Dec. 12, 1961 J. PAVLECKA 3,012,639

PANEL STRUCTURE

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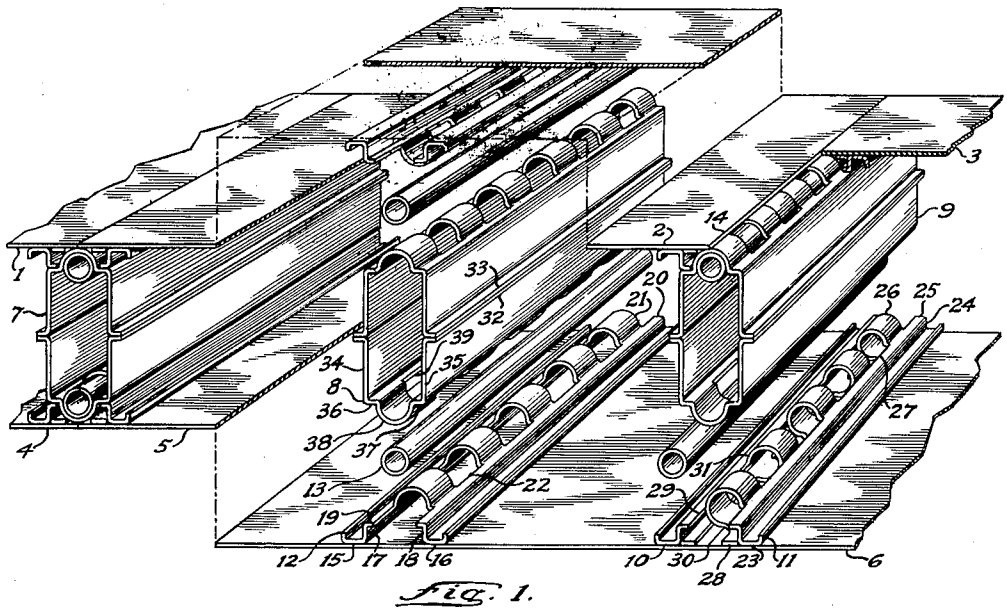


Fig. 1.

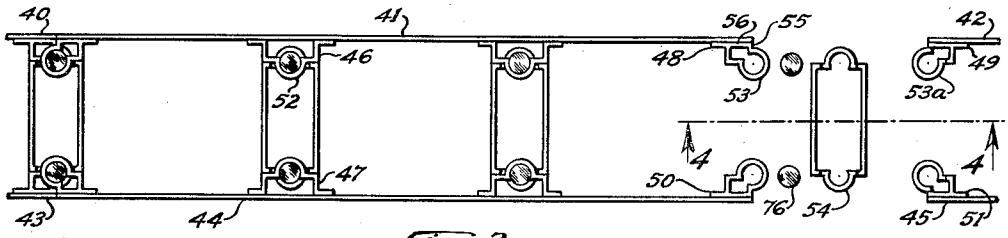


Fig. 2.

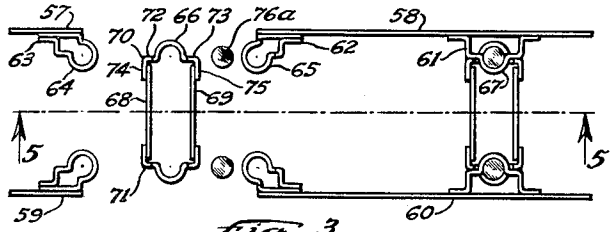


Fig. 3.

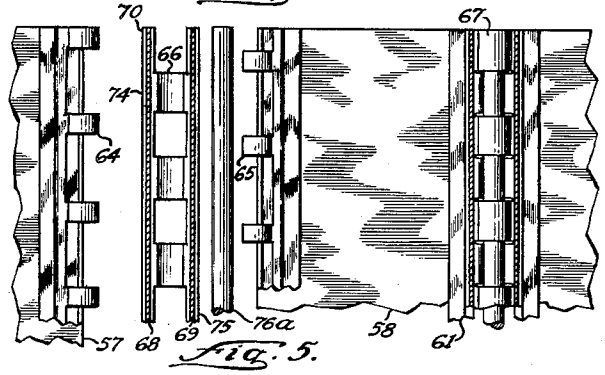


Fig. 5.

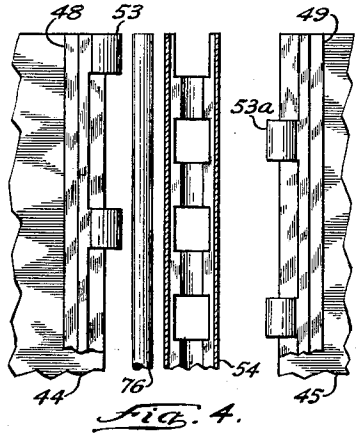


Fig. 4.

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PANEL STRUCTURE

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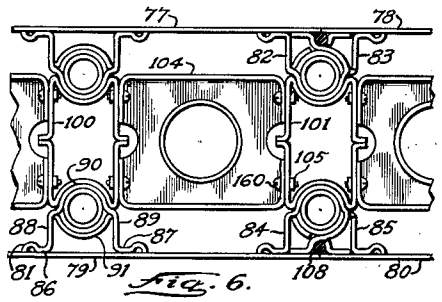


Fig. 6.

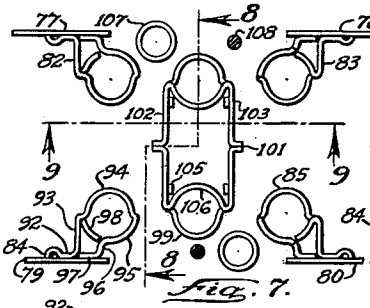


Fig. 7.

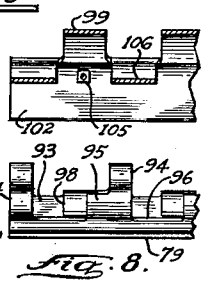


Fig. 8.

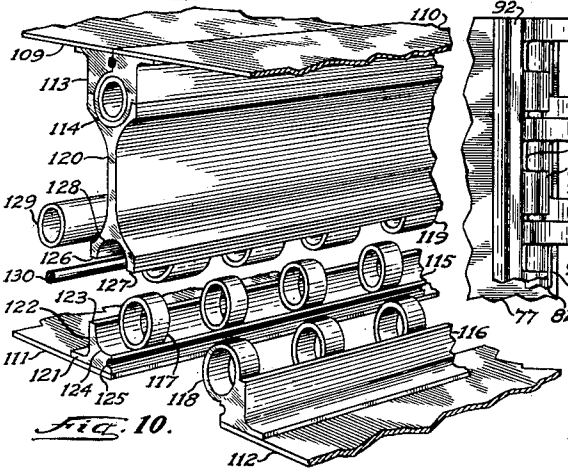


Fig. 10.

