

This invention aims to provide a cheap, light weight, moisture, heat and sound proof building panel of fire resisting materials, designed to meet a wide variety of conditions of service.

Among the advantages of the invention as compared with prior methods are the better interior and exterior finish that can be secured when casting the panels in the molds, the better bracing against bending and impact stresses, the more rapid setting and drying out of the plastic materials used, the better protection of the body portions of the panels from vapor penetration, and the lower cost.

Further objects of the invention appear in connection with the following description of the illustrative embodiments shown in the accompanying drawings, wherein

Fig. 1 is a face view of a wall panel and Fig. 2 is a plan view of a floor and roof panel constructed in accordance with my improvement;

Fig. 3 is a horizontal cross-section to a larger scale through a portion of the wall panel on the line 3—3 in Fig. 1, with part of the panel broken away to condense the drawing;

Fig. 4 is a cross-section through a portion of a wall or floor of modified design, showing two panels assembled to form a continuous wall or floor;

Fig. 5 is a vertical cross-section through the side of a double form or jig used for casting the panels, showing the completely formed panel in the condition in which it is molded prior to receiving the insulation in the space between the inner and outer cast faces; and

Fig. 6 is a vertical cross-sectional view similar to Fig. 5 illustrating a modified design and process of casting the panels.

The panels are similar in size and general features of construction to those illustrated in my patents, Nos. 2,001,605, dated May 14, 1935, and 2,070,479, dated February 9, 1937, the wall panels extending from floor to ceiling in unbroken lengths except where there are openings in the walls, and the floor panels spanning the spaces over and between adjacent floor beams and extending from side to side of the room, to provide a continuous floor or wall of uniform thickness and resistance to the passage of heat and sound.

Both floor and wall panels are similar in having a metallic core or skeleton composed of channel shape reticulated metal members 11, 12, extending lengthwise thereof along each edge and across each end, and intermediary members through the entire area of the panels, the intermediary members 13 in the wall panels (see Fig. 1) extending lengthwise parallel to the side members 11, and the intermediary members 14 in the floor panels (see Fig. 2) extending crosswise parallel to the end members 12 thereof. These channel shape stiffening members are preferably of sufficient depth to extend from close to one face of the panel through the body portion thereof to near the opposite face of the panel, and they support and are connected together by two sheets of wire mesh 15 secured to the outer sides of their flanges on each side of the panel and close to the faces thereof.

The metallic frame work is further stiffened and secured together by wood or hardened plastic blocks 16 arranged at the intersections of the channels 11, 12, 13, 14 to which the flanges of the channels and the wires of the mesh 15 or other reinforcement are fastened in any suitable way, as by staples 17. Intermediate blocks 18 may be spaced in the areas of the panels between the channels and secured to the reinforcement 15 to provide additional stiffness to the metallic skeleton, particularly in panels intended for exterior walls and floors, as shown in Figs. 3 and 4, respectively.

The assembling of the metal parts and blocks is conveniently done in a jig which may be turned over to permit the staples or other securing means to be applied expeditiously. A stapling gun may be used for stapling these parts together, enabling them to be assembled and secured in place quickly and accurately by ordinary labor, all of the metal parts being light enough to be cut and handled with tools readily available in a field plant.

The reticulated metal stiffeners 11, 12 are preferably made of expanded sheet metal of about one inch mesh having their diagonally extending ties making angles of about 30° with the longitudinal axis of the sheet, and of a gauge to suit the strength of panel desired. The depth and spacing of the channels and gauge and size of the mesh 15 can be varied to suit the requirements of each type of panel and span and load of floor or other structure for which it is to be used.

The panels are cast in steel forms preferably made in pairs, one for each face of the panel, as illustrated in Fig. 5. The forms are provided with bottoms 21 approximately coextensive in size with the panel to be formed, and similar side and end walls 22, 23, secured together by clamps

24 tightened by hand nuts 25 or other convenient means as is well understood in this art. In the type of device illustrated, the side and end walls are made of metal channels, and between the side walls and the adjacent edges of the bottom 21 there are arranged mold strips 26, which project into the space within the molds along each side margin to form a shallow groove in the adjacent corner edge of the panel when completed. The depth of the channels 22, 23, is somewhat greater than the desired thickness of the plastic body portions of the walls to be formed therein, and the sum of the depths of the channels 22, 23, forming the two halves of the mold may be such as to give the finished panel its desired thickness from outside to outside.

