May 29, 1956 L. E. BROBERG 2,747,703

WALL PANEL CONSTRUCTION

Filed March 29, 1952 2 Sheets-Sheet 1

FIG. 1.

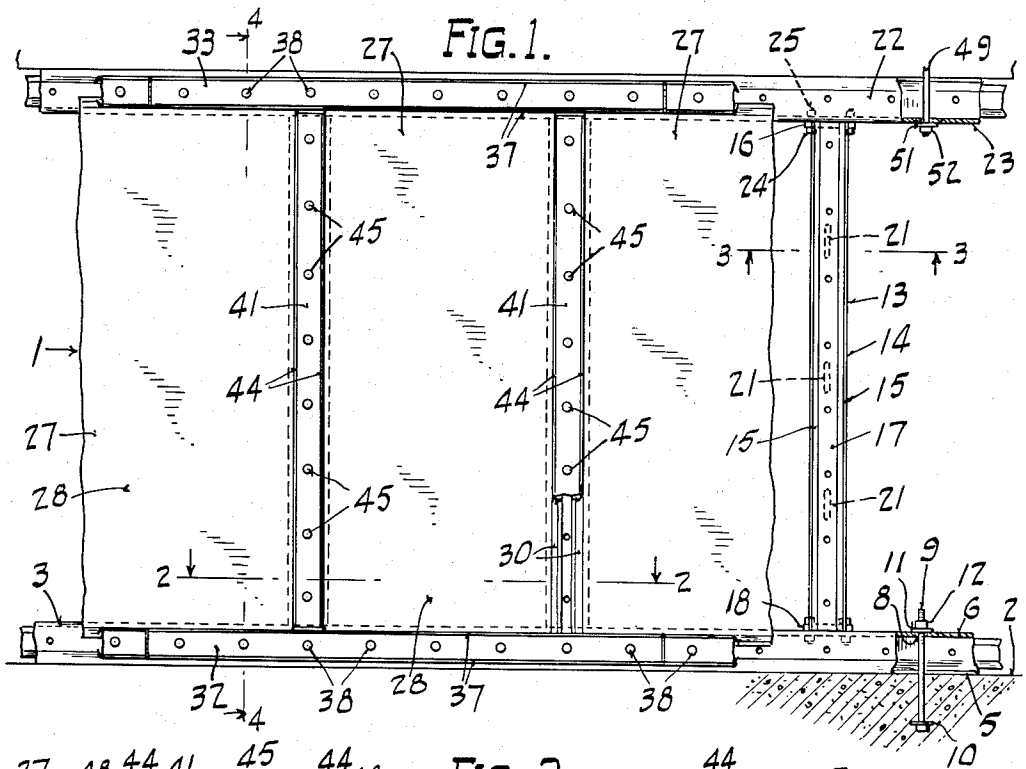


FIG. 2.

