

Aug. 7, 1962

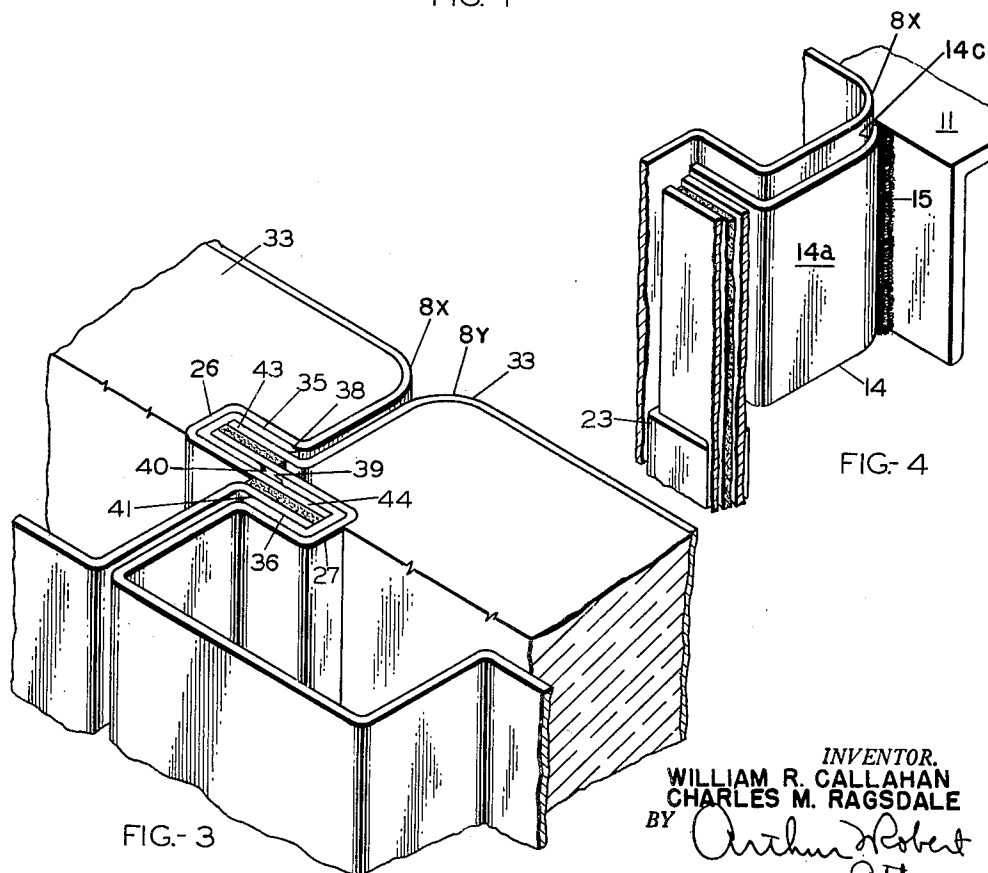
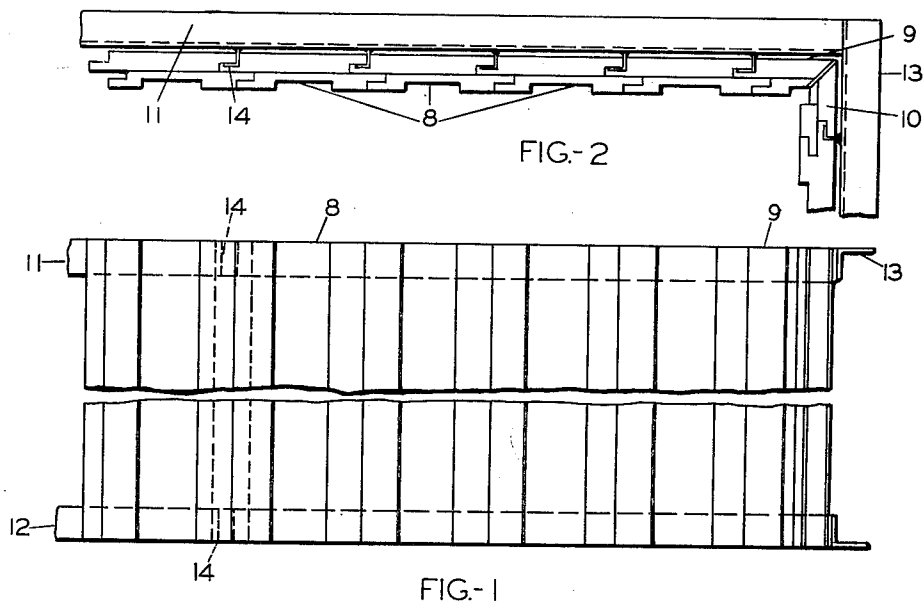
W. R. CALLAHAN ETAL

