United States Patent [19]

Skinner

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[54] **INTERLOCKING STRUCTURAL UNITS**

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[52] **U.S. Cl.** **52/93,** 52/191, 52/309, 52/478, 52/496, 52/539, 52/550

[51] **Int. Cl.** **E04b 7/12,** E04f 11/00

[58] **Field of Search** 52/93, 182, 183, 188, 190, 52/309, 550, 233, 478, 496, 539, 595, 191, 492, 546

[56] **References Cited**

UNITED STATES PATENTS

2,139,004	12/1938	Davey	52/496 X
2,551,345	5/1951	Scott	52/191 X
739,211	9/1903	Ohaus	52/550 X
1,023,878	4/1912	Ronnau	52/550
3,641,720	2/1972	Berrie	52/220 X

FOREIGN PATENTS OR APPLICATIONS

1,070,401	2/1954	France	52/481
953,462	11/1956	Germany	52/190
533,147	2/1922	France	52/86
332,693	12/1903	France	52/190

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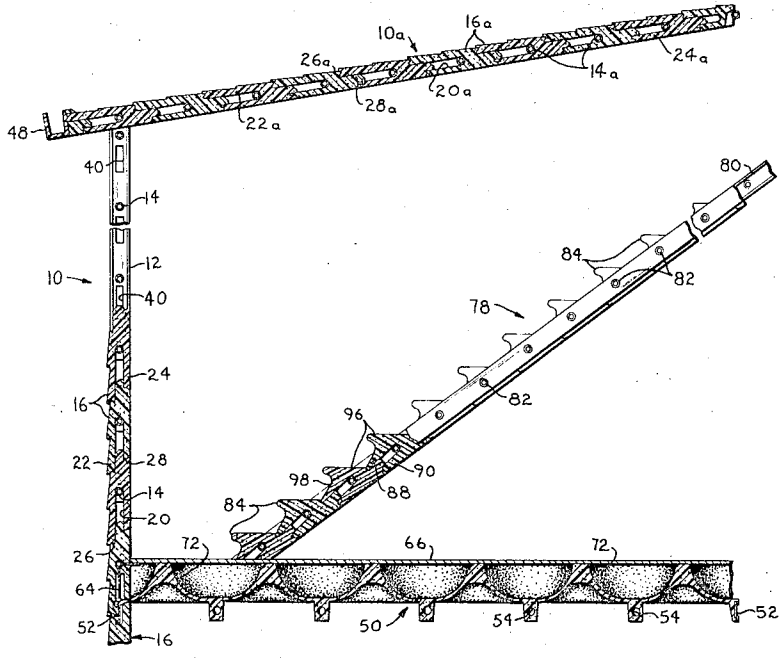
[57] **ABSTRACT**

A structural assembly is formed by a frame having a pair of spaced, parallel support components spanned by a series of spaced, parallel members orthogonal to said components, and a series of elongated structural units each longitudinally slotted to receive a corresponding member for support thereby. The frame would normally be positioned with the support components either upright for a wall or inclined for a roof or stairway, with the series of members being horizontally disposed. The structural units are successively installed on the members, each unit as it is installed interlocking with the previously installed unit to lock the series of units together in a rigid assembly. The interlocking units are monolithic bodies of structurally strong, rigid, synthetic resin foam material such as polyurethane, and thus possess superior insulating properties as well as being quite strong in compression. In constructing walls and roofs, panels of assembled frames and units are arranged in abutting, side-by-side relationship to form a multiple-panel wall or roof area. Several mechanical raceways are available and extend throughout the entire area. The individual interlocking units are molded panel sections having opposed, prefinished surfaces that become the interior and exterior of the structure. For stairway construction, a single frame is employed with the interlocking units thereon being shaped to provide treads and risers.

29 Claims, 8 Drawing Figures



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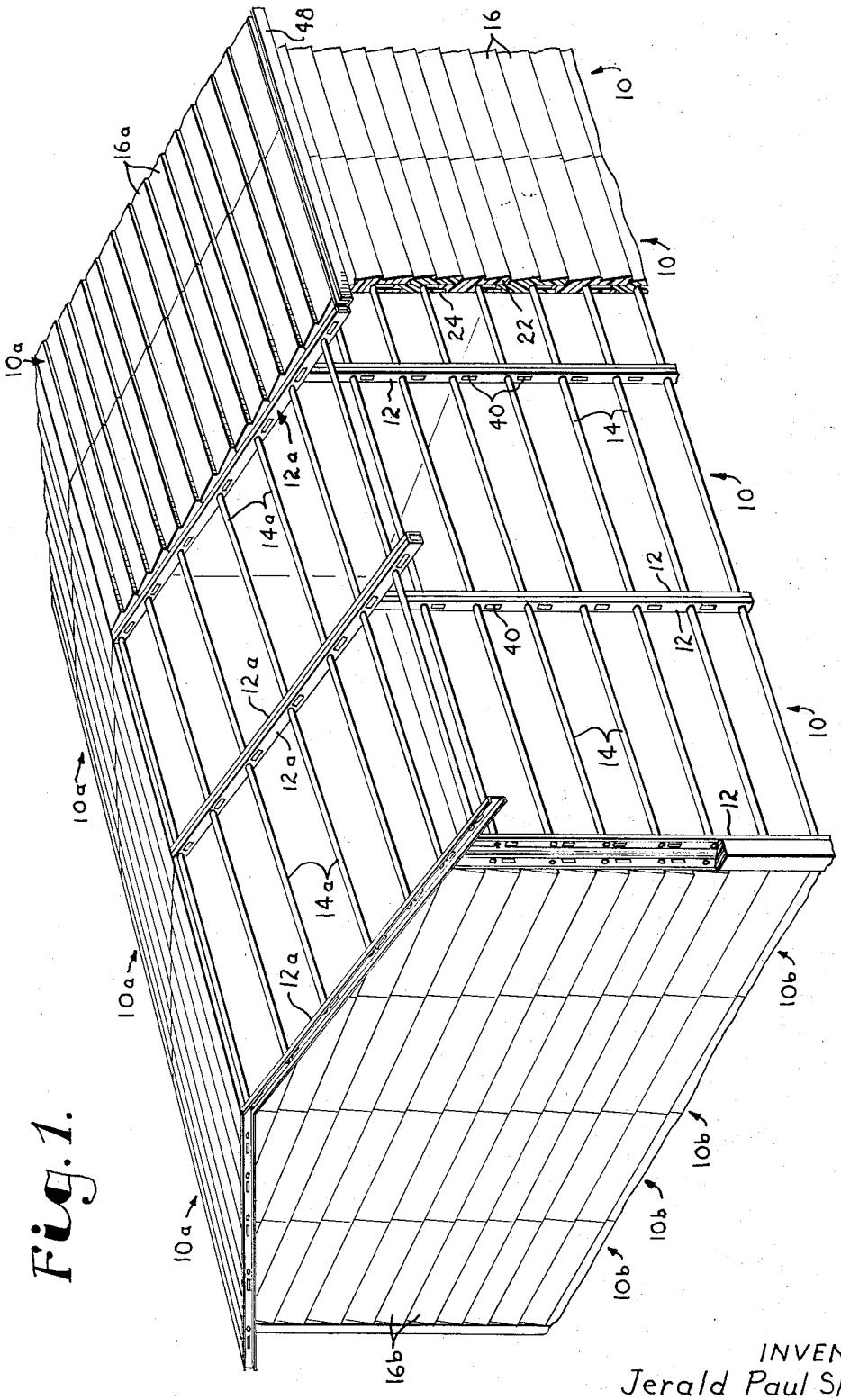