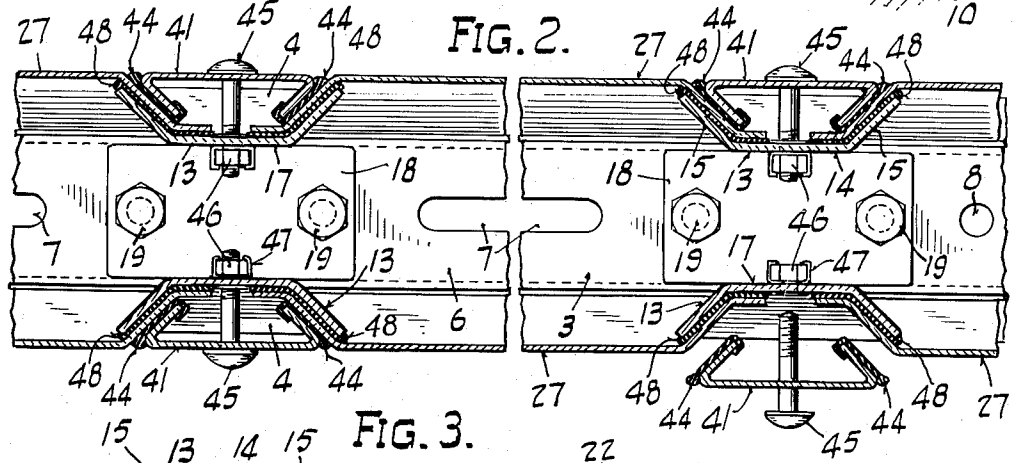
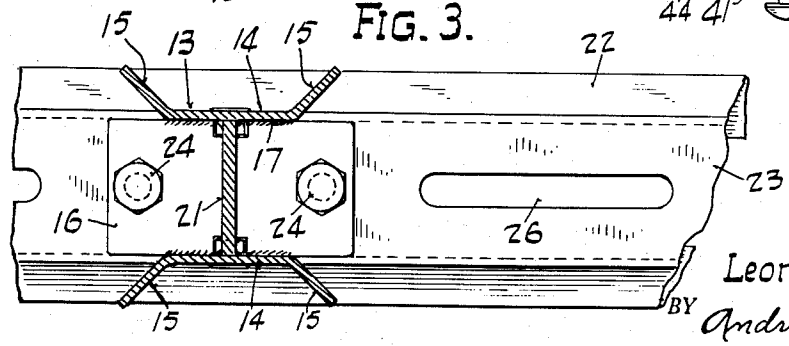


FIG. 3.



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May 29, 1956 L. E. BROBERG 2,747,703

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Filed March 29, 1952 2 Sheets-Sheet 2

FIG. 4.

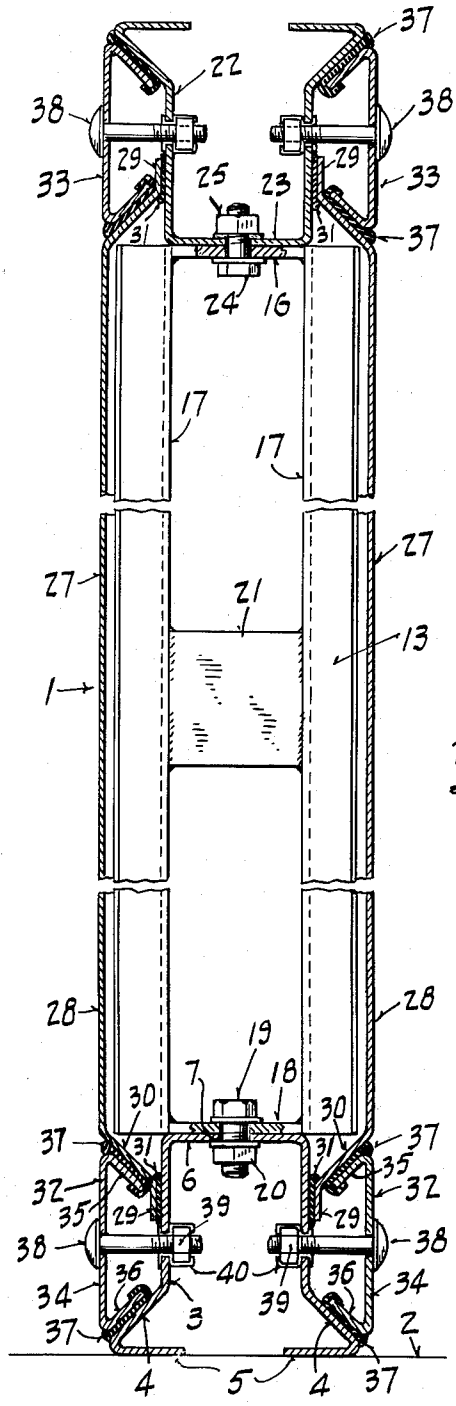


FIG. 5.