3,048,244

INTERLOCKING WALL SYSTEM

Filed April 10, 1957

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

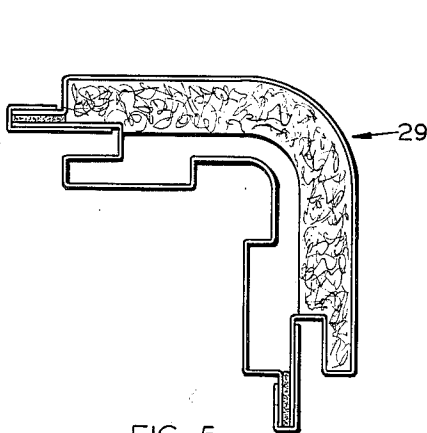


FIG-5

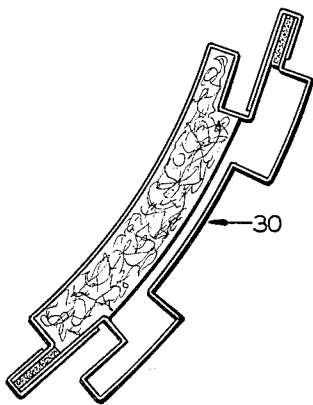


FIG-6

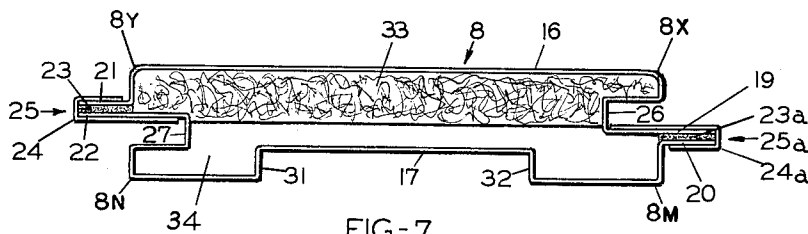


FIG-7

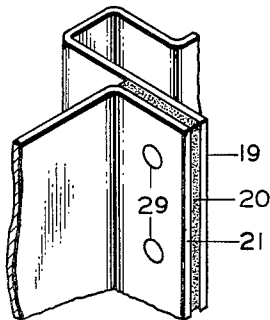


FIG-8

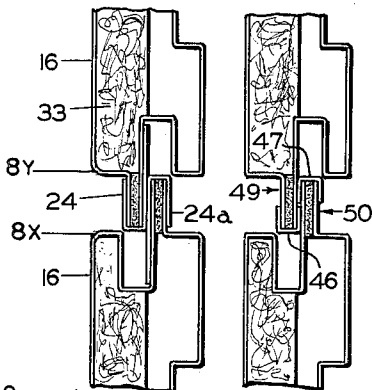


FIG-9

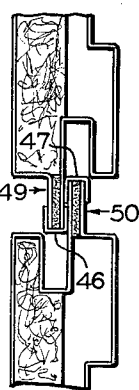


FIG-10

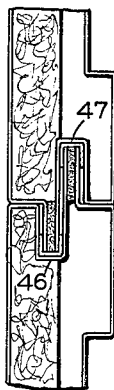


FIG-11

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3,048,244

INTERLOCKING WALL SYSTEM

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This invention relates to prefabricated walls and component units or panels adapted for end-to-end connection to form such walls. It relates particularly to building units of composite construction wherein high-strength surface elements of thin sheet material which need not be thermally nonconductive are combined with thermal insulating materials. The term "wall," as used herein, denotes generically the various space-dividing portions of a building whether it be a lateral wall, ceiling, floor or partition.