Fig. 1.

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Fig. 1.

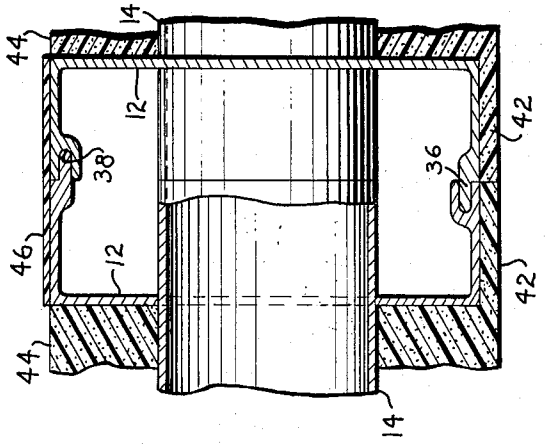
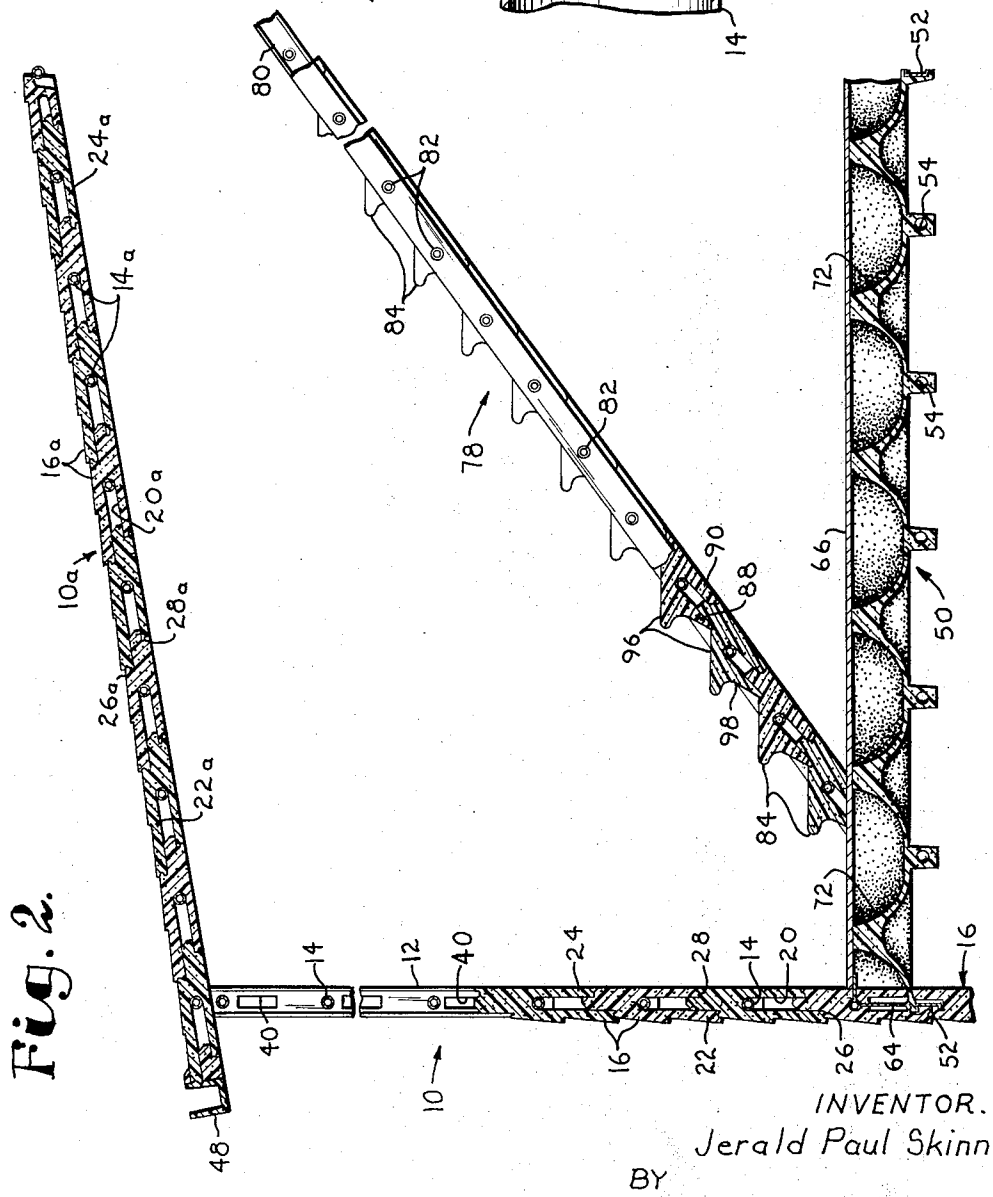


Fig. 2.