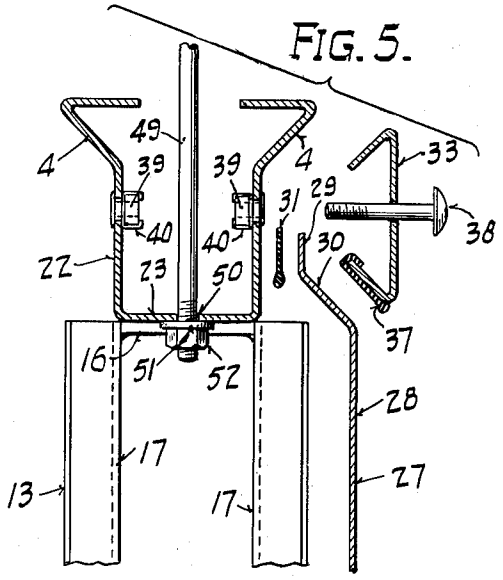


FIG. 6.

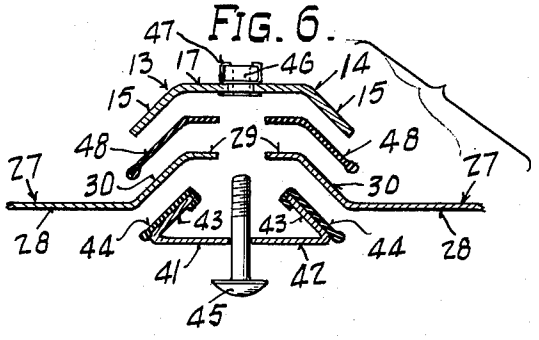
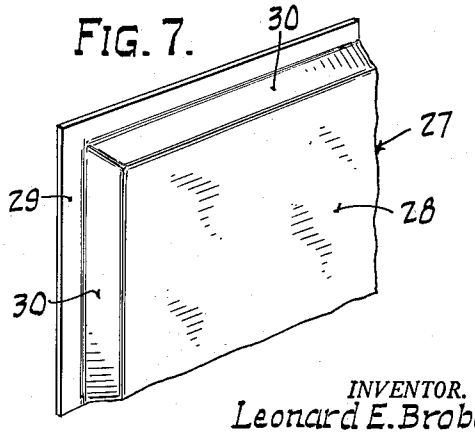


FIG. 7.



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WALL PANEL CONSTRUCTION

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2 Claims. (Cl. 189—34)

The present invention relates to building structures and more particularly to a new improvement in wall construction.

One object of the present invention is to provide a building structure of a character whereby substantially all of its parts may be prefabricated in the manufacturing plant and the structure may be assembled at the building site with a minimum of labor.

Another object is to provide a wall structure which may be expediently and inexpensively assembled or disassembled by the purchaser or user.

Still another object is to provide a wall construction of a character whereby a good many of the parts are of substantially similar construction in order to facilitate production.

Another object is to provide a wall construction which may be conveniently packed into a minimum of space to facilitate shipment to the consumer.

The present invention is directed to a novel all-metal wall construction which is made from a number of standardized parts and is partially assembled or prefabricated in the manufacturing plant so that the structure may be conveniently erected with the use of a few simple tools.

Under the wall construction of the present invention, the supporting members, which include a foundation beam, a ceiling beam and a plurality of vertical connecting studs, are each formed with diverging flanges or surfaces which are complemented by the converging side flanges of a plurality of locking channels. A plurality of wall panels having inwardly bent edge portions are disposed against the supporting members to form the walls of the structure with the bent edges being interposed between a diverging flange of the supporting members and the complementary converging flange of the channel. By securing the web of the locking channel to the supporting member, the channel is wedged inwardly against the diverging surface of the supporting member to provide a tight effective attachment of the panel between the converging and diverging surfaces.

Other objects and advantages will appear in the course of the following description.