The panels are conveniently cast by placing a layer or sheet of finish material 33 in the bottom of a mold section and pouring the plastic material forming the body 34 of the panel in on top of the finish. The finish material 33 may be omitted and the face of the body material 34 may serve as the inside finish of the panel. After pouring the plastic body material the metallic reinforcing frame is dropped into the mold, securely embedded to the desired depth, and the plastic material is permitted to set. If quick setting cement or other like material is used, a few hours will suffice for the body material to attain a sufficient strength to enable the panel to be completed and removed from the mold. If vaporproofing is desired on the inner surface of the body material 34, the mesh 15a will be omitted until asphalt emulsion 35, or other suitable material is placed, and then mesh 15a will be fastened on, as shown in Fig. 5, prior to removing the hardened body layer 34 and reinforcement from the mold.

The mating mold section, which is also set bottom down for the purpose, is thereupon filled in the same order, namely, the surface finish sheet or layer 31 is placed in the bottom of the mold section and the plastic material forming the body layer 32 is poured on it to the required depth. While the latter is still soft the first mold, containing the metal reinforcement and hardened body layer 34, is inverted over the mold containing the soft body layer 32 and may be brought down to a solid bearing along the meeting edges of the channels 22, 23, the exposed reinforcement being forced into the plastic material in the lower mold to imbed it to the depth desired in the finished panel. Fig. 5 illustrates the finished panel after turning it back over to the position in which the first layer was poured. Marble dust, chips and like loose materials of characteristic color and texture may be placed in the bottom of the mold in lieu of sheet material and cast into the face of the body material, forming a permanent finish of pleasing appearance.

If quick setting cementitious material, such as gypsum, is used for the body layers, the first layer may harden sufficiently to be removed from its mold before inverting it over the second mold, in which case one mold will suffice for forming the panel, the second body layer 44 being cast in the empty mold on top of a surface finish layer 43 placed therein after the mold has been removed from the first body layer, as illustrated in Fig. 6, wherein the first layer 42 is shown in the inverted position, the surface finish 41 thereon being a layer of thin material cast in place as described above. Waterproofing 45 may be applied to the inner face of the finish layer 43 before placing the layer 44 if additional protection against moisture is desired.

As soon as the body layers have set sufficiently to permit handling without danger of breaking, the forms are unclamped and removed, and the panel is allowed to age for several days or weeks until thoroughly dry, depending upon the nature of the plastic material used; following which the empty space between the two body layers of hardened material may be filled with mineral wool, spun glass, zonolite or other non-absorbent heat and sound proof insulation 36.

If the plastic material hardens and cures quickly it will be advantageous to run it through a drying kiln. When thoroughly dry the exterior surface can be treated with a wax emulsion or other suitable material in such a way as to produce a waterproof film on the exterior surface that will be durable.

This method of casting the panel does away with all interior cores, removable mold parts, bridge members and filling material which would otherwise delay the preparation of the panels and the setting and hardening thereof, and enables the exterior surfaces to be finished each in its own mold, the finished surfaces being against the mold bottom in each case, thus enabling a variety of mold formed finishes to be applied on both sides of the panel by casting in place, thereby becoming integral parts of the panel.

The invention makes it possible to anchor wood exterior finish 37, as shown in Fig. 4, for example, into the plastic body of the panel by means of nails 38 or other fastenings, driven into the finish before the plastic layer is placed thereon in the mold; and nailing strips for slate or tile roofs, metal flashing strips and other surface protection may be placed in the molds and integrally secured to the exposed faces of the panels by my improved method of fabrication, as will be readily apparent to those skilled in the art.

The panels, when assembled in walls and floors with their side edges in contact and the joints 39, 40 in the finish faces filled with plastic cement, or other suitable waterproof insulating packing materials, constitute continuous slabs of uniform thickness and substantially uniform resistance to the passage of heat and sound.