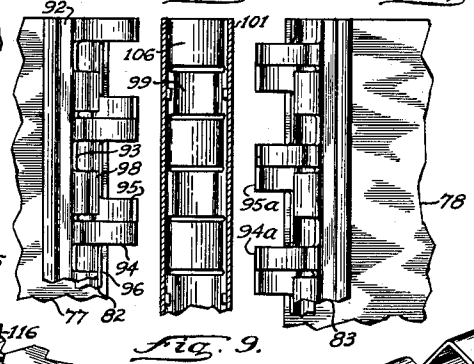


Fig. 9.

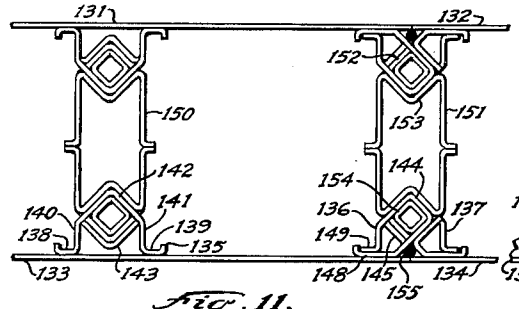


Fig. 11.

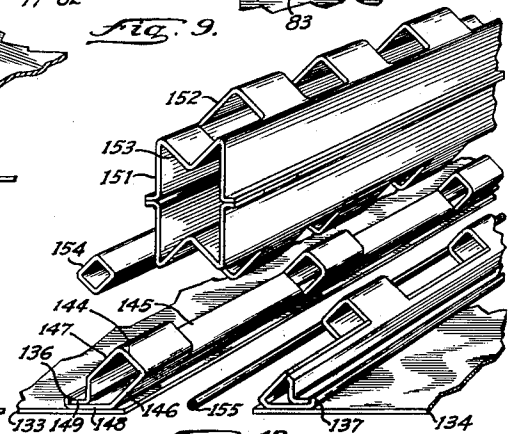


Fig. 12.

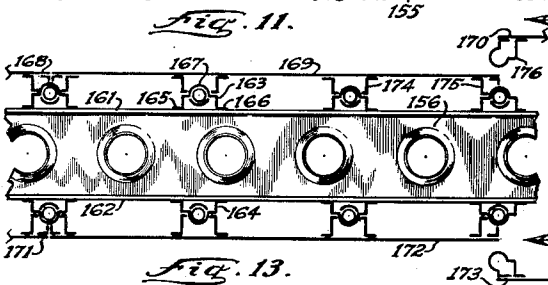


Fig. 13.

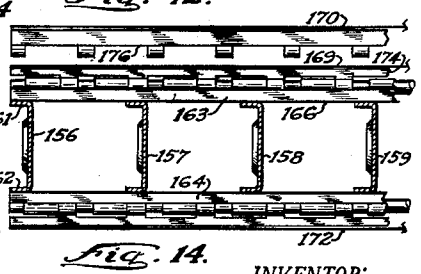


Fig. 14.

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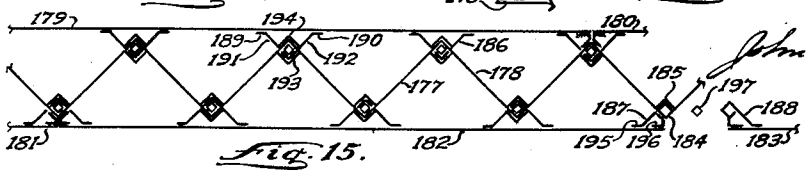


Fig. 15.

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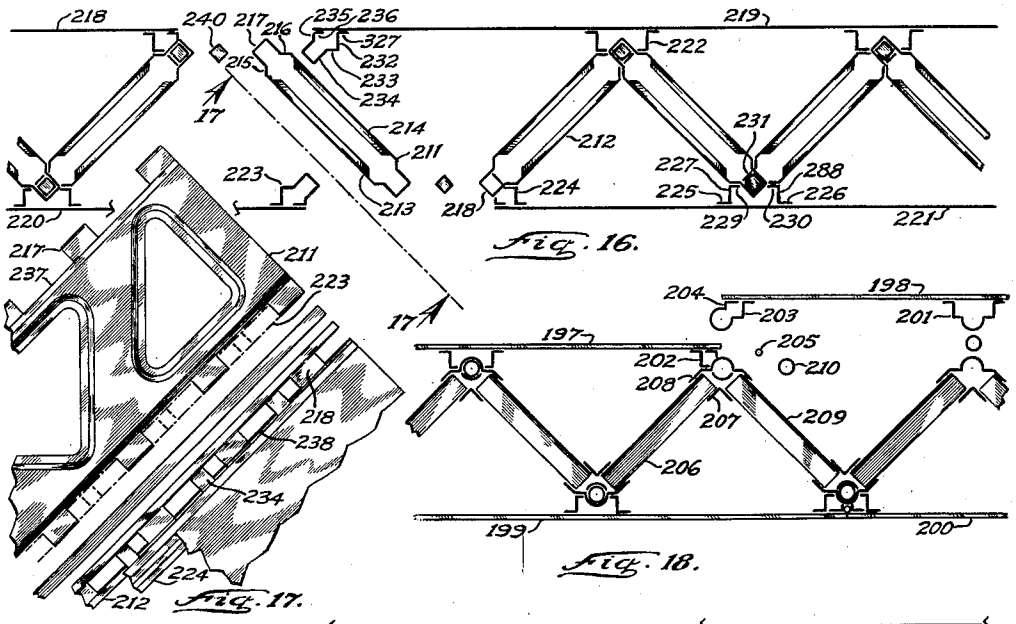


Fig. 16.

Fig. 17.

Fig. 18.

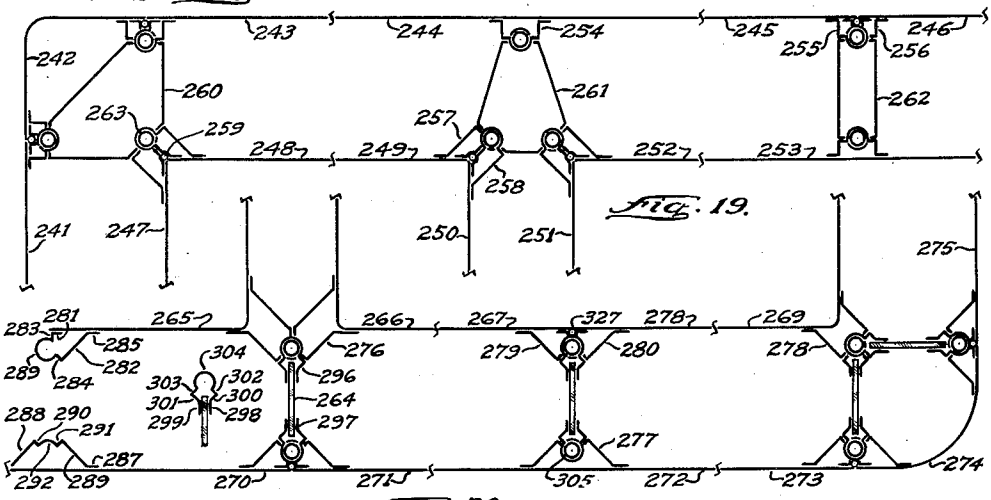


Fig. 19.