Figure 1 is an elevational view illustrating the wall structure of the present invention with parts being broken away;

Fig. 2 is a horizontal sectional view taken along line 2—2 of Figure 1 showing the attachment of the wall panels to the studs;

Fig. 3 is a section on the line 3—3 of Figure 1 showing a stud attached to the ceiling beam;

Fig. 4 is a vertical sectional view taken along line 4—4 of Figure 1 showing the attachment of the wall panels to the foundation and ceiling beams;

Fig. 5 is a section similar to the upper end of Fig. 4, some parts being omitted and others shown in exploded position;

Fig. 6 is an exploded transverse sectional view of a vertical joint; and

Fig. 7 is a perspective view of a corner of a panel.

Referring to the drawings there is illustrated an embodiment of the present invention comprising an all-metal wall structure 1 mounted on a suitable foundation 2.

The lower portion of the wall structure comprises a foundation beam or channel 3 having a generally U-shaped cross section which rests on the foundation 2 with the open side of the U-shaped beam facing the foundation. Beam 3 extends the entire length of the wall structure 1 and each leg of beam 3 adjacent the foundation is formed with a reverse bend to provide an outwardly diverging surface 4, and an inwardly extending base surface 5 which rests on foundation 2.

The web 6 of beam 3 is formed with a series of independent slots 7, each of which extends lengthwise along web 6, and a plurality of annular openings 8 longitudinally aligned with slots 7 and disposed near the ends of the beam.

A plurality of spaced tie rods 9 are employed to secure foundation beam 3 to foundation 2. The lower portions of the tie rods are embedded in the foundation and the rods extend upwardly through the foundation and within beam 3 with the threaded upper ends thereof projecting through the respective openings 8 or through slots 7 in web 6 of the beam.

The lower portion of each rod 9 may be bent outwardly away from the wall structure and the lower end thereof may be provided with a head and washer 10 embedded in the foundation to firmly attach rod 9 to foundation 2.

The threaded end of each rod 9 which projects upwardly through web 6 of beam 3 is received by a suitable washer 11 and engaged by nuts 12 to firmly secure beam 3 to the foundation.

Vertically extending studs 13 are disposed on the web 6 of foundation beam 3 and extend upwardly therefrom.

Studs 13 include a pair of spaced side plates 14 with each vertical edge portion of plates 14 being bent outwardly, at an angle of approximately 45°, to provide each plate with a pair of diverging flanges 15.

The spaced side plates 14 are joined at their upper extremities by the horizontally disposed flat plate 16 which is edge welded to the web portions 17 of the side plates. A flat base plate 18 similarly connects the side plates 14 at the lower extremities thereof and rests on web 6 of foundation beam 3. A pair of bolts 19 are employed to secure studs 13 to beam 3 and extend downwardly through suitable aligned openings in the base plate 18 and in web 6. Nuts 20 threaded on the lower end of bolts 19 secure the studs to beam 3.

To provide the studs with added strength and rigidity, a plurality of spaced tie plates 21 are welded edgewise between the side plates 14.

A ceiling beam 22, which corresponds to foundation beam 3 in order to achieve a standardization of parts in manufacture, is disposed on the top of the spaced studs 13. The open side of ceiling beam 22 faces upward and the web portion 23 thereof is in contacting relation with the flat plates 16 of the series of spaced studs 13.

Ceiling beam 22 is secured to each of the top plates by a pair of bolts 24 as shown in Fig. 3 which extend upwardly through suitably aligned openings in web 23 and plate 16 and are secured by threaded nuts 25 located inside beam 22.

Web 23 of beam 22 is provided with a number of longitudinal slots 26 as shown in Fig. 3 similar to slots 7 in beam 3. The slots 26 and 7 in the respective beams 3 and 22 permit access to the interior of the wall structure for the deposition of insulation or other material therein.

A plurality of generally rectangular shaped panels 27 are provided for wall surfaces of the structure 1 and are shown as secured to studs 13, foundation beam 3 and ceiling beam 22. However, panels 27 may merely be

secured to the beams 3 and 22 or to the studs 13 depending on the strength requirement of the structure.