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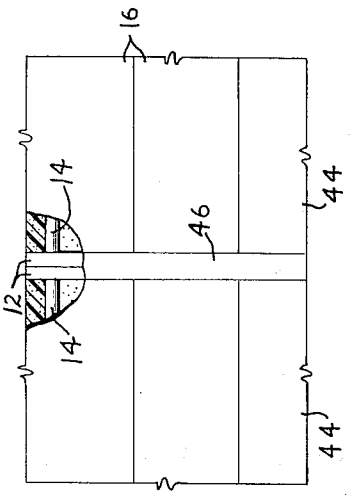
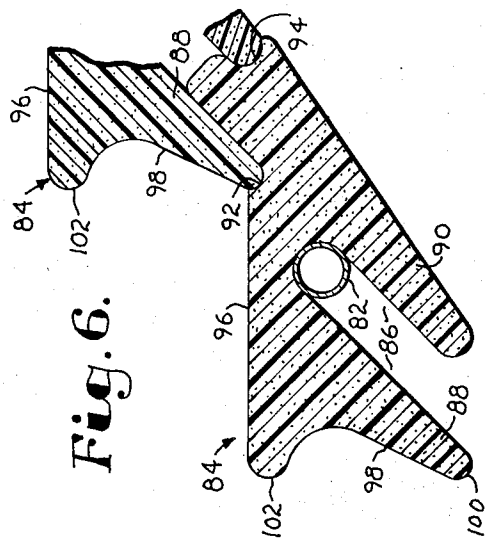


Fig. 4.



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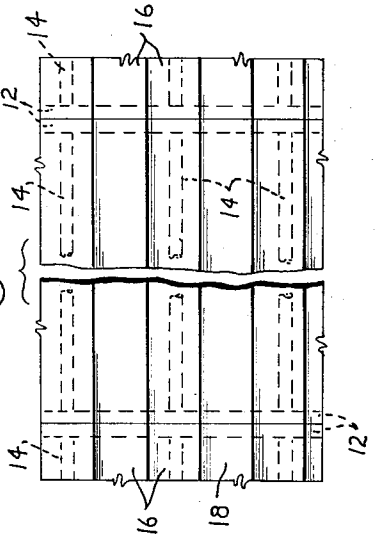

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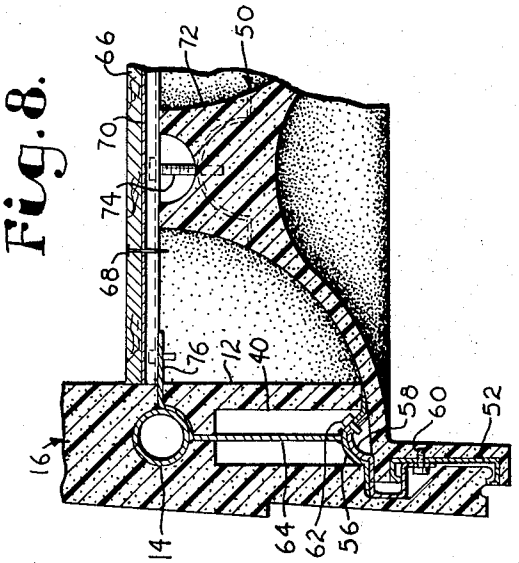

Fig. 8.

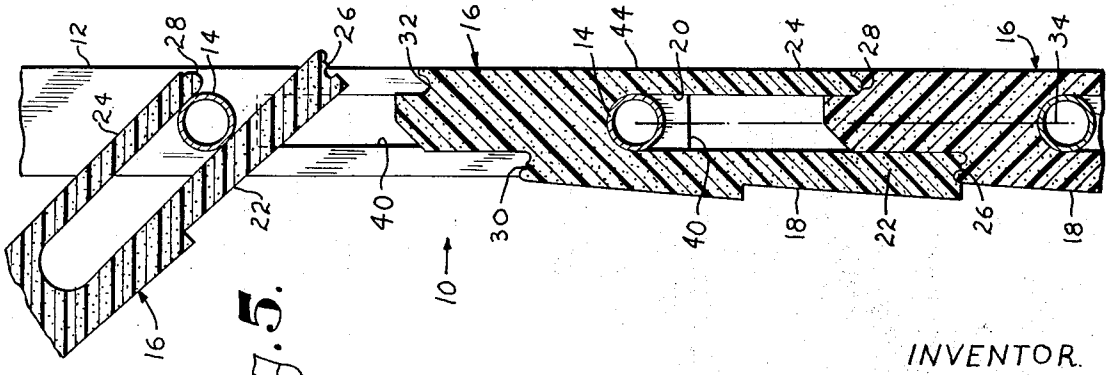

Fig. 5.

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INTERLOCKING STRUCTURAL UNITS

This invention relates to wall and roof systems and a stairway construction for homes, buildings and other structures, wherein interlocking structural units supported on a frame are employed as the basic components of a structural assembly.

In my copending applications for U.S. Letters Pat., Ser. No. 861,009, filed Sept. 25, 1969, and Ser. No. 73,345, filed Sept. 18, 1970, foundation and ceiling systems are disclosed that greatly reduce the time required for the construction of homes and buildings through the provision of a monolithic structural member of unique design which is capable of itself serving as a foundation and which provides mechanical chases to facilitate the emplacement of plumbing and electrical runs. Particularly in the construction of foundations, the weight and bulk of material to be transported to the site, the number of construction personnel and the skills required, and the construction time are materially reduced as compared with conventional foundation construction where excavation is necessary, along with the usual setting of forms or the driving of piles. As will be appreciated hereinafter, it is the broad objective of the present invention to provide wall and roof systems compatible with the concepts disclosed in the aforesaid applications and useful as well with conventional foundations and ceilings. A further broad objective is to provide a simple yet versatile structural assembly which may form a panel of such a wall or roof system, or be employed as an interior or exterior stairway in order to materially reduce the time consumed in the construction of any multi-level structure caused by the inherent necessity of providing stairways for either normal traffic or fire safety.

