SANDWICH-PANEL BUILDING CONSTRUCTION


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4 Claims

ABSTRACT OF THE DISCLOSURE

A building is constructed of elongated sandwich panels without framework, by disposing the sandwich panels upright for the front and rear walls of the building and horizontal for the side walls of the building and horizontal for the roof. The roof can be a series of inverted V's. The panels are connected by overlapping connectors secured on the outer side of their outer skins, and to this end are provided with special ribs and overhanging edge portions to which the connectors are secured.

The present invention relates to modular building constructions, more particularly of the type in which each module is a sandwich panel of two rigid parallel skins with a core between. The skins can for example be galvanized sheet steel, aluminum, plastic or wood, and the core can be a honeycomb or a foamed plastic material such as polyurethane foam, which adheres firmly to the skins. The materials of the skins and cores of the present invention can be quite conventional. Preferably, the panels are rectangular or trapezoidal, and elongated with a length-to-width ratio preferably greater than three to one.

In the past, building constructions including modular sandwich panels have required a framework in which the panels were set. A great deal of the load of the building was thus borne by the framework, the sandwich panels themselves being used only as light load-carrying shields or closure elements. The present invention, however, is based on the discovery that a particular arrangement or group of arrangements of sandwich panels according to the present invention can display such high rigidity as to themselves constitute the load-bearing members of a building construction and eliminate the need for conventional framework.

Accordingly, it is an object of the present invention to provide building constructions of sandwich panels, in which no framework is needed.

Another object of the present invention is the provision of such building constructions by which a variety of shapes and sizes of buildings can be realized.

Still another object of the present invention is the provision of such a building construction in which buildings of virtually any desired horizontal dimensions can be constructed.

Finally, it is an object of the present invention to provide such building constructions the modular elements of which will be relatively simple and inexpensive to manufacture, quick and easy to assemble with minimum labor cost, rugged and durable in use, and of great load-bearing strength under all normally encountered conditions of loading.

These and other objects, features and advantages of the present invention will become apparent from a consideration of the following description, taken in connection with the accompanying drawings, in which:

FIG. 1 is a side elevational view of a building construction according to the present invention, with the front wall removed and looking toward the rear wall thereof;

FIG. 2 is a side cross-sectional view of the construction shown in FIG. 1, with the near side wall and part of the roof removed and looking toward the far side wall;

FIG. 3a is a plan view of a modular sandwich panel according to the present invention;

FIG. 3b is an endwise cross-sectional view of the panel shown in FIG. 3a;

FIG. 3c is a sideways cross-sectional view of the panel shown in FIG. 3a;

FIG. 4a is a fragmentary enlarged cross-sectional view, taken in a horizontal plane, of a joint between two modular sandwich panels of the front wall of a building according to the present invention;

FIG. 4b is a fragmentary cross-sectional view, taken in a horizontal plane, of a joint between the front wall and the side wall of a building according to the present invention;

FIG. 4c is an enlarged fragmentary view of a portion of FIG. 1, showing the joint between the roof and a side wall;

FIG. 4d is another enlarged fragment of FIG. 1, showing the trough or valley between roof panels;

FIG. 4e is an enlarged fragment of FIG. 2 in a vertical plane, showing the joint between the front wall and the roof; and

FIG. 5 is a cross-sectional view of interconnected roof panels according to the present invention. Referring now to the drawings in greater detail, there is shown a building construction according to the present invention, comprising a plurality of elongated vertically disposed front and rear wall sandwich panels, a plurality of horizontally disposed side wall sandwich panels, and a plurality of horizontally disposed roof sandwich panels. When the term "horizontally disposed" or "vertically disposed" is used herein, it is intended to mean that the greatest lengths of the panels are respectively horizontal or vertical. In fact, of course, the horizontally disposed side wall panels are disposed in vertical planes; while the horizontal roof panels are disposed in inclined planes in the illustrated embodiments; although for short-span roofs, the panels may be disposed in horizontal planes.

The panels 1–3 are interconnected by connectors 4 or 4a which may for example be metal channel members having a web that rests on the outer sides of the contiguous portions of the panels. To bridge the peaks and valleys of the roof, connectors 5a and 5b, respectively, are provided.

The construction of each panel 1–3 may be as in FIGS. 3a–3c. As is there shown, each panel comprises an outer skin 7 of the usual rigid materials, for example, of galvanized sheet steel, aluminum, glass fibers embedded in thermosetting resin, wood, etc. and a rigid inner skin 8 of the same material. A core 9 between skins 7 and 8 may be of metal honeycomb or resin-bonded paper honeycomb, or more preferably of a foamed synthetic resin such as rigid polyurethane foam. The core material is rigidly bonded to both skins.

Each skin 7 or 8 has a plurality of ribs 10 thereon extending lengthwise thereof. The ribs 10 most closely adjoin the longitudinal side edges of the panel are spaced from those edges a distance 11 which is preferably half the thickness of the panel.