As shown in the drawings the wall structure comprises an interior and exterior wall surface. However it is contemplated that the structure may consist of only one wall surface depending on the ultimate use of the structure. The panels 27 are constructed of lightweight sheet metal and, if a corrosive medium is to be encountered in service, all, or a portion, of the panels may be glass-coated or constructed of a corrosion-resistant material.

As shown in Fig. 6 the top, bottom and side edge portions of each panel 27 are inwardly offset from the main panel surface 28 to provide a peripheral surface 29 which is substantially parallel to the main panel surface, and a connecting beveled or oblique surface 30, both of which extend completely around the panel.

The beveled connecting surface 30 affords a space saving when the panels are nested or stacked for shipment, as all parts of one panel will contact the corresponding parts of the adjacent panel with no lost space therebetween.

The peripheral surface 29 adjacent the top of each panel 27 is disposed flatwise against the side surface of ceiling beam 22 and the peripheral surface 29 adjacent the bottom of each panel is similarly disposed against the side surface of foundation beam 3.

The vertical side edges of adjacent panels are in a spaced relation on web 17 of stud side plates 14 with the peripheral surface 29 adjacent the side edges of each panel being disposed flatwise against web 17.

The surface 30 adjacent the side edges of each panel is designed to be in contacting relation and complement the respective diverging flanges 15 of the studs.

A plurality of resilient plastic or rubber seals 31 may be interposed between the overlapping surfaces 29 of panels 27 and between the side surfaces of the respective beams 3 and 22 to form a seal between panel 27 and the beams.

A plurality of horizontal base locking channels 32 and ceiling locking channels 33 are employed to secure the lower and upper portions of the interior and exterior wall panels 27 to the respective foundation beam 3 and ceiling beam 22. As the channels 32 and 33 are of identical structure and are similarly employed on the wall structure, the following description will be directed merely to the base channel 32.

The base channels 32 are horizontally disposed end-to-end, the number employed depending on the length of the wall structure, within the longitudinal recess bounded by the lower beveled surface 30 of panels 27 and the outwardly diverging surface 4 of foundation beam 3. The open side of base channel 32 faces inwardly toward beam 3 and the web 34 of the channel is substantially flush with the main panel surface 28.

The edge portions of base channels 32 are bent inwardly to an angle of approximately 45° to form flanges 35 and 36 with the upper converging flange 35 complementing beveled surface 30 and the lower converging flange 36 complementing the outwardly diverging surface 4 of beam 3. The converging flanges 35 and 36 of channels 32 are cushioned from the respective underlying complementary surfaces 30 and 4 by a seal 37. Seal 37 is preferably constructed of a resilient material such as plastic or rubber. Seals 37 extend the entire length of the channel 32 and the inner longtitudinal edges of each seal may be bent around the longitudinal edge of each respective channel flange 35 and 36 so as to be co-extensive therewith. The outer longitudinal edge of the seal may be formed with a greater thickness than the remainder of the seal to provide a smooth joint between the main panel surface 28 and the web 34 of channel 32.

Channels 32 are attached to beam 3, with the intermediate beveled surface 30 of panels 27 being secured therebetween, by a plurality of spaced screws 38. The screws extend inwardly through suitable aligned openings in the webs 34 of channels 32 and in beams 3 and cooperate with nuts 39. Nuts 39 are secured against rotation when receiving screws 38 by suitable nut retainers 40.

As screws 38 are threaded into nuts 39 channels 32 are wedged against the diverging surfaces 4 and 30 to firmly secure the panels 27 to beams 3.

A plurality of vertical locking channels 41 having the same structure as horizontal channels 32 and 33 extend from channels 32 to channels 33 and are employed to secure the interior and exterior panels to the respective studs. 13.