A primary object of the present invention is to provide a wall panel having an end edge of novel construction which renders it possible to connect it to and disconnect it from an adjacent panel and which provides a joint with the adjacent panel which is highly resistant to the leakage of heat and fluids therethrough.

Another object is to provide extremely light weight wall units in accordance with the foregoing object in which thin gauge metal or other rigid material is utilized in the manner of a box girder to obtain high strength with respect to laterally applied forces.

It is also an object to provide high thermal resistant wall-building units while utilizing, if necessary, a relatively high heat-conductive material as the strength-supplying skin or web portions of the units.

Ancillary to the foregoing object is the construction of units in such a manner that interlocking joints of one unit with the other are formed with a relatively heat-conductive skin material discontinuous within such joints wherein the gaps in such material contain another material which is highly resistant to heat transmission. Other objects, features and advantages will be apparent from the following description of the invention and the drawing relating thereto in which:

FIG. 1 is a fragmentary vertically shortened elevation of a wall illustrating several wall units joined together;

FIG. 2 is a fragmentary top view of the wall shown in FIG. 1;

FIG. 3 is an enlarged fragmentary perspective view of the juncture of two units, such as illustrated in FIGS. 1 and 2;

FIG. 4 is a fragmentary perspective view with portions broken away illustrating one arrangement for securing wall-forming units to a frame member;

FIGS. 5 and 6 are plan views of units adapted for forming curved or corner wall sections;

FIG. 7 is a plan view of a straight-sided unit adapted for connection with units of FIGS. 5 and 6;

FIG. 8 is a fragmentary perspective view illustrating a riveted joint of a unit;

FIG. 9 is a fragmentary plan view of two units positioned for moving into an interlocking position; and

FIGS. 10 and 11 are fragmentary plan views illustrating steps in joining units of a modified form.

Briefly stated, the invention resides in a wall-forming panel, in the combination of a pair thereof as a hollow unit which may serve as a container for an insulating material, and in the assembly of a plurality of such units as a wall. The basic structural element, the panel, comprises a self-sustaining web of sheet material having an inner face or back side, and an outer face or front side adapted to form a wall surface of one room, opposite side edges, and opposite first and second end-edge-portion terminating in corresponding first and second end

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and narrow marginal flange which extends longitudinally edges. The first end-edge-portion forms a relatively long or lengthwise in a direction proceeding from one side edge of the panel toward the other, and transversely or widthwise in a lateral direction proceeding away from the panel proper. The second or opposite end-edge-portion of the web forms an elongate marginal U-shaped channel which extends longitudinally or lengthwise in a direction proceeding from one side edge of the panel toward the other, said channel opening away from the panel proper in a second lateral direction proceeding opposite to the direction in which the flange extends. In a preferred embodiment, the web may extend generally within a major plane, the marginal flange may extend with its major plane parallel to the major plane of the web, and the marginal channel may extend with its outer and inner legs in spaced parallel relationship with each other but on opposite sides of the major plane of the flange.

Such panels may be joined in back-to-back relationship with the flange of each panel extending adjacent an outer marginal portion of the outer channel leg of the other panel to provide a tongue at each end of the unit. In preferred embodiments, insulating materials are incorporated into the tongues and within the body of the unit. A plurality of such panels may be joined in series interlocking relationship to form a wall by reason of a channel and tongue at each end of each unit adapted for mating relation of the tongue and channel, respectively, of the next adjacent unit. In a more specific form of the invention, the abutting end surfaces of two adjacent units and an element projecting from a support member cooperate to provide a wall comprising a plurality of such units and the member.

