Dec. 12, 1939. R. W. McLAUGHLIN, JR 2,183,381

BUILDING CONSTRUCTION UNIT

Original Filed Sept. 25, 1936 2 Sheets-Sheet 1

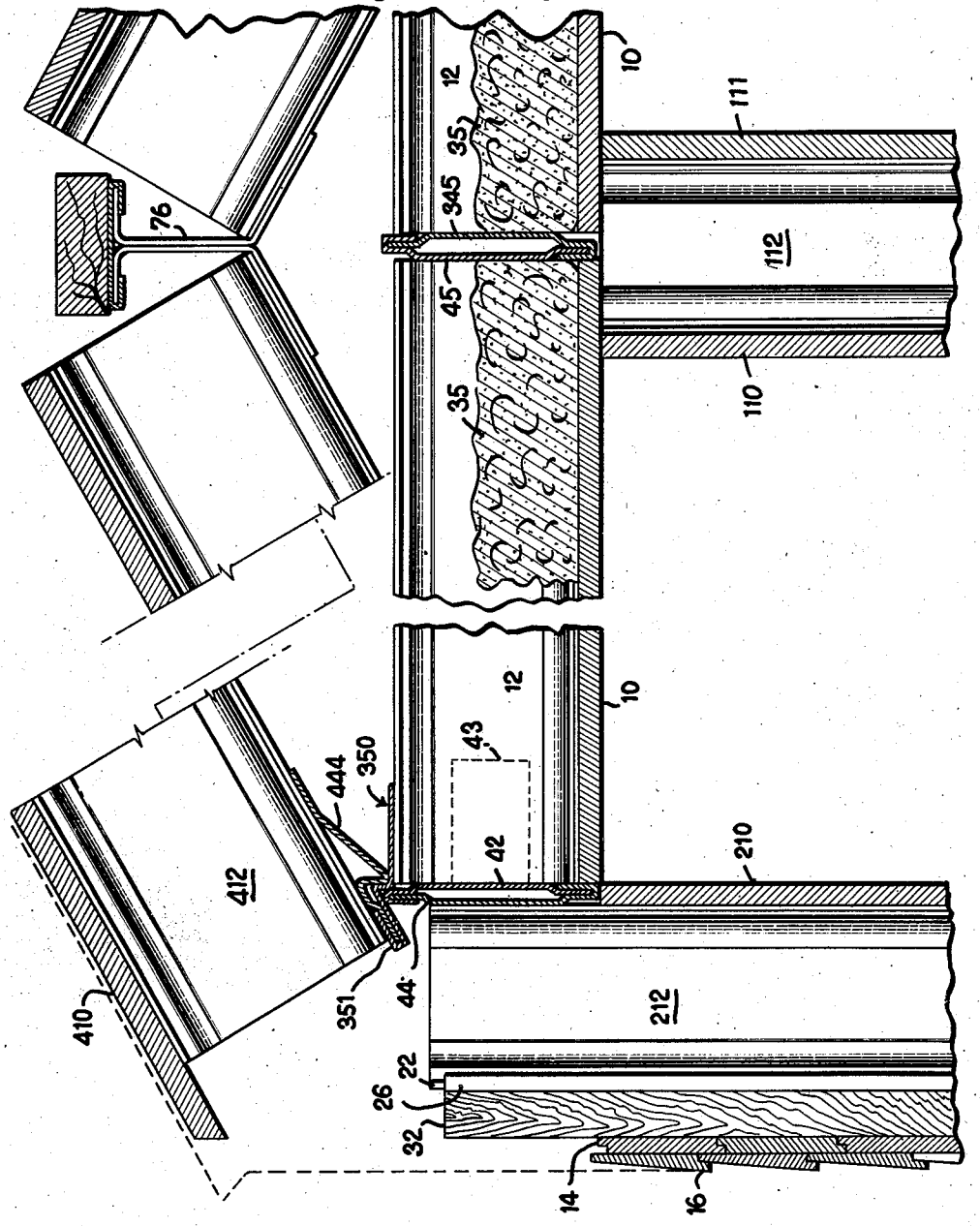


Fig. 1.

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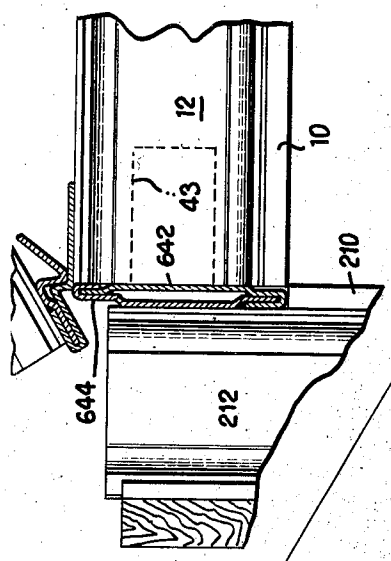


Fig. 3.