In present day construction of frame homes, for example, at least eight separate steps are involved in constructing the walls of the house, not to mention the time consumed in installing any necessary mechanical or electrical runs. First of all, the framing is erected, and plywood boxing is then nailed on the exterior directly to the studs. An asphalt impregnated paper or felt is then applied to the boxing, and the siding is nailed in place to complete the exterior construction. On the interior, however, it is still necessary to install insulation between the studs and to put up dry wall or sheet rock or other interior wall material, followed by taping and sanding. Finally, the desired interior finish is applied to the prepared wall surface. This involves a total of eight steps as mentioned above, and there is no provision in the wall for mechanical or electrical runs without drilling through studs. Severe limitations are placed on the installation of plumbing runs in the wall due to the insulation requirements of most climates.

A similar situation exists with respect to roof construction. In this instance the applicatioon of roofing, sheathing, insulation and dry wall is involved, plus the usual finishing of the interior ceiling. Besides the great amount of labor required, workers from a number of different construction trades must be employed in order to cover the various skills needed in wall and roof construction of this type.

It is, therefore, an important object of this invention to provide wall and roof systems which may be erected in a significantly less number of steps than set forth above, and which provide mechanical raceways which are built into the systems.

As a corollary to the foregoing object, it is an important aim of this invention to provide systems as aforesaid in which only two steps are required for erection of a wall or roof, that of emplacing prefabricated framing and then installing interlocking structural units on the framing, wherein such units are in the form of a series of panel sections which interlock one with the other as they are successively installed on the framing.

It is another important object of this invention to provide a structural assembly for use in forming walls and roofs and constructing stairways, wherein such assembly employs a series of structural units which are successively installed on a frame and, upon installation, interlock with previously installed units to lock the series of units together in a rigid assembly.

A further and important object of this invention is to provide such a structural assembly which is lightweight and may be easily transported in preassembled form to a construction site, and which may thereafter be rapidly erected by relatively unskilled labor.

Still another important object of this invention is to provide an assembly as aforesaid in which the structural units thereof may be configured as desired for either structural or aesthetic purposes to provide an exterior and interior appearance in the case of walls and roofs, and to provide treads and risers in the case of stairways.

Yet another important object of this invention is to provide an assembly as aforesaid in which each of the structural units comprises a monolithic body of high structural strength particularly in compression, so that the interlocked structural units augment the load supporting capability of the frame.

Furthermore, it is an important object of this invention to provide an assembly as aforesaid in which the structural units have superior insulating properties in order to provide a wall construction that does not require additional insulation either to prevent heat loss through the wall or to protect plumbing runs emplaced therein.

Additionally, it is a specific object of this invention to provide structural units as aforesaid which are composed of a structurally strong, rigid, synthetic resin foam material such as polyurethane, and which may be molded as monolithic bodies and provided with shapes and surface finishes depending upon the particular application and as may be desired from the standpoint of the appearance of the finished structure.

In the drawings:

FIG. 1 is a perspective view showing a portion of a simple structure, such as a house or shed, constructed utilizing the wall and roof panels of the present invention, certain of the interlocking panel sections being removed or broken away to reveal details of construction;

FIG. 2 is a fragmentary, vertical sectional view through an exemplary multi-story home or building showing wall and roof panels and the stairway construction of the present invention;

FIG. 3 is a fragmentary, elevational view of the exterior of the wall shown in FIG. 2, illustrating the joints at the abutting wall panels;

FIG. 4 is a fragmentary, elevational view of the interior of the wall shown in FIG. 2, illustrating a joint between two abutting wall panels, parts being broken away and revealed in section to show details of construction;

FIG. 5 is an enlarged, side elevational view of the frame of one of the wall panels showing the panel sections being installed thereon, the upright channel of the frame closest to the viewer being removed for clarity;

FIG. 6 is a diagrammatic end view of one of the structural units and a portion of another of the structural units of the stairway shown in FIG. 2;

FIG. 7 is a greatly enlarged, cross-sectional view taken in a horizontal plane through the wall of FIG. 2, and showing the joint formed at two abutting wall panels; and

FIG. 8 is an enlarged, detailed view of the joint formed between the upright wall panels and the ceiling member in FIG. 2.

WALL AND ROOF PANELS

Referring initially to FIG. 1, a portion of a simple structure is shown to illustrate the manner in which walls and roofs are constructed utilizing the panels of the present invention. The side wall of the structure nearest the viewer is formed by a number of side-by-side wall panels **10**, three such panels **10** and a portion of a fourth panel **10** being visible. Similarly, roof panels **10a** may be seen above corresponding wall panels **10**, the roof panels **10a** extending from the near edge of the roof line to the ridge. The opposite slope of the roof is constructed in similar fashion, as is the side wall opposite the wall formed by the panels **10**. The end wall of the structure visible in FIG. 1 is formed by four panels **10b** arranged in side-by-side, abutting relationship in the same manner as the panels **10** forming the illustrated side wall.

All of the panels **10**, **10a** and **10b** are of identical construction except for necessary dimensional differences and variations, such as in the length of the panel. The panel configuration may be appreciated from a comparison of FIGS. 1 and 2, the latter Figure showing one of the wall panels **10** and the roof panel **10***a* thereabove. Each panel **10** comprises a frame that consists of a pair of spaced, parallel support components **12** spanned by a series of regularly spaced, parallel frame members **14**. In FIG. 1, it may be seen that the frame (components **12** and members **14**) resemble a ladder with the members **14** being the rungs of such ladder. The frame is preferably of aluminum construction, extruded aluminum channels being employed for the support components **12**. A channel having a width of 4 in. is suitable for average home or small building construction, in which case the cross members **14** would be aluminum pipe 2 in. in diameter welded at their ends to the supporting channels. The spacing of the channels may be from 6 to 12 ft. as desired, with the pipe members **14** being on 16 in. centers.