With reference to FIGS. 1 and 2, panels or units 8 and corner units 9 and 10 are secured to bottom frame member 12 and top frame members 11 and 13 by hooks 14. The frame members 11—13 preferably form a rigid part of the building frame work. The hooks 14 normally will be secured to these frame members at the time the partitions are being installed and in a manner proceeding progressively with the installation of each panel.

The hooks 14 project into the joints of the unit as shown in FIG. 4. They preferably are secured to the frame by welding. When this mode of supporting the units 8 is employed, each hook 14 may be joined to the frame member as shown by its marginal edge 14c with such edge bent out of the plane of the flat portion 14a of the hook. As the flat portion extends perpendicularly with respect to the member, an acute dihedral angle is formed between the bent edge of the hook and the face of the member 11 which provides a trough-like recess in which a weld 15 is formed to anchor the hook to the member.

The resulting joint is substantially symmetrical with respect to the general plane of the flat hook portion 14a. Consequently, it is necessary to provide the unit with rounded corners 8x and 8y so that there will be no binding of the units with either side of the weld joint as they are placed in operative position. A further factor making desirable corners of radius adequate to provide clearance with the joint is the usual presence of splatter or beads of metal which stick to the parent metal adjacent a weld joint. As shown in FIG. 7, the corners 8n and 8m of the units in the outer face of the wall may be formed with smaller radii. The hooks are accommodated within the joints of the panels in a particular manner hereinafter described.

FIG. 7 is an enlarged view of one of the units 8 as viewed in FIG. 2 showing that the unit comprises two webs 16 and 17 which form the lateral sides of the unit and are turned in therefrom to form its end surfaces and then turned out in the longitudinal direction of the unit to form flanges 19 and 20 at one end, and the flanges 21

and 22 at the other end. Between each pair of flanges is interposed a strip 23 or 23a of thermally nonconductive material such as cork, fabric or paper. Extending around the outer surfaces of the flanges is a covering or channel 24 of resilient sheet material, such as a strip of rubber or vinyl plastic. Together, the flanges 21 and 22, the cork strip 23, and the outer covering strip 24 constitute a tongue 25. In a like manner, a tongue 25a is formed comprising the flanges 19 and 20, strip 23a and the cover 24a. Although the flanges of a tongue may be otherwise secured, the channel 24 or 24a may constitute the primary means for holding respective tongues together by either (or both) their rigidity, or by being adhesively joined to the flange surfaces.

Each end portion is formed with a channel adjacent its respective tongue. For example, a channel 26 is formed in the web 16 adjacent its flange 19. The bight of this channel is of sufficient width and the legs of the channel are of sufficient length for the channel to receive the tongue 25 of another unit 8. Likewise, a channel 27 is formed in the left end of the panel 8 as viewed in FIG. 7 to receive the tongue 25a of another unit. The tongues 25 and 25a are in staggered relation with respect to the flat face surfaces of the unit as provided by the web 16, or any other longitudinal plane of the unit. In a similar manner, the channels 26 and 27 are in staggered relation whereby they may receive the tongues of respective opposite ends of other similar panels or units and thus dispose corresponding lateral surfaces of the units in the same general plane or wall contour.

In a typical unit for forming a flat wall-portion, the major plane of the tongue at one end of the unit extends approximately parallel to the major plane of the unit and approximately through the middle of the bight of the channel at the other end of the unit. However, it is within the scope of the invention to construct a unit with the major planes of its channels and tongues canted at a predetermined angle with respect to the major plane of the unit.

Although the length of the tongues relative to the depth of the channels is not a critical feature, the length of the tongues should be approximately the same as the depth of the channels for tightest wall construction. When hooks projecting from supporting frame members, such as the hook 14 of FIG. 4, are used to secure the panels to the frame member, the tongues may be slightly longer than the depth of the channels so as to provide a slight gap between end surfaces of adjacent ends of connected panels through which a hook may extend.