The channels 41 are disposed within the vertical recesses formed between the beveled surfaces 30 of adjacent panels with the open side of channel 41 facing stud 13 and the web 42 of the channel being in a substantially flush relation with the main panel surface 28.

Each of the converging side flanges 43 of channels 41, as shown in Fig. 6, is disposed flatwise against the respective beveled surfaces 30 of the adjacent panels and separated therefrom by plastic seal 44 similar in structure to seal 37.

The marginal offset surface 29 of panel 27 is disposed flatwise against web 17 of stud side member 14 and prevents the beveled surface 30 of the panel from pulling out from between the diverging flange 15 of side member 14 and the complementary converging side flange 43 of channel 41.

Channels 41 are attached to studs 13 similarly to the manner by which channels 32 are secured to beam 3. A plurality of screws 45 extend inwardly through aligned openings in web 42 of channel 41 and side member 14 between the spaced vertical edges of adjacent panels 27 and cooperate with fixed nuts 46 which are secured behind the screw openings by nut retainers 47.

The converging side flanges of channels 32, 33 and 41 are of lesser width than the complementary stud and beam surfaces against which the side flanges are disposed. This difference in width permits the side flanges to be wedged against the complementary surfaces until a snug fit is obtained therebetween, thus eliminating the necessity for precisely machined surfaces and close tolerances between the two adjoining elements.

The bands or seals 48 which correspond to seals 31 are interposed between stud 13 and surfaces 29 and 30 of panel 27. Bands 48 prevent foreign matter from accumulating within the respective channels, and also provide a cushion and seal between the open end of the channels and the adjacent element.

A suitable ceiling or roof, not shown, may be secured to ceiling beam 22 by a plurality of tie rods 49. The lower end of each rod 49 extends through an opening 50 or through slot 26 in web 23 of beam 22 and is engaged by a washer 51 and nut 52. The upper end of each rod 49 may then be secured to a suitable roof which will rest on beam 22.

The preferred method of assembly is to initially construct the studs 13 in the manufacturing plant. This is accomplished by welding base plate 18, top plate 16 and tie plates 21 edgewise between side members 14.

Foundation 2 is constructed in the field and is of the configuration of the structure. Tie rods 9 are partially embedded in the foundation and are spaced so that the projecting ends thereof register with the openings 8 in the web 6 of foundation beam 3 which is to be subsequently disposed on the foundation.

Beam 3 is placed on the foundation with the upper ends of rods 9 projecting upwardly through openings 8 and the beam is secured to the foundation 2 by threading home the nuts 12.

The prefabricated studs 13 are then vertically disposed in a spaced relation on foundation beam 3 and base plates 18 of studs 13 are secured to web 6 of beam 3 by bolts 19.

Ceiling beam 22 is disposed on the top of spaced studs 13 with web 23 thereof being secured to top plate 16 of the studs by bolts 24.

Before disposing panels **27** on the wall structure nuts **39** are attached behind the screw openings in beam **3** and beam **22** by nut retainers **40** and are in position to subsequently receive screws **38**. Nuts **46** are similarly fixed behind the screw openings in side plates **14** of studs **13** by nut retainers **47**.

The panels **27** are then properly disposed on the wall structure with seals **31** and **48** interposed between the panel surfaces and the adjoining beam and stud surfaces, to provide interior and exterior wall surfaces, or a single wall surface, as desired.

The horizontal locking channels **32** and **33**, having the longitudinal edges thereof covered by seal **37**, are positioned on the structure and attached to the respective beams **3** and **22** by screws **38** which cooperate with nuts **39**.

The assembly is completed by attaching the vertical channels **41** to the studs **13** by the screws **45** which engage the fixed nuts **46** with the seals **44** being interposed between the channels and panels **27**.

The present invention provides a sturdy wall structure which may be quickly and inexpensively assembled by the consumer. In addition a minimum of parts are employed and these, as far as practical, are of standardized construction to facilitate production and erection. For example, of the basic elements employed, beams **3** and **22** are identical structures, channels **32**, **33** and **41**, are all of like construction and may be employed interchangeably and panels **27** are all standard and may be interior or exterior wall surfaces.