The panels may be formed without the surface finish if desired, and the latter applied thereto after the panels have been completed and either before or after erection.

The invention is not restricted to the constructional features of the illustrative panels and forms, these being adaptable to suit a wide variety of purposes and conditions of use and choice of materials.

I claim the following as my invention:

1. The method of forming a building panel by casting a body layer of cementitious material in a removable form coextensive in length and breadth with said panel, partly embedding therein reenforcing members of greater depth than said body layer to project therefrom, permitting said layer to harden, inverting said form coextensive in length and breadth with said panel above a second form containing a soft body layer of cementitious material and placing the projecting reenforcing members into said soft material to a depth less than their projecting portions and spacing the body layers parallel and apart to the overall dimension desired, whereby said reenforcing members serve to support and

maintain said body layers with a space between them when the body material has hardened.

2. The method of forming a building panel by casting a body layer of cementitious material upon a finish layer in a removable form coextensive in length and breadth with said panel, partly embedding therein reenforcing members of greater depth than said body layer to project therefrom, permitting said layer to harden, inverting said form above a second form coextensive in length and breadth with said panel containing a second finish layer and soft body layer of cementitious material and placing the projecting reenforcing members into said soft material, and spacing the body layers parallel and apart to the overall dimension desired, whereby said reenforcing members serve to support and maintain said body layers with a space between them when the body material has hardened.

3. The method of forming a building panel by casting a body layer of cementitious material in a removable form coextensive in length and breadth with said panel, partly embedding therein reenforcing members of greater depth than said body layer to project therefrom, permitting said layer to harden, removing said form and inverting said body layer above a similar form containing a soft body layer of cementitious material and placing the projecting reenforcing members into said soft material, and spacing the body layers parallel and apart to the overall dimension desired, whereby said reenforcing members serve to support and maintain said body layers with a space between them when the body material has hardened.

4. The method of forming a unitary light weight metal reinforced building panel which comprises separately preparing cooperating forms for each surface and adjacent body portion of the panel, said forms consisting of bottom and removable low marginal walls adapted to be superposed with their edges in vertical alinement around the sides of the panel, placing soft plastic material in one of said forms to a depth of less than the thickness of said panel and while still soft partially embedding a metal openwork frame therein of substantially the full depth of the panel, permitting said plastic material to harden sufficiently to be self-sustaining, and thereafter placing a layer of soft plastic material in the cooperating form, inverting the first form and contained hardened plastic material and metal frame over the cooperating form with the plastic layers spaced apart and embedding the metal frame in the soft plastic layer to the depth necessary to produce the desired thickness of panel, permitting said plastic layer to harden, removing the forms, and permitting the panel to dry.

5. The method of claim 1 wherein the depth of the plastic material in the two cooperating forms is filled in to a total depth less than the thickness of the slab, so that an empty space is left in the slab between the two hardened plastic body portions which assists in drying them out.

6. The method of claim 1 wherein the depth of the plastic material in the two cooperating forms is filled in to a total depth less than the thickness of the slab, so that an empty space is left in the slab between the two hardened plastic body portions, and filling said space with insulating material after said forms have been removed and the slab has dried out.

7. The method of forming a unitary light weight metal reinforced building panel which comprises separately preparing cooperating forms for each surface and adjacent body portions of the panel, said forms consisting of bottom and removable low marginal walls adapted to be superposed with their edges in vertical alinement around the sides of the panel, placing soft plastic material in one of said forms to a depth of less than one half the thickness of said panel and while still soft partially embedding a metal openwork frame therein of substantially the full depth of the panel, permitting said plastic material to harden sufficiently to be self-sustaining and thereafter placing soft plastic material in the cooperating form to a depth of less than one-half the thickness of said panel, inverting the first form and contained hardened plastic material and metal frame over the cooperating form with the plastic layers spaced apart and embedding the metal frame in the soft plastic layer to the depth necessary to produce the desired thickness of panel, permitting said plastic layer to harden, removing the forms and filling said space with insulating material.