Fig. 20.

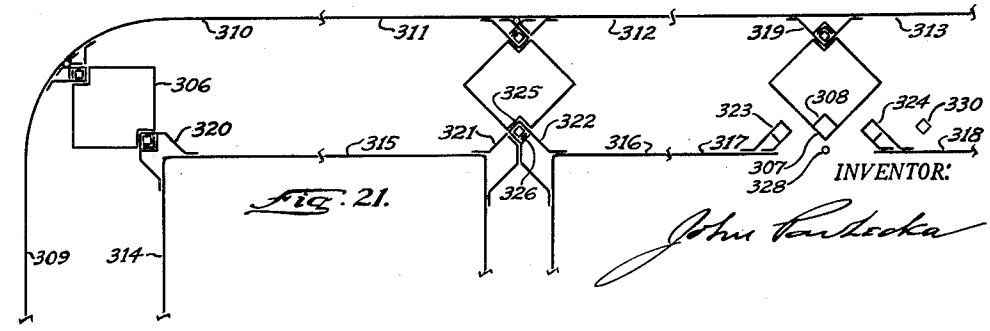


Fig. 21.

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United States Patent Office 3,012,639 Patented Dec. 12, 1961

3,012,639

PANEL STRUCTURE

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Filed Jan. 12, 1951, Ser. No. 205,787
27 Claims. (Cl. 189—34)

This invention relates to structures such as walls, floors, decks, partitions, etc., and more particularly to a novel type of such a structure consisting of facing rows of panels and interjacent stress members, the panels being conjoined with one another as well as with the stress members by means of stringers and interlocking keys.

The subject matter of this patent is related to that of my pending application for Panel Structure, Serial No. 265,316, filed January 7, 1952, and to that of the following of my pending applications for Interlocked Panel Structure: Serial No. 32,509, filed May 26, 1960; Serial No. 301,010, filed July 26, 1952; Serial No. 318,692, filed November 4, 1952; Serial No. 324,903, filed December 9, 1952; Serial No. 326,391, filed December 17, 1952; Serial No. 328,039, filed December 26, 1952; Serial No. 632,601, filed January 4, 1957.

One object of this invention is a structure of the above class that can be fabricated as a number of duplicate individual components with full accessibility and then assembled, or subsequently disassembled, in a facile manner requiring a minimum amount of labor and tools.

Another object is to provide, in a structure having by its nature an inaccessible interior, a smooth and flush exterior with a complete absence of any visible fastening means, and in which the usual attaching parts such as rivets, screws, bolts, nails, etc., can be eliminated from the interior as well and more effective joining processes, such as spot or projection welding and adhesive bonding, employed to the fullest extent.

Yet another object resides in devising a panel structure which is producible by simple processing of a variety of either metallic or non-metallic sheets or plates and extruded or rolled shapes, and in which the widest sheets or plates available can be used and the number of parting lines thus reduced to a minimum.

Another object is to provide sealing means for parting lines between adjacent panels and to retain it by a compressive grip of stringers provided on the panels at each parting line in juxtaposition to each other and locked jointly and immovably by a linear key in opposition to a stress member thereat.

A further object is a structure in which facing rows of panels are supported or braced by interjacent principal stress members such as beams, studs, etc., the panels being conjoined separably with one another as well as with the stress members by means of auxiliary stress members in the form of stringers provided on the panels both along their parting lines and intermediate thereof, the stringers as well as the principal stress members having instrumentalities thereon for holding slidably onto linear keys interposed between them, and having confronting faces for blocking them relatively immovably with each other so that they function jointly as unitary stress members.

The overall object of my invention includes the provision of panels united edge-to-edge and drawn towards each other firmly yet separably by means of stringers attached to them in juxtaposition to each other and interlocked by a linear key; the provision of two panels united at a parting line with each other as well as with a number, i.e., one or more, of stress members relatively immovably yet separably by means of stringers and linear keys; the provision of two spaced panels united with stress members between their facing sides by means of stringers provided on the panels intermediate their edges and by means of linear keys, and rendering such a union relatively immovable and free of play and thereby cause the

stringers to coact with the stress members as unitary stress members, preferably of the box type; and the provision of panels meeting at parting lines in facing rows, the parting lines in both rows being selectively or indiscriminately related so that they fall into either coinciding or non-coinciding relationships with one another, or into both such relationships; such panel rows follow a straight, curved or angular direction and are united into a tightly cohesive yet demountable assembly with interior members of any shape, inclination or direction with respect to the panels as well as to one another, by means of linear keys and stringers, the latter having holding, positioning and blocking or constraining means dependent in their function upon the former.

A panel structure fabricated and assembled according to the above stated precepts comprises at least two, and usually a number of facing panels meeting edge-to-edge in two rows, and interjacent the two rows of panels includes principal stress members or structural members which may be of any shape or configuration to suit any particular kind of loading or purpose; in a wall, for instance, they are studs designed for compressive loads, in a floor or deck they are beams or girders designed for bending loads. The union between the panels in each row as well as between the panels and the stress members is effected by means of linear keys telescoped inbetween them, and by providing both the panels and the stress members with means for obtaining a slidable hold on these keys.

To this end, each panel is provided with a plurality of stringers a number, i.e., one or more, of which extends at intervals between its edges, and this type is hereinafter referred to as intermediate stringers; at and along its lateral edges each panel is provided with stringers of a type hereinafter referred to as edge stringers; both types are based on the panels and with them form complete subassemblies or panel units. In a longitudinally opposed alinement with each two edge stringers in juxtaposition at panel parting lines, and with each intermediate stringer, apart therefrom extends at least one stress member, and interposed between this stress member or members and the stringers is a linear key, such as a rod or tube. The stringers, both the intermediate and the edge types, are the carriers for the panels of means for obtaining a slidable hold on or engagement with these linear keys, the stress members being provided with like means on their profile extremities opposing the stringers; by means of this holding or engaging means and through the medium of the linear keys not only are panels in facing rows integrated into unity with the stress members but the panels in each row with one another as well.

The holding or engaging means on the stringers and on the stress members can be of any type that fulfills that function; the type shown in all embodiments in the drawings consists of a longitudinal outwardly arched portion in the stringer profile interrupted at intervals by blanked out portions which give rise to a series of archways separated by clearance spaces. In the intermediate stringers, the clearance spaces are longer and wider by a nominal amount than the archways, but in the edge stringers the length of the archways and of the clearance spaces is proportioned so that when two panels and their stringers meet at a parting line, the edge stringer archways become interfitted and alined lengthwise in a congruent manner in the clearance spaces intervening between them and jointly constitute a full equivalent of one intermediate stringer. The stress members are also provided on their profile extremities with alternate archways and clearance spaces, which archways may be either an integral part of the stress member body, or they may be borne by caps or stringers similar to those on the panels and forming portions of the stress members.