Various embodiments of the present invention may be employed within the scope of the following claims.

I claim:

1. An all-metal building structure, comprising an open sided foundation channel resting on the foundation of the structure with the open side of said channel facing said foundation and with the sides of said channel being substantially flat and turned outwardly adjacent the foundation to form a pair of diverging flanges, an open sided ceiling channel disposed above said foundation channel with the open side of said ceiling channel facing upwardly and with the sides of said channel being substantially flat and turned outwardly adjacent said open side to form a pair of diverging flanges, a plurality of laterally spaced studs extending vertically between the foundation and ceiling channels and secured to the web of each channel, a plurality of wall panels to form the wall surfaces of the structure and having a generally rectangular main panel surface bounded by an inwardly diverging section and terminating in a peripheral edge section which is inwardly offset from and parallel to the main panel surface, and said offset edge section adjacent the top of the panels being disposed flatwise against the side of the ceiling channel and the offset edge section adjacent the bottom of said panels being disposed flatwise against the side of the foundation channel, means securing the vertically extending edge section of the wall panels to said studs a plurality of horizontally extending foundation locking channels having converging side flanges with the uppermost side flange thereof being disposed flatwise over the lowermost diverging surface of said panels and with the lowermost side flange being disposed flatwise against the diverging flange of the foundation channel, a plurality of horizontally extending ceiling locking channels having converging side flanges with the uppermost of the ceiling locking channel side flanges being disposed flatwise against the diverging flange of the ceiling channel and the lowermost of said ceiling locking channel side flanges being disposed flatwise against the upper diverging section of said panels, and securing means extending through said channels and attaching the locking channels to the respective foundation and ceiling channels and firmly securing said panels between the locking channels and the respective foundation and ceiling channels.

2. An all metal building structure, comprising an open sided foundation channel resting on the foundation of the structure with the open side of said channel facing the foundation and with the sides of said channel being substantially flat and turned outwardly adjacent the foundation to form a pair of diverging flanges, an open sided ceiling channel disposed above the foundation channel with the open side of said channel facing upwardly and with the sides of said channel being substantially flat and turned outwardly adjacent said open side to form a pair of diverging flanges, a plurality of laterally spaced stud plates extending vertically between the foundation and ceiling channels and joining said channels together with the vertical edge portions of said ceiling and foundation stud plates being turned outwardly from a central web to form a pair of diverging flanges, a plurality of wall panels providing the wall surface of the structure and having a generally rectangular main panel surface bounded horizontally and vertically by an intermediate section diverging toward said channels and to an outer edge section with the latter section being inwardly offset and parallel to the main panel surface, the horizontal offset edge section adjacent the top of each panel being disposed flatwise against the side of the ceiling channel and the horizontal edge section adjacent the bottom of each panel being disposed flatwise against the side of the foundation channel, and the vertical offset edge sections on each side being disposed flatwise against the web of a stud plate, a plurality of horizontal extending foundation locking channels having converging side flanges with the uppermost flange of each locking channel being disposed flatwise over the lowermost diverging section of said panels and with the lowermost flange of each locking channel being disposed flatwise against a diverging flange of the foundation channel, a plurality of ceiling locking channels having converging side flanges with each uppermost ceiling channel locking flange being disposed flatwise against the diverging flange of the ceiling channel and each lowermost ceiling locking channel flange being disposed flatwise against the upper diverging section of said panels, a vertical locking channel for each stud plate with converging side flanges on each vertical locking channel disposed complementary to the diverging flanges of the stud plate and with the vertical diverging section of each panel being interposed between a converging flange of each vertical locking channel and a diverging flange of each stud plate, and securing means extending through the locking channels and foundation and ceiling channels and stud plates to firmly secure the wall panels between the locking channels and said foundation and ceiling channels and stud plate.

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