Fig. 2.

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Patented Dec. 12, 1939

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UNITED STATES PATENT OFFICE

2,183,381

BUILDING CONSTRUCTION UNIT

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Original application September 25, 1936, Serial No. 102,451, now Patent No. 2,142,523, dated January 3, 1939. Divided and this application November 6, 1937, Serial No. 173,132

2 Claims. (Cl. 189—1)

This invention relates to building construction, and more specifically to prefabricated buildings.

This application is a division of my co-pending application, Serial No. 102,451, filed September 25 1936, Patent No. 2,142,523, granted January 3, 1939.

In general, it is an object of the invention to provide a device of the character described which will efficiently perform the purposes for which it is intended, which is simple and economical of construction, which can be expeditiously, conveniently and safely manipulated, and which can be readily manufactured and assembled.

Other objects of the invention are to provide a building unit which may be interchangeably used throughout the flooring or the wall or the ceilings or the roof; to provide such units which interlock; to provide a simple keying arrangement for interlocking such units; to provide such units which may be fabricated at the factory and interlockingly assembled at the place where the building is to be erected, preferably without the use of rivets, nails, or the like; to provide such units which may have heat-insulating material added as or before they are assembled; to provide such units which may be assembled into buildings of various types of room lay-out; and to provide such units which may be used as connecting conduits at the same time as units for floor or wall structure.

Another object is to provide interchangeable, prefabricated units which, when assembled, form a self-supporting structure.

Another object is to provide a building, the ceilings of which are suspended from the walls; and to provide interlocking suspending means accomplishing this.

Another object is to provide a wall and roof construction which tends to take the weight of the ceilings off the partitions.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises an article of manufacture possessing the features, properties and the relation of elements which will be exemplified in the article hereinafter described and the scope of the application of which will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description, taken in connection with the accompanying drawings, in which:

Figure 1 is a vertical view in section of a construction embodying one form of the invention;

Fig. 2 is a perspective view of a part of the ceiling shown in Fig. 1; and

Fig. 3 is a detail of a modified form of a part of the device shown in Fig. 1.

This invention contemplates a house or other building, the great majority of the parts of which may be manufactured into relatively large-sized units at the factory and which may be erected simply by the interlocking of these together at the site of the building, without the use of bolts, rivets, nails or the like.

A principal unit, as shown in Fig. 2, comprises a panel 10, which may be of plywood, board or other suitable material, and two stud elements 12 which are attached to the panel by any convenient means, such as nails or rivets, or by a suitable adhesive, along the long edge of the panel. This trough-like element may be used in the roofing where the panel becomes the support for the roof proper. It may be used in the ceiling. When it is used in the partitions, a second panel 111 may be carried by partition stud elements 112 so as to be parallel to and spaced from partition panel 110. The unit may be used as an outer wall, in which case any suitable covering elements such as brick veneer, metal lathe and stucco, shingles or ship lap siding 14 with lap siding 16 thereon may be positioned parallel to panel 10 to serve as the outside of the building. The unit may be used in constructing a floor.

The various units employed in the building are preferably of the same breadth, and all floor units are preferably of the same length, as are all wall units and all ceiling units. It is to be understood that if the units employed are of a width of two feet or less it may be desirable in certain parts of the building, as for example where doors or windows are to be positioned, to employ a plurality of units formed into a single structural unit with portions cut away to permit the insertion of the door or window element, which in turn may be provided with suitable standard frame elements and the like. It is intended, however, that basically the structural units em-

bodying the present invention, if intended as wall units, may be interchangeably employed anywhere in the wall structure of the building. The same is true of the units intended as floor or ceiling or partition or roofing units.

It will be understood also that although certain elements may be termed studs or joists throughout this specification, these elements are in fact, preferably, similarly formed stud or beam-like elements of sheet metal. In the claims it is to be understood that the use of the word "stud" or the words "stud elements" is to be deemed to include elements of this type where employed specifically as stud or as joists or the like.

A pair of ceiling units is shown in perspective in Fig. 2. The studs 12, which may be of sheet metal, such as steel, each have a surface attached to a surface of the panel by such means as a rivet, screw, or nail, or by any suitable adhesive. Each stud is shaped or bent to provide a concavity 18 closely adjacent the panel. The stud elements are positioned along the side edges of the panel elements, and where the structural units are assembled in adjacent position, with the stud elements of adjacent units abutting, these concavities of adjacent stud elements face in the same direction and nest or interlock, one within another, the one extending out over the edge of the panel and the other in from the edge of the panel. Each stud element has a second concavity 20 closely adjacent its other end, spaced from and parallel to but facing oppositely from the first-mentioned concavity in that stud. Immediately beyond the concavity 20, i. e., distal from the panel 10, each stud element is bent parallel to the panel 10 in a flat portion 22. Each stud element may have a flat portion 24 between the two concavities. Panel 11 may, if desired, be placed upon or attached to the flat stud portions 22. There may be one panel 11 for each unit. These panels 11 form the flooring for the space above the ceiling. Such panels shown in Fig. 2 are not shown in Fig. 1.