In the assembled relationship, the stress member archways falls into an opposed longitudinal alinement with the panel intermediate stringer archways and with the combined edge stringer archways, and the archways on the stress members and on the stringers are so spaced and staggered lengthwise that they interfit complementally through the clearance spaces therein into an axial alinement with one another and form a sheath; a linear key is telescoped endwise into each sheath, thereby interlocking the panels in each row with one another as well as the panels in both spaced rows with the stress members.

In order to obtain a definitely located and held relationship between the panels and the stress members in the in-and-out direction and, moreover, to eliminate and prevent rocking motion between them to the extent of securing a tightly abutted and pre-loaded contact between them, my new structure is characterized in all of its embodiments by certain features productive of these results; they include the provision of opposed faces on the panel edge stringers and intermediate stringers as well as on the stress members, which faces are drawn into a confronting and preferably firmly abutted relationship in the presence of the linear keys, thereby blocking or constraining the stringers, the panels and the stress members relatively immovably; these blocking faces may be of either one or of both of the following two types: First, in the form of confronting and abutted shoulders alongside the stringer and the stress member archways and clearance spaces or, they may be in the form of depressed archways or walls, preferably V-shaped, inbetween the stringer and the stress member protruding archways.

Both the intermediate and the juxtaposed edge stringers, besides serving as carriers of the key-engaging means and of the abutting or constraining means for the panels, are primarily auxiliary stress members and in their abutted and immovably constrained relationship with the principal stress members complement them so that together they function as unitary stress members between the faces of the panel rows.

The above disclosed principles of providing abutted and relatively immovable key-locked unions of panels in spaced apart rows, both with one another at their parting lines and with interjacent structural members, by means of stringers of two equivalent types, are applicable to a large variety of wall structures certain representative ones of which will now be described with reference to the drawings forming an integral part of this specification.

In the drawings,

FIG. 1 represents a perspective view of a panel structure, such as a wall or a floor, the components of which are shown in part in an exploded, sectional and disassembled relationship in order to expose their characteristic features to view.

FIG. 2 is an end view of a panel structure with its members at the right hand end shown in a disassembled relationship.

FIG. 3 is another end view of a panel structure with its members at the left end shown disconnected.

FIG. 4 is a view of a portion of the structure of FIG. 2 taken in the plane and direction **4—4** therein.

FIG. 5 is a view of a portion of the structure of FIG. 3 taken in the plane and direction **5—5** therein.

FIG. 6 is an end view of a portion of a panel structure employing depressed archways as the positioning means for its members and transverse bulkheads between its stress members for stability.

FIG. 7 is an end view of the panel edge stringers and of one stress member pertaining to the structure of FIG. 6.

FIG. 8 is a cross-section through a part of the stress member of FIG. 7 taken in a plane indicated by **8—8** therein, and showing also a side view of one of the edge stringers therein.

FIG. 9 is a view taken in the plane and direction **9—9** in FIG. 7 and shows the interfitting instrumentalities of the stress member and of the edge stringers therein.

FIG. 10 is a perspective view of a structure similar to that of FIG. 6, with the lower panels shown disassembled, comprising parts of extruded origin instead of sheet material.

FIG. 11 is an end view of a portion of a panel structure analogous to that of FIG. 6 but depending upon V-shaped interfitting instrumentalities for lateral stability.

FIG. 12 is a perspective view of certain of the components of the structure of FIG. 11 shown in a disassembled relationship.

FIG. 13 is an end view of a panel structure in which the stress members extend transversely to their own interfitting instrumentaliites borne by stringers as well as to panel stringers, the top and bottom panels at the right hand side being shown disconnected.

FIG. 14 is a side view of the structure of FIG. 13 taken in the direction **14—14** therein.

FIG. 15 is an end elevation of a panel structure in which diagonally disposed stress members, shown diagrammatically by single lines, form a one-piece truss.

FIG. 16 is an end view of a panel structure with individual diagonal stress members, the panels being disconnected at a parting line to show clearly the profile of the component members.

FIG. 17 is a view taken in the direction indicated by **17—17** in FIG. 16, and shows two stress members, one in side view and the other in edge view, and the relationship between their and the associated stringers' interfitting instrumentalities.

FIG. 18 is an end view of another panel structure with diagonal stress members which are conjoined by cap members into a single truss.

FIGS. 19, 20 and 21 are plan views of three wall structures employing studs and stringers of diverse configurations, the studs of FIG. 19 being of three different box shapes, those of FIG. 20 being all alike and of single web type, and those of FIG. 21 being of rectangular tubular type, all alike.

The panel structure of FIG. 1, in a manner typical of all the other embodiments shown in the above figures, consists of two spaced facing rows of panels, top row **1—2—3** and bottom row **4—5—6**, both rows providing a continuous surface on the opposite sides of the structure which may be extended laterally as well as lengthwise by merely duplicating and lengthening the panels and the components associated with them in the interior; these components include stress members **7, 8** and **9**, panel edge stringers in juxtaposition such as **10—11**, panel intermediate stringers such as **12**, and linear keys **13**. Both the intermediate stringers **12** and the combined edge stringers **10—11** bear instrumentalties for conjoining and immovably blocking each two adjoining panels in a row as well as for conjoining and blocking both rows of panels with the stress members **7** to **9** by linear keys **13**.

The panels **1** to **6** may be sheets, plates, slabs, or boards of any material, formed with straight border lines represented in most embodiments by plain square-cut edges, such as edge **14** on panel **2**, so that the panels can meet with one another at parting lines in a flush, smooth and close-fitting manner to present a continuous and even exterior. On its underside each panel is provided with stringers of the aforementioned two kinds, i.e., intermediate stringers **12** and edge stringers **10** and **11**; the intermediate stringers **12** are characterized by a profile including two flanges **15—16** resting based on the panel surface as by spot or projection welding or adhesive bonding, two spaced apart walls **17—18** rising from the flanges and at a distance therefrom supporting two longitudinal shoulders **19—20**, and between them bearing a series of longitudinal archways **21** protruding outwardly and separated by perforated clearance spaces **22** of a length and width somewhat greater than those of the archways.

The edge stringers **10** and **11** are both alike in profile and are attached to their respective meeting panels by a flange **23**, and each stringer has a wall **24** standing on

its flange in a spaced apart relationship to the panel parting line **30**, and at a distance frontally from the flange and laterally from the parting line supporting a shoulder **25**, and alongside this shoulder bearing a series of longitudinal archways or loops **26** separated by clearance spaces or gaps **27** of a length substanitally greater than thier own; the loops overlap the parting line **30** and on their inward side are connected by a longitudinal flange **28** which is based on the panel along the parting line **30**; this stringer profile characterized by a flange-based wall remote from the panel parting line represents not only a stress member useful as such but provides a reinforcement for the panel thereof against flexing at the parting line to which the panel would be subject if the stringer consisted merely of a wall turned up from the panel at the parting line.