FIG. 8 illustrates one manner in which the flanges at the opposite ends of each panel may be secured together. As depicted, rivets 29 extend through both flanges 19 and 20 and the interposed cork strip 23a. When the webs 16 and 17 of the unit comprise a highly heat-conductive material, such as aluminum or other metal, the flanges may be joined adhesively such as by applying a thermosetting glue to the surfaces thereof in contact with the cork strip 23, and/or to the cork strip, whereupon the glue may be set by heating the tongue after assembling the unit. In this manner, all metal connection between the two webs of a panel is eliminated thereby minimizing the passage of heat therebetween.

One important advantage derived from construction of the units 8, i.e., the construction wherein both webs terminate as flanges in a tongue and one of the webs contains a channel which functions also to hold the tongue together which it receives, is that the strength of a wall comprising such units is substantially independent of the strength of the joint holding the two flanges at one end of the unit together. Thus, the tongue of any unit, when inserted into the channel of another unit, is permanently held together by the channel as long as the wall is assembled.

As shown in FIG. 7, the web 17 is formed with a shallow U-shaped section forming a lateral depression within

one side of the unit 8. Such a depression provides inwardly extending surfaces 31 and 32 which add to the rigidity of the unit as a whole. If desired, the web 16 may be formed with a similar U-shaped section, however, it is preferable to provide sufficient space within the unit 8 for an insulating material. The presence of turned-in surfaces 31 and 32 in some applications will be preferred because of the decorative effect imparted thereby to the units. As very thin gauge metal sheets are used in forming the webs 16 and 17, decorative designs are readily rolled, embossed or otherwise formed by deformation of the body or surface of the metal sheet.

As shown in FIG. 7, the unit 8 contains a layer of insulating material 33 which does not completely fill the space between the web 16 to the web 17 with respect to the transverse direction of the unit. To make the unit completely fireproof, the layer 33 comprises a material such as glass fibers or other mineral fibers mixed with an inorganic cement to render the layer self-sustaining within the unit. For some uses of such panels, it is desirable to provide an air space, such as region 34, between the insulating material and one web of the unit.

With further regard to securing the units to the frame members, FIG. 4 illustrates that in order to provide sufficient space within a joint between two units for insertion of a hook 14, a portion of the plastic cover 24 as shown in FIG. 3 may be removed. Thus, in an installation wherein such hooks are used, the upper and lower end portions of the covers 24 for the tongues nearest the wall will be removed to accommodate hooks 14 which must go into both ends of the joints. As stated hereinbefore, the cover (see cover 24) may be adhered to the outer surfaces of the flanges with a glue or cement whereby the unit may be held together permanently, or at least with sufficient strength in the tongues to hold the unit together through handling and storage until incorporated into a wall.

FIGS. 5 and 6 illustrate non-rectilinear or non-planate units which differ in direction and degree of curvature. These sections are exemplary of units that may be formed and adapted to evolve any desired lineal direction of wall contour. The unit 29 of FIG. 5 is typical of a unit required for forming an inside right angle wall portion. Unit 30 of FIG. 6 is arcuate with its direction of curvature opposite to that of unit 29 and less than a right angle. The latter unit is adapted for forming rounded walls.

With a view to providing the units in a condition providing easy assembly, different modes of attachment of the cover strips or channel elements of the tongues are illustrated. FIG. 3 illustrates an arrangement wherein channel elements 35 and 36 are normally held within the channels 26 and 27 in the manner of window glass channels of automobile doors. The elements 35 and 36 may be secured, e.g., as the result of a press fit, or adhesively. The edges of the channel elements are rounded at 38, 39, 40 and 41 to facilitate entry thereto of the tongues 43 and 44. The above arrangement allows the use of covers which extend substantially full depth of the panel channel which is contradistinct from the arrangement shown in FIGS. 10 and 11 wherein the covers 46 and 47, secured to the flanges, are a part of respective tongues. The covers are not more than half the length of the channels or tongues in order that the tongues may be aligned for entry into respective channels as shown in FIG. 10. The covers 24 and 24a of FIG. 7 and 9 are attached as parts of respective tongues. One leg of each cover extends the full length of the tongue to which it is attached and continuously into the adjacent channel to substantially its full depth. Some suitable materials from which the covers or channel elements may be made are plasticized vinyl resins, moderately hard vulcanizates of synthetic and natural rubbers, polyethylene, leather, woven fabrics with or without impregnation by a resin, and resin-impregnated non-woven fabrics.