The panel **10** is completed by a series of structural units **16** which are installed on the members **14** of the frame. Each of the units **16** is a molded monolithic body of structurally strong, rigid, synthetic resin foam material. The preferred material is polyurethane foam having a free rise core density of approximately 4–8 lbs. per cubic foot, and a skin density of up to 60 lbs. per cubic foot. This provides a molded body having a low density core for minimum weight, combined with an integral skin of high density for increased surface strength. The polyurethane body, though light in weight, is particularly strong in compression and thus is capable of augmenting the load bearing function of the frame.

The units **16** are configured to provide interlocking panel sections as may be especially appreciated from FIG. 5. In both FIG. 2 and FIG. 5, the support component or channel **12** closest to the viewer is removed for clarity, revealing the cross members **14** and the opposite support component **12**. The units **16** are elongated and extend along the members **14** to completely fill the space between the parallel components **12**, thereby forming a solid panel as is evident in FIG. 1. The outer surface **18** of each unit **16** is configured to provide a desired exterior appearance. In this instance, the surfaces **18** present the appearance of conventional siding or roofing.

FIGS. 2 and 5, however, reveal the units **16** as seen from one end thereof, and clearly show that each unit **16** is provided with a longitudinal slot **20** which receives the associated member **14**. The effect of the slot **20** is to provide the unit **16** with a pair of fingers **22** and **24** which, in the wall panel **10**, depend from opposite sides of the member **14**. It should be noted that all of the members **14** of the panel **10** are supported in a common plane by the components **12**, such plane being vertically disposed as would normally be the case with a wall construction. Thus, the fingers **22** and **24** of each of the units **16** project transversely of the unit **16** in substantial parallelism with such plane, and terminate in offset ends **26** and **28** in interlocking engagement with the adjacent unit **16** as will now be discussed.

In FIG. 5 the uppermost unit **16** visible therein is shown during installation thereof on the frame, while the units **16** therebelow are shown in their installed positions. It may be seen that the upper edge portion of each unit **16** is provided with a pair of recesses **30** and **32** which receive the ends **26** and **28** respectively of the fingers **20** and **22** of the next unit **16** thereabove. Accordingly, the units **16** are successively installed on the members **14** from bottom to top, with each unit **16** interlocking with the next unit therebelow as it is set in position on the associated member **14**.

The offset ends **26** and **28** are of particular significance in that they enable a positive lock to be formed. In this respect, the axis of alignment **34** of the members **14** passes centrally through such members and also through the slots **20** in the units **16**. The offset of the ends **26** and **28**, however, is such that an imaginary plane through such ends forms an angle of approximately 45° with the axis **34**. Once two of the units **16** are in place neither can be rotated about its supporting member **14**, and once the entire series of units is in place, it is impossible to remove any unit **16** since the series is locked together in a rigid assembly. It should be understood that the uppermost unit **16** is positively held by an overlying roof panel **10a** or by a ceiling joint, as will become clear hereinafter.

The manner in which the panels **10** are joined in side-by-side relationship is best illustrated in FIGS. 3, 4 and 7. As may be seen in FIG. 7, the abutting support components or channels **12** of adjacent panels **10** are provided with mating parts which interlock the abutting channels. These mating parts comprise an outwardly projecting, longitudinally extending tongue **36** on one flange of each channel **12**, and a longitudinally extending groove **38** formed within the opposite flange of the channel **12**. The channels open outwardly, thus the tongues **36** and grooves **38** of the abutting channels **12** mate as illustrated in FIG. 7 to both interlock the channels and form a box member which provides a mechan-

ical raceway. The frames 12–14 of the panels 10 are all of identical construction and are simply alternately reversed to interfit as shown in FIG. 7.

Primary mechanical raceways are provided by the tubular cross members 14 of the panel frames and the slots 20 in the units 16. Particularly in FIG. 7, it may be seen that the members 14 extend through the walls of the channels 12 a distance equal to the length of the channel flanges, the members 14 being brought into alignment when the frames are arranged side-by-side. With the ends of adjacent members 14 being in abutting engagement, it may be appreciated that continuous horizontal raceways are provided by the members 14 along the entire wall area, through which electrical wiring may be fed, for example.

Referring particularly to FIG. 5, it may be seen that each support component or channel 12 has a number of rectangular openings 40 therein which are aligned with the slots 20 in the units 16, the openings 40 and slots 20 being located in the common plane of the members 14. In employing aluminum extrusions for the channels 12, the openings 40 are provided by press stamping the extrusions to form knockouts that may be readily removed as desired, leaving the openings 40. Accordingly, it may be appreciated that horizontal raceways are also provided through the entire wall area by the aligned openings 40 and slots 20 of the side-by-side panels 10, these raceways being of sufficient size to handle plumbing if desired. In this regard, it should be noted that polyurethane has superior insulating properties and that a significant layer of the polyurethane foam amterial is present on both sides of the slots 20, thereby providing adequate insulation to prevent the freezing of water in pipes even in severe climates.

As mentioned hereinabove, the exterior surface 18 of each of the structural units 16 is molded with the desired exterior appearance. Furthermore, again with reference to FIG. 7, the units 16 are provided with laterally extending lips 42 at their exterior end edges which overlap the flanges of the channels 12 so that the channels are completely hidden from view. Accordingly, the side-by-side panels 10 have the appearance depicted in FIG. 1 without adding trim to the exterior of the structure.

On the interior of the wall, the units 16 abut the channels 12 and have interior surfaces 44 flush with the surfaces of the channel flanges. A trim strip 46 is placed on the exposed flange area and would be aesthetically keyed to the interior wall finish. In this regard, the interior surfaces 44 of the units 16 are molded to the desired interior wall surface configuration and, together with the exterior surfaces 18, are preferably molded with the finish applied so that painting or other decorating is not required.

The roof panels 10*a* are constructed in the same manner as the wall panels 10, and thus will not be discussed in detail herein. Corresponding parts are designated by the same reference numerals with the addition of the "*a*" notation. One feature of the roof system is the employment of a polyurethane roof end cap 48 which combines facia, soffit, and gutter in one structural element. In order to assure that water leakage through the roof will not occur, it may be desired in some instances to coat the ends 26*a* and 28*a* of the fingers 22*a* and 24*a* with a suitable solvent so that, as the units 16*a* are installed in interlocking relationship, a bond will be formed at the zones of interengagement.