The length of the loops **26** is equal to that of the intermediate stringer archways **21**, but the length of the gaps **27**, unlike that of the clearance spaces **22** in the intermediate stringers, is somewhat more than three times the length of the loops **26**. As attached in juxtaposition to their respective panels **5** and **6**, the edge stringers **10** and **11** are paired so that their loops **26** and **31** are staggered lengthwise to interfit and become axially alined when the panels **5** and **6** are abutted edge-to-edge at the parting line **30** by virtue of the stringers being set apart from the parting line and out of contact with each other thereat; in this relationship, the loops **26** of the stringer **11** fit centrally into the gaps **29** of the companion stringer **10** and vice versa, the loops **31** of the stringer **10** assume central locations in the gaps **27** of the stringer **11**, the open clearance space between the loops so interfitted amounting to slightly more than their own length; each two edge stringers so combined, such as **10** and **11**, represent physically as well as functionally a full equivalent of one intermediate stringer, such as **12**.

The stress members **7** to **9** bear instrumentalities on their profile extremities complemental to those on the stringers; their configuration, in this particular embodiment, resides essentially in two caps analogous to the panel stringers such as **12** but with elongated sides and joined base-to-base by flanges **32** and **33**; the resultant box beam comprises spaced walls **34—35**, two shoulders **36—37** on the walls at each profile extremity, and between these shoulders a series of longitudinal protruding archways **38** separated by clearance spaces **39** of slightly greater length than the archways.

In the assembly, the beams **7** to **9** are in a longitudinally opposed alinement with the panel intermediate stringers, such as **12**, and with each two combined edge stringers, such as **10—11**, and are matched with them so that their and the stringer archways are staggered by a distance slightly greater than their own length; in that relationship, the intermediate stringers and the combined edge stringers confront the stress members shoulder-against-shoulder and their archways interfit with one another through the clearance spaces therebetween; linear keys **13** are slid endwise inbetween the archways so interfitted to interlock the panels in each row with one another as well as both panel rows with the stress members.

The panel stringers and the stress members can be tied into a firmly abutted shoulder-against-shoulder contact with one another by forming their archways to interfit—by even a minimal amount—short of their axial alinement; then, by being drawn into an exact alinement around the linear keys in the direction normal to the panels, the archways are subjected to tension and cause the shoulders to abut one another forcibly whereby they function not only as spacing and positioning means but also block the stringers and the stress members against relative motion both frontally with respect to the panels and angularly with respect to the keys, thereby endowing the structure with lateral stability and, moreover, rendering the union highly cohesive against forces tending to separate it. Similarly, each two meeting panels can be drawn into a tight edge-to-edge contact and blocked against rocking or swaying motion at their parting line by causing the key **13** to fit inbetween the edge stringer loops **26—31** with a nominal interference. One result of the relatively immovably blocked and abutted edge stringers and their associated stress member is that by being immobile in relation to the member the stringers become immovably constrained in relation to each other, as are their panels at the parting line; moreover, by virtue of the walls of both the edge stringers and the intermediate stringers, such as walls **17—18**, being spaced apart and meeting the stress member walls, such as **34—35**, astride the keys cohesively and immovably, the stringers coact with the stress members as unitary stress members between the facing panels as well as for each two meeting ones.

The panel structure of FIGS. 2 and 4 employs stringers as well as stress members of extruded origin; two panel rows **40—41—42** and **43—44—45** are provided with intermediate stringers **46** and **47** bearing protruding archways **52**, and along their parting lines with edge stringers **48—49** and **50—51**, respectively, bearing loops **53** and **53*a***; these loops are supported in their respective stringers in spaced relationship to the panel surface by a wall **55** on an attaching base **56**. Similarly as the loops **26—31** of FIG. 1, the loops **53—53*a*** are separated by gaps slightly longer than three times their own length, as shown in FIG. 4, so that in the assembly one edge stringer, such as **48**, occupies with its loops **53** every other clearance space in the associated stress member **54**, while the loops **53*a*** on the companion edge stringer **49** occupy the remaining alternate spaces therein.

The embodiment of FIGS. 3 and 5 is characterized by yet another type of stress member and, moreover, by a different spacing of the edge stringer loops than that shown in FIGS. 1 and 4; in this structure, facing rows of panels **57—58** and **59—60** are provided with intermediate stringers **61** and with juxtaposed edge stringers **62** and **63**, both kinds having a profile substantially the same as those of FIG. 2 but formed of sheet material in this instance. The edge stringer loops **64** and **65** are only one half as long as the intermediate stringer archways **67**, or the stress member archways **66**, and the gaps between them are equal in length to a little over three times their own length; in each juxtaposed pair of edge stringers the loops **64** and **65** are staggered lengthwise so that they interfit into a near axial alinement with one another, and each two loops so interfitted become spaced from the nearest loops in the series by a vacant gap equal in length to the clearance spaces between the intermediate stringer archways **67**, or between the stress member archways **66**, thereby again constituting an equivalent of one intermediate stringer, such as **61**, and being capable jointly of interfitting with one stress member.

The stress members of FIG. 3 are of composite construction, each consisting of two side walls **68—69** and two caps **70** and **71** on its profile extremities; these caps straddle the side walls with attaching flanges **74** and **75**, and on the opposite extremites provide spaced longitudinal shoulders, such as **72—73**, and between them a series of protruding archways **66** with intervening clearance spaces of a width and length somewhat greater than their own. Linear keys, such as **76*a***, are telescoped inbetween all stringer, edge stringer, and stress member interfitted archways and lock these components shoulder-against-shoulder into a relatively immovable and laterally stable relationship whereby they function jointly as a unitary box stress member.

The structure and its components of FIGS. 6 to 8 are notable because of certain novel features additional or alternate to those of the preceding structures, such as depressed archways on the panel stringers and on the stress members as the positioning and abutting means therefor, transverse bulkheads between the stress mem-

bers for lateral stability, and sealing means between edge stringers at panel parting lines. The structure consists of facing rows of panels 77—78 and 79—80 with intermediate stringers 81 and juxtaposed edge stringers 82—83 and 84—85 thereon; the stringers 81 have a profile consisting of two attaching flanges 86—87, lateral walls 88—89 standing on the flanges and bearing a series of protruding longitudinal archways 90 separated by clearance spaces, and in these clearanc spaces supporting depressed archways 91 the concave face of which conforms to the convex shape and size of the archways 90.