8. The method of forming a unitary light weight metal reinforced building panel which comprises separately preparing cooperating forms for each surface and adjacent body portion of the panel, said forms consisting of bottom and removable low marginal walls adapted to be superposed with their edges in vertical alinement around the sides of the panel, placing a layer of finish material followed by a coating of waterproof material in the bottom of each form, placing soft plastic material in one of said forms of less than the thickness of said panel and while still soft partially embedding a metal openwork frame therein of substantially the full depth of the panel, permitting said plastic material to harden sufficiently to be self-sustaining and thereafter placing a layer of soft plastic material in the cooperating form, inverting the first form and contained hardened plastic material and metal frame over the cooperating form with the plastic layers spaced apart and embedding the metal frame in the soft plastic layer to the depth necessary to produce the desired thickness of panel, permitting said plastic layer to harden, removing the forms, and permitting the panel to dry.

9. The method of forming a unitary, self-sustaining building panel of metal-reinforced cementitious material which comprises assembling metal reinforcing members into a skeleton frame of greater depth than the body layer to be formed, casting a body layer of cementitious material in a form coextensive in length and breadth with said panel, partly embedding therein said frame, permitting said material to harden, removing the form from the hardened cementitious body, inverting said reinforcing members and body into a second form coextensive in length and breadth with said panel containing an unhardened body layer of cementitious material and forcing the projecting reinforcing members into said soft material to partly embed them therein, permitting said second body layer to harden, and removing said form to permit said body material to dry thoroughly.

10. The method of forming a unitary, self-sustaining building panel of metal-reinforced cementitious materal which comprises casting a body layer of cementitious material in a removable form coextensive in length and breadth with said panel, partly embedding therein expanded sheet metal reinforcing members of

greater depth than said body layer, permitting said layer to harden, removing said form, inverting said hardened layer upon an unhardened body layer of cementitious material in a similar removable form and forcing the projecting reinforcing members into said soft material to partly embed them therein, permitting said second body layer to harden, and removing said form to permit said body layers to dry.

11. The method of forming a building panel by casting a body layer of cementitious material in a removable form coextensive with said panel in length and breadth, embedding therein reinforcing means comprising parallel body members attached to truss members approximately the length of the panel and of greater depth than said body layer to project therefrom, permitting said layer to harden, inverting said casting above a second form coextensive in length and breadth with said panel and containing a soft body layer of cementitious material and placing the projecting truss members and the exposed body reinforcing means thereto attached into said soft material while spacing the body layers parallel and apart to the overall dimension desired and permitting them to harden and dry out, whereby said reinforcing means and hardened body layers constitute a unitary light weight panel especially adapted for the purpose specified.

12. The method of forming a unitary light weight metal reinforced building panel which comprises placing a layer of soft plastic material in a suitable form having a bottom and side walls coextensive in length and breadth with said panel to a depth of less than the thickness of said panel and while soft embedding a metal frame therein of greater depth than said layer to project therefrom, the exposed face of the frame being open, permitting said plastic material to harden sufficiently to be self-sustaining, coating the inner face of said hardened layer with vapor-resisting material, placing a second layer of soft plastic material in a similar form and while soft inverting the hardened layer and partly embedded metal frame upon said second layer with a space between said layers and embedding the projecting portion of the metal frame to a depth to make the desired panel thickness, permitting said second layer to harden, and drying out said panel.

13. The method of forming a unitary light weight metal reinforced building panel which comprises placing a layer of soft plastic material in a suitable form having a bottom and side walls to a depth of less than the thickness of said panel and while soft embedding a metal frame therein of greater depth than said layer to project thereform, the exposed face of the frame being open, permitting said plastic material to harden sufficiently to be self-sustaining, coating the inner face of said hardened layer with vapor resisting material, placing a second layer of soft plastic material in a similar form and while soft inverting the hardened layer and partly embedded metal frame upon said second layer with a space between said layers and embedding the projecting portion of the metal frame to a depth to make the desired panel thickness, permitting said second layer to harden, and drying out said panel, the projecting portion of the metal frame being provided with a layer of metal reinforcement upon its exposed face after the vapor resisting material has been applied before inverting it upon said second layer of soft plastic material.

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