From the foregoing description, the invention may be observed to have such obvious and inherent advantages as (1) almost complete fireproofness; (2) interlocking joints which connect the units characterized by (a) complete blocking of the passage of vapor, (b) a high degree of rigidity or box-frame effect within the joint itself as provided by the interlocked channels and tongues, and (c) thermal non-conductivity resulting from the use of heat non-conducting laminate for separating various metal portions within the tongues and channels of the units; (3) ease of assembling units and attaching them to supporting members; (4) high strength of the unit or a wall of such units resulting from the box-frame design of the unit as a whole; (5) and the use of light-gauge web materials which are readily worked to provide decorative surface effects.

While preferred embodiments of the invention have been shown and described, it is understood that changes and variations may be made without departing from the spirit and scope of the invention as defined in the appended claims.

Having described our invention, we claim:

1. A prefabricated box-like wall forming unit capable of being interfitted with like units in edge abutting relationship to form a multiple unit, continuous wall comprising: a pair of cooperating unit forming panels, each of which is composed of a continuous sheet of material of substantially uniform thickness formed to provide a self-sustaining web having an inner face, an outer face adapted to form an exposed wall surface, opposite side edges and opposite first and second end-edge-portion terminating in first and second end edges; said first end-edge-portion being bent to form a relatively long and narrow first marginal flange which extends longitudinally in a direction proceeding from one side edge of said web toward the other side edge and transversely in one lateral direction proceeding away from said faces and is offset inwardly from said inner face; the second end-edge-portion of said web being bent to form an elongate U-shaped channel which extends longitudinally in a direction proceeding from one side edge of said web toward the other side edge and opens in a second lateral direction proceeding away from said faces; said channel including an inner leg, a bight and an outer leg with said inner leg connected with the face portion of the web by an inward extension and extending from the inner edge of said extension along the inner face in a direction substantially opposite to said second lateral direction and proceeding to one edge of the channel bight, and said outer leg projecting from the opposite edge of said bight in a direction substantially the same as said second lateral direction and proceeding to said second end edge of said web, said inner and outer legs offset from the inner face distances respectively less than and greater than the offset of said first marginal

flange, the distance between said legs being greater than twice the combined thicknesses of said outer leg and first marginal flange and the length of said outer leg in said second lateral direction greater than the corresponding dimension of said inner leg whereby said second end edge of said web is spaced beyond said extension in said second lateral direction; said panels being arranged with their inner faces in spaced face-to-face relationship with each other and with the first marginal flange of one panel extending adjacent the outer portion of the outer channel leg of the other panel on the outside of the channel; heat insulating means connected with and forming a part of the unit and disposed between said adjacent flanges and outer portions of said outer legs and also on the exterior of said flanges and outer legs and operable to provide an insulating seal between said flange and outer leg and between the flange and outer leg and the adjacent surfaces of a channel of a like wall forming unit when the flange and outer leg are interfitted therein; and means securing the first marginal flange of each web to the outer channel leg of the other web.

2. A wall comprising: a pair of the units of claim 1 arranged in end-to-end relationship with the adjoining flange and outer portion of the outer leg and heat insulating means on the adjacent end of each unit extending into the adjacent channel of the other unit.

3. The wall assembly of claim 2 comprising a support member for the units having a surface extending in the end-to-end direction of the units adjacent to correspondingly similar faces of the units, the member having means projecting laterally with respect to said surface and extending between the end surfaces of an adjacent pair of joined units and into the channel of said pair of units nearer the member.

4. The wall assembly of claim 3 wherein one of said units has its corner nearest the junction of the member and said means extending therefrom rounded to facilitate the movement of the unit into normal position within said assembly.

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