The edge stringers 82 to 85 have each a profile including a flange 92 resting on and attached to the appertaining panel in spaced relationship to its edge, a wall 93 standing on this flange and bearing a series of loops overhanging the panel edge, each loop consisting of a protruding archway 94 and a depressed archway 95, the latter archway supported by a wall 96 standing in offset relationship to the panel edge and secured to the panel surface by a flange 97. The archways 94 and 95 differ from each other in two ways, first, the depressed archways 95 are larger in that the radius of their inner concave face is equal to that of the outer convex face on the protruding archways 94, and second, although the archways 95 form a continuation of the archways 94 as complete loops, they also extend laterally from these loops, as seen in FIGS. 8 and 9, and it is this extended portion which corresponds to the depressed archways 91 of the intermediate stringers 81 and which is functionally involved in the assembled structure. Bridging the gap between the walls 93 and 96 is a curved tongue 98, formed as a continuation of the wall 93, which provides a segmental complement to the depressed archways 95.

The spacing of the archways 94 and 94*a* on a pair of companion edge stringers 82 and 83, respectively, as shown in FIG. 9, corresponds to that shown in FIG. 5, the archways being each one half as long as the archways 90 on the intermediate stringers, and the gaps between them being slightly longer than three times their own length, and their relative lengthwise shift being such that when these edge stringers combine at assembly, their archways 94 and 94*a* interfit side-by-side and become distanced from successive pairs by the alined depressed archways 95 and 95*a*, and in that relationship represent a full equivalent of one intermediate stringer, such as 81.

The stress members 100 and 101 are of analogous construction with those of FIG. 1 and include walls 102—103 connected at each extremity by a series of protruding archways 99 and alternate depressed archways 106, the latter being larger than the former by the thickness of the material.

For lateral stability as well as increased load capacity, the stress members in this structure are all tied into a single framework by intervening transverse bulkheads, such as 104, which are held in place by clinch nuts 105 fastened on the stress member walls, and by screws or bolts 160.

In the assembly, the intermediate stringer archways 90 and the combined edge stringer archways 94—94*a* interfit with the stress member archways 99, and the stringer as well as the stress member archways confront and become nested in the respective depressed archways 106, 91, and 95—95*a* therein, thereby becoming fixedly and accurately positioned with respect to one another, and are drawn into an abutted contact between their nested archways when linear keys, such as tubes 107, are telescoped into place.

In order to render a structure like that of FIG. 6 weather-proof, the panel parting lines are sealed by strips 108 one of which is lodged between the stringer walls 96; these walls stand apart from the parting line and compress the strip between them while they hold the panels in edge-to-edge abutment at the parting line by being forced by the key 107 together against the depressed archways 98 of each other.

FIG. 10 represents an embodiment characterized by certain of the features hereinabove disclosed and, furthermore, instead of bulkheads employs confronting shoulders on the stress members and on the panel stringers for lateral stability; all of the components, except the panels, are shown as being of extruded origin which fact may influence the cost and the strength of the structure but not the basic and novel structural features which are the same as in the structures of sheet material hereinabove disclosed.

Panels 109—110 and 111—112 meet edge-to-edge in two facing rows and are provided with edge stringers 113—114 and 115—116, respectively, all alike except for the necessary shift of their loops, such as 117 and 118; these loops are each one half as long as archways 119 on the stress members, such as 120, and are spaced by gaps over three times as long as their own length in conformity with the arrangement shown in FIG. 5. Each stringer has a profile defined by an attaching flange 121, a wall 122 with a shoulder 123 thereon, and between this wall and the panel edge has a concave surface 124 on which are positioned the loops 117 which may be either integral portions of the stringer extrusions or they may be made integral with the surface 124 by bonding or brazing. At and along the panel edge the stringers are formed with an upright wall in which runs longitudinally a groove 125.

The stress member 120 is an I-beam having at each profile extremity two spaced shoulders 126—127, and between them a concave surface 128 and a series of longitudinal protruding archways 119 separated by clearance spaces of somewhat greater length than their own.

In the assembly, the interfitted and alined loops of the edge stringers, such as 113—114, leave gaps next to them so that when confronted shoulder-against-shoulder with the beam 120, the stringer loops interfit with its archways and into them is telescoped a linear key 129. A sealing strip 130 is deposited between the grooved stringer walls.

FIGS. 11 and 12 represent a modified version of the structure of FIGS. 6 to 9 in that instead of relying upon confronting abutted shoulders or transverse bulkheads for stability, the interfitting instrumentalities as well as the interlocking keys are rectanguuar in profile. Two rows of panels 131—132 and 133—134 are provided with intermediate stringers 135 and edge stringers 136—137, the former stringers having a profile including spaced attaching flanges 138—139, lateral walls 140—141, and between them outwardly pointed V-shaped archways 142 alternating with inwardly pointed V-shaped archways 143.

Both edge stringers 136 and 137 have an identical profile including a rectangular body portion longitudinally serrated to give rise to archways 144, the clearance spaces between which are over three times their own length; this spacing conforms to that shown in FIG. 4. The archways 144 are supported in an inclined position over the panel edge by their lateral walls 146—147 which continue down to the panel surface and are attached to it in a recessed relationship from the parting line by flanges 148—149. In the clearance spaces between each two archways 144 on both edge stringers, the sheared off portion 145 of the lateral wall 146 is folded over inwardly into the clearance space to rest on the edge of the opposite wall 147 and serve, at assembly, as one half of a V-shaped abutment face corresponding to the depressed archways 143 in the intermediate stringers. When interfitted, the edge stringers 136—137 jointly provide an equivalent of one intermediate stringer, such as 135, in that their archways 144 are so staggered lengthwise that they leave vacant gaps between them of slightly over their own length and closed off by V-shaped inwardly pointing archways consisting of the combined wall portions 145.

The stress members 150 and 151 are of the type shown

in FIGS. 6 to 8 except that their protruding and depressed archways 152 and 153 are V-shaped; when these archways are interfitted with like archways on the intermediate and on the combined edge stringers, and when interlocked by linear keys 154, the V-shaped protruding archways become wedged in the depressed archways confronting them and thereby function most effectively as spacing, locating, and blocking means and endow the structure with lateral stability and rigidity.

A seal strip 155 is included between the edge stringers at panel parting lines, the stringer lateral walls 146 being set apart from the panel edge to accommodate the strip and exert pressure upon it while holding the panels together relatively immovably at the parting line by being wedged against the depressed archways 153 of the stress member and against the depressed wall 145 of each other.

Another embodiment of marked utility is represented in FIGS. 13 and 14, and is distinguished in that the caps or stringers bearing the stress member holding or interfitting means are attached to and extend crosswise of the stress members instead of being concurrent therewith. The stress members 156 to 159 are disposed in a spaced relationship to one another and, by way of an example, are of a channel profile with an upright web 160 and flanges 161—162; to these flanges are attached at intervals caps or stringers 163 and 164, respectively, all substantially alike and comprising each attaching flanges 165—166, lateral walls supporting shoulders and a series of protruding archways 167 in a manner analogous to the stringers 30 and 31 which make up the stress members in the structure of FIG. 1, or to the panel intermediate stringers 12 in the same structure.