It will be seen that the stud on the right of one unit fits into the stud element on the left hand edge of the next unit to the right. In certain instances, as in the case of the upright walls, a locking or keying member 26 (see Fig. 1), preferably also of thin sheet metal, is used to hold the two adjacent studs together. This member may be very simple, comprising a flat surface 28 with ends 30 bent around the flat ends 22 of the contacting stud. If desired, the key 26 may be attached to a piece of wood 32 as by a nail or other element 34 before the element is affixed in place. The element 32 may extend the length of the key 26, and may be of any material to which may be screwed or nailed, or otherwise attached, the second panel or wall closure element.

It is to be understood that the key 26 need not extend the full length of the stud element. Sections of the key element of short length may be affixed at the factory to the cooperating element 32, so that a section of such element with a short key at each end thereof may be provided, or short sections of the key element and its cooperating element 32 may be successively positioned one above the other to cover the face of the two internesting adjacent stud elements. If desired, the secondary wall covering elements or panel may be prefabricated of such width as to coincide with the width of the structural unit. The wall covering elements may, for example, be formed as a slab of material of such width as accurately to coincide with each wall panel element.

At the factory, the panel 10 is attached to its two studs 12. A plurality of such units are sent to the site of the building, and aligned, vertically in the case of a wall, side by side, with the studs fitting into each other. A locking element 26, with attached strip of wood 32, is slipped into position so as to lock each unit with the next unit by holding together the two distal parts of the two adjacent studs. In the case of an outer wall, the outer wall surface may then be attached to the wooden strips 32 so as to form a series of hollow, upright compartments. These may be left empty, or may be filled with insulating material such as mineral wool 35.

A series of outer wall units which have been fabricated at the factory is usually set up first with panels 210 facing inward. The stud elements 212, which form part of each of the wall units, are longer than panels 210 which latter need extend upward to a point no higher than the level of the ceiling. Keying elements 44 are suitably attached, as by rivets, to the upright studs 212. Each keying element 44 may extend horizontally past several stud elements and above panels 210.

It should be here noted that the keying elements 44, and other similar keying elements throughout the structure, act as braces to provide with the stud a rigid frame for each wall element. They thus perform a double function, acting not only as keying elements but also as bracing and supporting elements as will be more fully described.

Across the end of each floor or ceiling unit is provided a keying element 42 which is attached by wings 43 to the webbing of the joists 12. The keying elements may have been affixed to the joists or studs by welding or rivets at the place of manufacture of the units.

Any suitable outer wall covering elements may be affixed to the upright wooden strips 32, to which are nailed the locking elements 26. Mineral wool 35 may be inserted into the hollow, upright compartments formed by the upright units and covering elements. It should be noted that the insulating material may, if desired, be put in place at the factory.

A ceiling is provided as follows. A series of units is brought together side by side in a horizontal row so as to form a ceiling. The main panels 10 face downward. The keying elements 42 at the ends of the ceiling units are in a position reversed from that of the keying elements 44 which are at the top of the side wall units and into which are fitted the keying elements 42. In this fashion, the ceiling units are suspended from the wall units. Along the long side of those ceiling units which are at the edge of the ceiling, there may be provided a keying element 47 which fits into and is suspended from a keying element which is along the top of another wall of the building not shown in Fig. 1.

Each end of each ceiling unit may be supported as shown for one end only at 42 and 44 in Fig. 1. However, there may be a partition in the building with surface panels 110 and 111 separating the interior of the building into rooms. In such a case, one end of each ceiling unit is suspended, as shown at 42 and 44, and the other end of each ceiling unit may rest on one of the panels 110 or 111 of the vertical partition unit or on the studding associated therewith. A second series of ceiling units may be similarly supported from an outer wall at the right of, but

not shown in, Fig. 1, and rest on partition panel 11.

Keying elements 45 and 345 may key together the ends of the ceiling units which rest on panels 110 and 111, respectively. When the upper panels 11 are lacking, the ceiling from above looks like a plurality of tightly packed troughs. Material 35 may be inserted in this trough to prevent the transfer of heat.

The keying elements have a central portion 70 extending lengthwise thereof (see Fig. 2). Along one edge there is a U-shaped extension 72, each arm of which is parallel with, but not in the plane of, the central portion 70. Along the other lengthwise edge of the element, there is a flat portion 74 parallel with, but not in the plane of, the central portion 70. It will be seen that two such elements may be inter-keyed, the portion 74 of one fitting into the U-shaped extension 72 of the other. Whichever one is to support the other has its U-shaped extension facing upwardly along its lower edge. Thus, the extension of keys 42 and 47 is along the upper edge while the extension of key 44 is along the lower edge.