FIG. 2 depicts an exemplary multi-story structure and illustrates the manner in which the upper and lower ends of the panel frames are joined with an intervening ceiling. The ceiling system illustrated is formed from monolithic structural members of the type illustrated in my aforesaid copending application, Ser. No. 73,345. One of such members is designated 50 and is composed of a synthetic resin foam material such as polyurethane, reinforced at its peripheral edges by channels 52. Although incidental to the present invention, the member 50 is crossed by a number of oval aluminum tubes 54 welded to the channels 52 to provide structural reinforcement as well as additional mechanical raceways.

Referring to FIG. 8, a horizontal foot 56 in the form of an extruded aluminum strip spans the channels 12 of an individual panel frame at the bottom thereof and is welded in place. A second extruded strip 58 is bolted to channel 52 at 60 and extends in a hook shape around the upper edge of the channel 52 and over the edge of the member 50 into underlying engagement with the footing strip 56, the latter being bolted thereto at 62. A leg 64 depends from the lowermost member 14 and is welded to such member and to the footing strip 56; the leg 64 may conveniently comprise the knockout stamping removed from opening 40. A number of such legs 64 depend from member 14 and are spaced longitudinally therealong between the channels 12 of the panel frame. In FIGS. 2 and 8 it may be seen that the lowermost structural unit 16 of the wall panel of the upper story and the uppermost unit 16 of the wall panel of the lower story are suitably configured to interfit with the ceiling member 50. This also serves as a final lock on the series of units 16 of each wall panel of the lower story, since the uppermost unit 16 is recessed to receive the edge of the member 50 thereby preventing its removal.

The plywood subfloor of the upper story is shown at 66 and is secured by screws or screw nails 68 to underlying extruded aluminum strips 70 spanning the upstanding support elements 72 of the member 50 and secured thereon by bolts 74. The ends of the strips 70 are supported by brackets 76 welded to member 14 and spaced therealong at the same invervals as the spacing between the strips 70. As will be appreciated from my aforesaid copending application, Ser. No. 73,345, the upstanding support elements 72 of the ceiling member 50 are spaced at regular intervals over the entire floor area.

STAIRWAY CONSTRUCTION

A stairway 78 is illustrated in FIGS. 2 and 6 and is constructed according to the teachings of the present invention. A frame comprises a pair of parallel, inclined support components 80 similar to the components 12 of the wall panels 10, and a series of regularly spaced, parallel members 82 spanning the components 80 like rungs on a ladder. The frame 80–82 thus formed may be considered essentially identical to the wall panel frames, except for the spacing of the components 80 and the members 82 peculiar to stairway construction.

A series of structural units 84 are carried by the series of frame members 82 and comprise monolithic bodies of synthetic resin foam material, such as polyurethane. Preferably, each of the stair units 84 is an integral skin polyurethane foam having a variable density as discussed above with respect to the units 16.

One of the stair units **84** is shown in detail in FIG. **6**, together with a portion of the next adjacent unit **84** thereabove. It may be appreciated that the configuration of the stair unit **84** is similar to the panel unit **16**, in that a longitudinal slot **86** is provided which receives the associated member **82**, the stair unit **84** extending along the member **82** between the side support components **80**. Fingers **88** and **90** of unequal length are formed by the slot **86**, the ends of such fingers being received within mating recesses **92** and **94** in an upwardly extending portion of the adjacent lower unit **84**. Each unit **84** is of identical configuration and is molded in a shape providing a tread **96** and a riser **98**.

It should be noted that the base **100** of the riser **98** (such base also forming the end of the longer finger **88**) is in vertical alignment with the nose **102** of the tread **96**, and that the riser surface **98** is canted inwardly beneath the tread **96** at an angle of approximately **20°** with the vertical. This cant reduces scuffing and, since the nose **102** of the tread **96** projects outwardly over the riser **98** to a point no further than vertical alignment with the base **100**, the likelihood that one might accidentally trip while climbing the stairway is materially reduced.

As in the wall and roof panel construction, the off-set ends of the fingers **88** and **90** of the stair units **84** provide positive interlocking of the units as they are installed on the frame members **82**. An imaginary plane spanning the ends of the fingers **88** and **90** of an individual stair unit **84** forms an angle of approximately 45° with the axis of the stairway. As was discussed hereinabove with respect to the wall and roof panel construction, this degree of offset provides maximum interlocking action.

ERECTION OF THE SYSTEMS

The wall units **16** and the roof units **16*a*** are installed on their frames from the bottom up, i.e., the lowermost unit is first installed, followed by successive installation of the remaining units of the series. The same is true for the units **16*b*** of the wall panels **10*b***, attention being directed to the constructional variation in these panels **10*b*** caused by the sloping roof line with which such panels merge. The panel units of the present invention are installed or loaded from the longer units to shorter units, thus the sloping roof line does not interfere with installation of the units **16*b*** after erection of the supporting frames. It should be understood, however, that the upright support components of these frames would be of different lengths to accommodate the sloping roof, thereby requiring that certain of the upper cross members be either cantilever supported on the longer upright or braced as appropriate to cross members therebeneath. In instances where roof configurations necessitate that panel units be successively longer from bottom to top, reverse panel units (not shown) may be employed to permit loading in a downward direction. Reverse units are similar in configuration to the standard units disclosed herein except that the longitudinal slots therein face in an upward direction and the locking fingers project upwardly in order to permit the reverse loading.

In some instances, as illustrated in FIG. **8** and described above, completion of the interlocking of a series of units is accomplished by locking the uppermost unit to an overlying ceiling member. In other cases, since the structure is built from the ground up, such final locking will occur when the roof is installed, as is the case with the uppermost story shown fragmentarily in FIG. **2**. Specially configured panel units to be used in the uppermost position of the series would be provided in order to accommodate the overlying roof.