The panels meet edge-to-edge in two rows 168—169—170 and 171—172—173, and are provided with intermediate stringers 174 and juxtaposed edge stringers 175—176, both types of which correspond to like stringers in the structures of FIGS. 1 to 5; these stringers could obviously be replaced by any of the intermediate and edge stringers from the structures of FIGS. 6 to 12 without in any way affecting the axiom that while the panel and the stress member interfitting instrumentalities have to be in opposed longitudinal alinement with one another, the stress members themselves may extend in any direction best suited for their function.

Furthermore, not only may the stress members run in any other direction besides that of their and the panels' holding means, but they may also be disposed otherwise than at right angles to the panels. An example is shown in FIG. 15 wherein a number of stress members, such as 177 and 178, are placed on a bias in converging fashion between two rows of panels 179—180 and 181—182—183 so that they form a continuous truss; each two of the truss members meet at an apex, such as 184, which is serrated longitudinally so that it provides, due to its natural shape, a series of protruding V-shaped archways alternating with clearance spaces occupied by depressed V-shaped archways 185 which are the serrated apex portions pointed inwardly in the manner of the archways 152 and 153 of FIG. 12.

The panels 179 to 183 are provided with intermediate stringers 186 and with edge stringers 187—188; the stringers 186 have each attaching flanges 189—190, lateral walls 191—192 and between them support holding means of the same kind as the truss members 177 and 178, i.e., outwardly pointed archways 193 and inwardly pointed archways 194 alternating therewith, in a manner analogous to the stringers 135 of FIG. 11. The edge stringers 187 and 188 are also substantially the same as the stringers 136 and 137 of FIG. 11.

When interlocked, by linear keys 197, the protruding archways 193 and 184 on the stringers and on the truss, respectively, become nested in the depressed archways 185 and 194 therein with the only difference in that the truss members 177—178 function as individual components while the dual walls, such as 150 of FIG. 11, pertain to one and the same box type member.

In certain embodiments, the diagonal truss may be built up of a number of parts in order to sustain heavier loads than the single web type of FIG. 15; such a truss is represented in FIG. 18, and is a continuous unitary stress member of composite construction intervening between two rows of panels 197—198 and 199—200; these panels are provided with intermediate stringers 201 and with edge stringers 202—203 of the type shown in FIGS. 1 to 6; each edge stringer is formed with a wall 204 recessed from the panel edge so that both stringers form a crevice at the panel parting line for a seal strip 205.

The truss consists of lattices 206 and 209 which fit between an L-shape 207 on the inner side and a cap 208 on the outer side; the stringers 201 and 202—203 confront the truss caps 208 shoulder-against-shoulder so that their archways interfit and thus obtain a hold on linear keys 210 telescoped inbetween them.

The structure of FIGS. 16 and 17 is another diagonal truss type, the truss in this instance consisting of a number of individual stress members, such as 211 and 212, each of which comprises spaced walls 213—214 and two profile extremities each of which has a pair of longitudinal shoulders 215—216 slanted convergently and connected by a series of rectangular archways 217 on the member 211 and 218 on the member 212, separated by clearance spaces 237 and 238, respectively.

There are two rows of panels 218—219 and 220—221 with intermediate stringers 222 and juxtaposed edge stringers 223—224 thereon, the former comprising each attaching flanges 225—226, lateral walls 227—228, shoulders 229—230, and between them a series of protruding archways 231 of V-shaped profile. The edge stringers have a profile including an attaching flange 327, lateral wall 232 with shoulder 233 thereon, and a rectangular portion inclined over the panel edge and longitudinally interrupted to give rise to a series of archways 234 supported at the panel edge by a wall 235 based on a flange 236. The stress member archways 217 and the stringer archways 231 and 234 are complemental to one another and comparable to those disclosed in the foregoing embodiments, with a difference in their spacing engendered by the fact that two individual stress members intersect and interfit with each intermediate stringer and with each two combined edge stringers; a number of various spacing arrangements is feasible for the archways, the one shown in FIG. 17 provides clearance spaces 237 and 238 on the stress members of slightly more than twice the length of the archways 217 and 218 so that each clearance space will accommodate the combined archways of one intermediate stringer and one proximate stress member; the edge stringer archways 234 are one half as long as those on the intermediate stringers so that each two combined edge stringers constitute a full equivalent of one intermediate stringer and are capable of interfitting with the archways of two intersecting stress members in the same manner as the latter. Linear keys 240 thus hold in unity four structural components at each panel parting line and three between the parting lines.

The structural principles above disclosed are further evidenced in FIGS 19 to 21, each of which presents an original embodiment thereof as applied to building walls.

The hollow walls of FIG. 19 are erected of rows of facing panels 241 to 246, 247 to 250, and 251 to 253, meeting at a corner and at an intersection, the panels being provided with intermediate stringers 254, and at each parting line with juxtaposed edge stringers either 255—256 or 257—258; both the intermediate and edge stringers are substantially the same as those of FIG. 18, except in that the edge stringers 257—258 are attached to panels meeting each other in a corner and their side walls are, therefore, slanted so that the stringers interfit

with each other in a plane bisecting the corner. Sealing strips 259 are lodged between all edge stringers.

Studs 260, 261 and 262 are all of box construction of three different sizes and shapes devised for specific use in corners, at intersections, and in straight walls, respectively. The stud 262 has two profile extremities with positioning and key-engaging means thereon, and is analogous to those shown in FIGS. 1, 2 and 3; studs 260 and 261 are both of a basically prismatic shape with the positioning and key-engaging means in the form of two shoulders and protruding archways occuping three apex extremities. Linear keys 263 hold all components in unity.

The walls of FIG. 20, in distinction to those of FIG. 19, employ but one kind of stud 264 in all locations. The panels in rows 265, 266 to 269, and 270—275, are arranged so that their parting lines do not coincide with corners, which arrangement calls for diverse types of intermediate stringers 276, 277 and 278, but only one type of edge stringers 279—280; the latter stringers have a profile made up of attaching flanges 281—285, lateral walls 282—283, a shoulder 284, and a series of protruding archways 289; the wall 283 is recessed from the panel parting line so that each two edge stringers can contain a seal strip 327 between them and exert pressure on it as they and their panels are urged against each other by their wedged engagement with the studs 264, as disclosed herebelow.

The intermediate stringers all conform to the same definition, the difference between them being in the angularity of their profile elements; each profile consists of two attaching flanges such as 287, lateral walls 288—289, shoulders 290—291, and a series of protruding archways 292; while the flanges of stringers such as 277 are coplanar, those of the stringers 276 and 278 are at right angles to each other; the lateral walls of the stringer 277 are inclined while those of the stringers 276 and 278 are parallel, and while the shoulders on the stringer 277 are canted divergently to include an acute angle between them, those on the stringer 276 are slanted to form an obtuse angle, and those on the stringer 278 are coplanar.