Each skin 7 overhangs one longitudinal end of the core of the panel in a flange 12 of a height preferably the same as the height of ribs 10. Each skin 8 terminates short of the end of core 9 adjacent flange 12, by a distance 13 which is preferably the same as the thickness of the panel.
At the other longitudinal end, each skin 7 terminates in an upstanding flange 12a perpendicular to ribs 10 and perpendicular to the plane of skin 7.

An extremely important feature of the present invention is that the panels are held in contiguous relationship, without the aid of an external framework, by means of the connectors 4, by which most of the joints of the present invention can be effected, or 4a of a greater width as shown in FIG. 4b. The connectors 4 are of a width about the same as the thickness of the panels, thereby to bridge between the most closely adjacent ribs 10 of contiguous panels. Thus, as seen in FIG. 4a, the upright joints between the vertically disposed panels 1 are effected by a vertical parallel series of such connectors 4, secured to the adjacent ribs 10 by any conventional means of securement such as welding, riveting, bolting, spot welding, cementing, etc. The space between the contiguous edges of the panels themselves can be taped or putted or provided with any other known packaging; and the inner side of the joint, between the edges of skins 8, can be taped or otherwise closed to provide a vapor-proof joint.

FIG. 4b shows the joint between the vertically disposed front or rear panels 1, and the horizontally disposed side panels 2. In this case, the aligned vertically disposed flanges 12 of the panels 2 together provide a rib corresponding to the vertically extending ribs 10 on the front and rear panels 1, so that a connector 4a of a width about 1 1/4 times the thickness of the panels, serves to bridge the gap between flanges 12 and the most closely adjacent rib 10 of the contiguous panels 1.

As seen in FIG. 4c, the joints between the side panels 2, and between the side panels 2 and the roof panels 3, is effected by the narrower width of connectors 4. As indicated above, connectors 4a serve as ridge caps and are secured to the adjacent ribs 10; while as seen in FIG. 4d, the connectors 5 serve as valley troughs and are also secured to the adjacent ribs 10.

FIG. 4e shows the joint between the front and rear panels 1 and the roof panels 3, in which case the aligned flanges 12 of the roof panels 3 oppose the parallel row of aligned flanges 12a of the panels 1 to provide a recess of substantially the same size and shape as that between the ribs 10 in FIGS. 4a and 4e, thereby to accommodate a connector 4 of the narrower width.

FIG. 5 shows an alternative embodiment of roof panel 3 for use at the ridges, the skin 8 being continuous between the two panels that define between them the ridge and being flexible in the region of the joint between the panels.

From a consideration of the foregoing disclosure, therefore, it will be evident that a construction has been provided in which the outer skins 7 of the sandwich panels, interconnected by the connectors 4 or 4a, replace the load-bearing framework of the prior art and provide a rigid three-dimensional building construction in which maximum utilization is made of the strength of the panels themselves.

From a consideration of the foregoing disclosure, therefore, it will be evident that all of the initially recited objects of the present invention have been achieved.

Although the present invention has been described and illustrated in connection with preferred embodiments, it is to be understood that modifications and variations may be resorted to without departing from the spirit of the invention, as those skilled in this art will readily understand. Thus, the front and rear walls 1 may themselves be of a zig-zag configuration, in the same manner as the roof, in which case the roof panels 3 will be trapezoidal as well as the panels 1. Such a construction is useful for the construction of buildings of increased height according to the present invention. These and other modifications and variations are considered to be within the purview and scope of the present invention as defined by the appended claims.

Having described our invention, we claim:

1. A sandwich-panel building construction, comprising a plurality of sandwich panels each comprised by rigid inner and outer skins with a core material therebetween, the outer skins of the panels being elongated and having longitudinally extending ribs projecting from said outer skins, said ribs being spaced from the adjacent longitudinal side edges of the panel by half the thickness of the panel, connectors interconnecting the most closely adjacent ribs on coplanar portions of the outer skins of contiguous side panels to form an integrated building construction, each said outer skin having a flange at one end thereof that overhangs said core material and an upstanding flange at the opposite end thereof perpendicular to the length of the panels and to said ribs, and a further said connector disposed between and secured to confronting surfaces of a plurality of said overlapping flanges on a first plurality of said panels and a plurality of said upright flanges on a second plurality of said panels perpendicular to said first plurality of panels.

2. A building construction as claimed in claim 1, in which said panels comprise the roof, the side walls, and the front and rear walls, the panels comprising the front and rear walls having their longest dimensions upright, the panels comprising the side walls and roof having their longest dimensions disposed horizontally.

3. A building construction as claimed in claim 1, said connectors being of channel shape having a web disposed against the outer skins of the panels interconnected by said connectors and having outwardly extending flanges secured to and between confronting surfaces of said ribs.

4. A building construction as claimed in claim 1, said core material overhanging the inner skin of each panel by the thickness of the panel.

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