Various conventional means of attachment may be employed at wall corner joints and where the upper ends of channels **12** engage the sloping channels **12*a*** of the roof panels. The frames of adjacent wall or roof panels may be secured together with metal clips (not shown) embracing the abutting, interlocked channels **12** or **12*a***.

Although windows and doorways are not illustrated herein, these may be readily installed by cutting away the cross members **14** at the desired location of the opening. A metal jamb or casing may then be installed, and such would preferably employ upright side members apertured to meet and align with the free ends of the members **14** defining the door or window opening. Thus, once in place, the casing or jamb becomes a part of the wall panel framework.

With respect to the stairway **76**, the manner of erection thereof is similar to the wall and roof panels in that the stair units **84** are successively loaded in the stair frame from the bottom up. It should be understood that the stair units would be molded with the desired finish on the treads **96** and the risers **98** so that finishing of the exposed surfaces is not necessary. Accordingly, the stairway **78** offers the same feature of prefinished surfaces as was discussed hereinabove with respect to the wall and roof panels. Railings or other ornamentation may be secured to the components **80** at the sides of the stairs as may be desired for safety or appearance.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. A building structure comprising:

a frame having a series of spaced, generally parallel members; and

a series of structural units, each of which has a pair of fingers and a slot between said fingers receiving a corresponding member for support of the unit thereby as the units are successively installed on the members,

each unit in its installed position on the corresponding member being in interlocking engagement with an installed unit on an adjacent member to lock the series of units together in a rigid assembly,

the fingers of one unit of each pair of adjacent units extending into said interlocking engagement with the other unit of the pair and terminating in offset ends engaging the other unit.

2. The building structure as claimed in claim **1**, wherein said frame supports said members in a common plane, and wherein the slots in the units are disposed substantially in said plane.

3. The building structure as claimed in claim **2**, wherein the fingers of said one unit of each pair of units are of unequal length, presenting said offset ends engaging the other unit.

4. The building structure as claimed in claim **3**, wherein an imaginary line through said ends of the fingers of each unit forms an angle of approximately 45° with the axis of alignment of said members in said plane.

5. The building structure as claimed in claim **1**, wherein each of said units comprises an elongated, monolithic body provided with said slot therein and

presenting said pair of fingers extending longitudinally thereof, said fingers projecting transversely of the body beyond the member received therebetween.

6. The building structure as claimed in claim 5, wherein said bodies are composed of a structurally strong, rigid, synthetic resin foam material.

7. The building structure as claimed in claim 1, wherein said frame further has a pair of spaced support components extending generally orthogonally of said members, the latter spanning said components and being supported thereby in a common plane, and wherein each of said units is elongated and extends along the corresponding member between said components.

8. The building structure as claimed in claim 7, wherein said components extend upwardly and are disposed in upright planes to position said members in a horizontal attitude, said frame and said units presenting a structural panel and each of said units comprising a monolithic, compressive load-bearing body.

9. The building structure as claimed in claim 7, wherein said frame and units present a structural panel, and wherein is provided a plurality of said panels in side-by-side relationship with said components in parallelism and with the components of adjacent panels abutting each other, there being mating parts on said abutting components interlocking the same.

10. The building structure as claimed in claim 7, wherein said frame and units present a structural panel, and wherein is provided a plurality of said panels in side-by-side relationship with said components in parallelism and with the components of adjacent panels abutting each other, said members being tubular and the members of adjacent panels being in alignment and communicating through the abutting components, whereby to provide mechanical raceways in the panels.

11. The building structure as claimed in claim 7, wherein said frame and units present a structural panel, and wherein is provided a plurality of said panels in side-by-side relationship with said components in parallelism and with the components of adjacent panels abutting each other, said components being of elongated, transversely channel shaped configuration, each pair of said abutting components being disposed to present a box member defining a mechanical raceway.

12. The building structure as claimed in claim 7, wherein each of said units comprises a monolithic body provided with said slot therein and presenting said pair of fingers extending longitudinally thereof, said fingers projecting transversely of the body substantially parallel with said plane and beyond the member received therebetween.

13. The building structure as claimed in claim 12, wherein said frame and said units present a structural panel, and wherein said components have openings therein aligned with said slots to provide mechanical raceways through the panel.

14. The building structure as claimed in claim 7, wherein said frame and said units present a structural panel, and wherein each of said units comprises a monolithic panel section of structurally strong, insulating material having opposed surfaces presenting a desired exterior and interior appearance.

15. The building structure as claimed in claim 7, wherein said components are inclined and disposed with said members extending horizontally therebetween, and wherein each of said units is horizontally disposed and presents a tread and a riser to provide a stairway.

16. The building structure as claimed in claim 15, wherein the riser of each unit is canted with respect to the vertical from its base inwardly beneath the tread, said tread having a nose projecting outwardly over the riser to a point no further than vertical alignment with the base thereof.

17. The building structure as claimed in claim 15, wherein each of said units comprises a monolithic body provided with said slot therein and presenting said pair of fingers extending longitudinally thereof, said fingers of each unit above the lowermost unit projecting downwardly substantially in the direction of inclination of said components and into said interlocking engagement with the adjacent unit therebelow.

18. A structural assembly comprising:

a frame having a pair of spaced, inclined support components and a series of spaced, generally parallel members extending horizontally between said components and supported thereby; and

a series of elongated structural units, each of which is provided with finger structure and has a longitudinal slot in the unit receiving a corresponding member for support thereby as the units are successively installed on the members,

each of said units extending longitudinally along the corresponding member between said components in continuous engagement with the member received within said slot in the unit,

the finger structure of each unit projecting transversely thereof, and the end portion of the finger structure of one unit of each pair of adjacent units being in engagement with the other unit of the pair,

each of said units engaged by the finger structure of an adjacent unit being provided with means interlocking the unit with the engaging end portion of the finger structure to lock the series of units together in a rigid assembly,

each of said units being horizontally disposed and presenting a tread and a riser to provide a stairway, the tread of each unit overlying the member received within the slot in the unit,

each unit above the lowermost unit having a base portion presenting the finger structure thereof engaging the next unit therebeneath adjacent the tread of the next unit.