Attention should be drawn to the shape of the keying elements. It should be noted that the U-shaped extension portion of each element and the flat portion adapted to internest or interlock with a U-shaped extension portion of a cooperating keying element are displaced forwardly from the plane of the central portion of the keying element. This displacement is of such nature and of such extent as to permit the interlocking or interkeying units to be moved into interlocked position vertically and without lateral displacement of either unit. If, for example, it is desired to remove a single ceiling panel unit before the roof is fixed in position, the unit may be lifted vertically and without lateral displacement until the keying elements are completely disengaged. Elements such as are shown in the drawings and which are designed with both the U-shaped extension and the flat extension laterally displaced from the central portion may be adapted to permit such adjustment without difficulty.

Roofing also may be supplied and formed from prefabricated units similar to the other units in the building, the main panels 410 being on the upper side. One series of units may extend slopingly upward from the top of one wall, and another set from the top of an opposite wall, and be upheld centrally by a keystone element 76. To this latter, a ridge pole and associated roofing devices, not shown, may be attached. The outer, lower ends of the studs 412 of the roof units are provided with a special form of key 444, which sits in, and is held by, a key 350 attached to the ceiling units. The latter key has a U-shaped extension 351 into which an extension of key 444 extends. A bend in key 350 abuts a bend in key 444. The bend and the U-shaped part of key 350 support the outward thrust of the roof transmitted by key 444.

It will be seen that, the weight of the roof being transmitted diagonally downward and outward against keys 350, there is set up an outward, horizontal component of that force to which the ceiling units are subjected and which is transmitted to the wall elements. The keying elements 45 and 345 are therefore subjected to a stress. This, in turn, relieves the interior partition elements of at least some of the weight of the ceiling elements.

Joists which form the side walls of various units, such as the floor units, may be provided with openings 78, the openings in one joist being in registry with the openings of a joist in the next unit, so that the units may intercommunicate and act as conduits for the transmission of hot or cold air, pipes, etc.

It is of course to be understood that while the wall-forming units have been shown as suspended by the floor units, and while certain other units have been shown as suspended from or supporting still other units, these arrangements may be altered in any desired manner by altering the relative positions of engaging keying elements. Thus, in Fig. 3, there is shown an arrangement whereby the horizontal keying element 644 along the top of vertical wall units is suspended from a horizontal keying element 642 which is along the ends of the ceiling units. In this arrangement, the ceiling units are supported from, or balanced on, some portion of the main structure, such as the partition unit 112 and the ceiling units in turn carry the vertical wall units suspended therefrom.

It should also be pointed out that the concavities in the stud elements, positioned as they are in close proximity to the cooperating panel elements, act to substantially increase the strength of said stud elements, which in general act as beams wherein an accumulation of material at the ends, such as is provided by the said concavities, is highly desirable.

Doors, windows, wall-finishing elements and roofing elements have not been shown or described, in the interest of clarity. It is to be understood that for all such purposes, standard elements may be employed.

It should be noted that the structures described provide a building utilizing only dry materials in such form and condition that they may be assembled, substantially without the use of fastening elements, such as bolts, screws, rivets, nails and the like, by substantially unskilled labor.

Since certain changes may be made in the above article and different embodiments of the invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

Having described my invention, what I claim as new and useful and desire to secure by Letters Patent is:

1. In a device of the character described, in combination, a ceiling unit, a roof unit extending at an angle with said ceiling unit, a keying member secured to said ceiling unit and comprising a trough-shaped portion and an abutment portion, and a keying member secured to said roof unit and comprising an abutment portion and a ridge portion, said abutment portions having surfaces in contact with each other which are relatively large compared to the cross-sections of said members, said cross-sections being those at right angles to said surfaces, said abutment portions abutting each other and said ridge portion being positioned in said trough-shaped portion, said abutment portions and said trough and ridge portions supporting the thrust of said roof unit

and transmitting said thrust immediately and directly to said ceiling unit.

2. In a device of the character described, a vertical wall unit, a ceiling unit extending sidewise from a side face of said vertical wall unit and supported from said vertical wall unit, a roof unit extending at an angle with said ceiling unit, a keying member secured to said ceiling unit and comprising a trough-shaped portion and an abutment portion, and a keying member secured to said roof unit and comprising an abutment portion and a ridge portion, said abutment portions abutting each other and said ridge portion positioned in said trough-shaped portion, said abutment portions and said trough and ridge portions supporting the thrust of said roof unit and transmitting said thrust to said ceiling unit.

ROBERT W. McLAUGHLIN, JR.