19. The assembly as claimed in claim 18, wherein each of said units comprises a monolithic body provided with said slot therein and presenting said finger structure, said slot being continuous throughout the length of the body.

20. The assembly as claimed in claim 19, wherein said bodies of the units are composed of a rigid, synthetic resin material characterized by the property of being of relatively low density but strong in compression, and wherein each of said members is rigidly secured at its ends to said components.

21. The assembly as claimed in claim 18, wherein said finger structure of each unit comprises a pair of spaced fingers.

22. A structurally strong, lightweight stairway assembly comprising:

a frame having a pair of spaced, inclined support components and a series of spaced, generally parallel members spanning said components and supported thereby in a common plane,

each of said members being rigidly secured at its ends to said components; and

a series of elongated stair units, each having a monolithic body composed of a rigid, synthetic resin material characterized by the property of being of relatively low density but strong in compression, and provided with a longitudinal slot therein continuous throughout the length of the unit and receiving a corresponding member for support thereby as the units are successively installed on the members,

each of said units extending longitudinally along the corresponding member between said components in continuous engagement with the member received within said slot in the unit,

each of said units being horizontally disposed and presenting a tread and a riser with said tread overlying the member received within the slot in the unit,

each of said units above the lowermost unit having a base portion engaging the next unit therebeneath adjacent the tread of the next unit and throughout its length to provide a continuous stairway of successive, uninterrupted risers and treads.

23. A building structure comprising:

a frame having a series of spaced, generally parallel members; and

a series of structural units, each of which has a pair of fingers and a slot between said fingers receiving a corresponding member for support of the unit thereby as the units are successively installed on the members,

each unit in its installed position on the corresponding member being in interlocking engagement with an installed unit on an adjacent member to lock the series of units together in a rigid assembly,

the fingers of one unit of each pair of adjacent units extending into said interlocking engagement with the other unit of the pair,

each unit including an elongated, monolithic body composed of a structurally strong, rigid, synthetic resin foam material provided with said slot therein and presenting said pair of fingers extending longitudinally thereof, said fingers projecting transversely of the body beyond the member received therebetween.

24. A building structure comprising:

a frame having a series of spaced, generally parallel members; and

a series of structural units, each of which is provided with finger structure and has a slot in the unit receiving a corresponding member for support thereby as the units are successively installed on the members,

each unit in its installed position on the corresponding member being in interlocking engagement with an installed unit on an adjacent member to lock the series of units together in a rigid assembly,

the finger structure of one unit of each pair of adjacent units extending into said interlocking engagement with the other unit of the pair,

said frame further having a pair of spaced support components extending generally orthogonally of said members, the latter spanning said components and being supported thereby in a common plane,

each of said units being elongated and extending along the corresponding member between said components whereby said frame and units present a structural panel, there being a plurality of said panels in side-by-side relationship with said components in parallelism and with the components of adjacent panels abutting each other, and mating parts on said abutting components interlocking the same.

25. A building structure comprising:

a frame having a series of spaced, generally parallel members; and

a series of structural units, each of which is provided with finger structure and has a slot in the unit receiving a corresponding member for support thereby as the units are successively installed on the members,

each unit in its installed position on the corresponding member being in interlocking engagement with an installed unit on an adjacent member to lock the series of units together in a rigid assembly,

the finger structure of one unit of each pair of adjacent units extending into said interlocking engagement with the other unit of the pair,

said frame further having a pair of spaced support components extending generally orthogonally of said members, the latter spanning said components and being supported thereby in a common plane,

each of said units being elongated and extending along the corresponding member being said components whereby said frame and units present a structural panel,

there being a plurality of said panels in side-by-side relationship with said components in parallelism and with the components of adjacent panels abutting each other,

said members being tubular and the members of adjacent panels being in alignment and communicating through the abutting components, whereby to provide mechanical raceways in the panels.

26. A building structure comprising:

a frame having a series of spaced, generally parallel members; and

a series of structural units, each of which is provided with finger structure and has a slot in the unit receiving a corresponding member for support thereby as the units are successively installed on the members,

each unit in its installed position on the corresponding member being in interlocking engagement with an installed unit on an adjacent member to lock the series of units together in a rigid assembly,

the finger structure of one unit of each pair of adjacent units extending into said interlocking engagement with the other unit of the pair,

said frame further having a pair of spaced support components extending generally orthogonally of said members, the latter spanning said components and being supported therein in a common plane,

each of said units being elongated and extending along the corresponding member between said components whereby said frame and units present a structural panel,

there being a plurality of said panels in side-by-side relationship with said components in parallelism and with the components of adjacent panels abutting each other,

said components being of elongated, transversely channel shaped configuration and each pair of said

abutting components being disposed to present a box member defining a mechanical raceway.

27. A building structure comprising:

a frame having a series of spaced, generally parallel members; and

a series of structural units, each of which has a pair of fingers and a slot in the unit receiving a corresponding member for support thereby as the units are successively installed on the members,

each unit in its installed position on the corresponding member being in interlocking engagement with an installed unit on an adjacent member to lock the series of units together in a rigid assembly,

the fingers of one unit of each pair of adjacent units extending into said interlocking engagement with the other unit of the pair,

said frame further having a pair of spaced, inclined support components extending generally orthogonally of said members, the latter extending horizontally between said components and being supported thereby in a common plane,

each of said units being elongated and extending along the corresponding member between said components, each of said units being horizontally disposed and presenting a tread and a riser to provide a stairway.

28. The building structure as claimed in claim **27**, whrein the riser of each unit is canted with respect to the vertical from its base inwardly beneath the tread, said tread having a nose projecting outwardly over the riser to a point no further than vertical alignment with the base thereof.

29. The building structure as claimed in claim **27**, wherein each of said units comprises a monolithic body provided with said slot therein and presenting said pair of fingers extending longitudinally thereof, said slot in each unit being disposed between the fingers thereof, said fingers of each unit above the lowermost unit projecting downwardly substantially in the directioon of inclination of said components and into said interlocking engagement with the adjacent unit therebelow.

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