The stud 264 is a single-web member with two caps 296 and 297, each cap having a profile including attaching flanges 298—299, side walls 300—301, shoulders 302—303 slanted convergently, and between them a series of longitudinal protruding archways 304. Linear keys 305 lock all the panels and studs into a continuous and rigid wall structure by drawing the studs 264 into a wedged contact with the stringers 277 at their angular shoulders; the same wedging action takes place between the studs and the juxtaposed stringers 279—280 with the result that these stringers and their respective panels are urged against each other and since the stringers are out of contact with each other for most of the distance between the panels and the keys, the panels become abutted with each other edge-to-edge at the parting line 327; such wedged contact exists also between the stud 264 at the cross intersection and the two stringers 276; these stringers reach from the facing panels in the partition wall into opposition with each other and with the stud, and all three are wedged against the shoulders of one another in the presence of the key therein, thereby effecting a rigid juncture of the two hollow walls; at the corner in the peripheral wall, two studs at right angles complement each other at their profile extremities and are wedged shoulder-against-shoulder with each other and with the stringer 278 by their joint engagement with one of the keys.

The wall structure of FIG. 21 employs again but one type of stud 306 throughout, the stud being of square tubular shape for maximum column strength combined with the fact that it offers most advantageous holding means in the form of outwardly pointed archways 307 in two of its corners, and provides positioning and abutting means in the form of inwardly pointed archways 308 alternating with the former archways; both kinds of these archways are analogous to the archways 184 and 185 on the truss members 177—178 of FIG. 15.

Panel rows 309 to 313, 314—315, and 316 to 318, are provided with intermediate stringers 319, 320, and 321, and with edge stringers 323—324, the latter being analogous to the stringers 187—188 of FIG. 15. The intermediate stringer 319 is identical with the stringer 186 of FIG. 15, the stringer 320 is a modification of it in that its lateral walls are bent into a parallel relationship and its flanges are at right angles to each other instead of being coplanar; the stringer 321, and its identical mate 322 are both intermediate stringers but their rectangular interfitting archways 325, their positioning and abutting seats 326, and the longitudinal spacing of the archways are duplicate of those of the edge stringers 136—137 of FIGS. 11 and 12, the essential difference being that the panels 315 and 316 are bent at right angles to face each other as portions of a partition wall branching off from the peripheral one. In a manner analogous to the cross intersection of FIG. 20, the stringers 321 and 322 reach into opposition with each other as well as with one of the studs 306 in the peripheral wall, and all three of them are in a wedged contact at the respective seats 326 and 308 of one another, similarly as in the unions of the other stringer types 319, 320 and 323—324 with the studs 306. The juxtaposed stringers 323—324, drawn together by the key 330, cause their panels 317 and 318 to abut at the parting line as well as compress a sealing strip 328 between their recessed walls.

I claim:

1. In a panel structure, two panels meeting with each other at a straight parting line, at least one stress member in spaced relationship to said panels, a linear key interposed between said panels and said stress member along said parting line, means on each of said panels and means on said stress member holding slidably onto said linear key, and means along said panel and said stress member holding means for aligning, positioning and blocking said panels and said stress member relatively immovably in the presence of said linear key.

2. In a panel structure, two panels meeting with each other at a straight parting line, at least one stress member in spaced relationship to said panels, a linear key interposed between said panels and said stress member along said parting line, means for conjoining said panels separably with each other and with said stress member by said linear key, lateral and frontal blocking means rendering said panels and stress member relatively immovable in the presence of said linear key, means on said stress member bearing said conjoining and said blocking means therefor, and stringers standing in juxtaposition on said panels along said parting line and reaching to said stress member therefrom, said stringers bearing said conjoining and said blocking means for said panels.

3. In a panel structure, two panels meeting with each other at a straight parting line, at least one stress member in spaced relationship to said panels, a cap extending on said stress member, a stringer on each of said panels along said parting line, a linear key interposed between said stress member cap and said panel stringers, said stress member cap having attaching flanges on said stress member and having means between said flanges holding slidably onto said linear key, said stringers each having flange means attached to one of said panels and having walls standing thereon and supporting means holding slidably onto said linear key in conjunction with the other stringer and with said stress member cap holding means, and abutment means on said stress member cap and on said stringers for aligning, positioning and blocking one another relatively immovably in the presence of said linear key.

4. In a panel structure, two panels meeting with each other at a straight parting line, at least one stress member in spaced relationship to said panels, stringers at-

tached to said panels at and along said parting line and having recessed walls thereat, sealing means confined between said stringer walls, said stringers and said stress member having faces thereon confronting one another, a linear key interposed between said stringers and said stress member beyond said sealing means, means on said stringers and means on said stress member holding slidably onto said linear key for becoming locked into an abutted relationship at said confronting faces thereof and for exerting pressure on said sealing means between said stringer walls.

5. In a structure, two panels meeting with each other at a straight parting line, a structural member extending along said parting line at a distance from said panels, stringers extending on said panels at and along said parting line in juxtaposition to each other and in opposition to said structural member, a linear key interposed between said stringers and structural member, said stringers and said structural member having alternate lengthwise portions in a congruent slidable engagement with said key, and faces on said structural member and faces on said stringers along said key in confronting positions of one another, said stringer faces and structural member faces being drawn into abutment with one another by said stringer and structural member key-engagement portions in engagement with said key for blocking said stringers and panels thereof relatively immovably with respect to said structural member.

6. In a structure, components and their relationships as set forth in claim 5, said structural member having two spaced apart walls extending astride said key and bearing said key-engagement portions and abutment faces thereof, and said stringers having each at least one wall standing on the panel thereof and bearing said key-engagement portions and abutment faces thereof, said wall of each stringer meeting one of said structural member walls astride said key whereby said stringers coact with said structural member as a unitary box stress member in said relatively immovably blocked relationship thereof.

7. In a structure, components and their relationships as set forth in claim 5, said structural member bearing two shoulders thereon astride said key-engagement portions thereof, and said stringers bearing each a shoulder in opposition to one of said structural member shoulders, said shoulders in opposition providing said confronting faces on said structural member and stringers drawn into abutment with each other.

8. In a structure, components and their relationships as set forth in claim 7, said two shoulders on said structural member being canted convergently at an angle to each other, said shoulder on each of said stringers being at a divergent angle from the shoulder on the other stringer, and said structural member being drawn into a wedged abutment of said shoulders thereof with said stringer divergent shoulders.

9. In a structure, components and their relationships as set forth in claim 5, said structural member and said stringers bearing walls conforming to the exterior of said key-engagement portions of one another, said walls and said key-engagement portions providing said confronting faces of said structural member and stringers drawn into abutment with each other.

10. In a structure, components and their relationships as set forth in claim 9, said structural member key-engagement portions having two substantially flat outwardly convergent sides, said stringer key-engagement portions having three substantially flat sides outwardly and laterally convergent with each other, said structural member bearing inwardly convergent walls conforming to two outwardly convergent sides of each stringer, and said stringers bearing each a wall inwardly of said key-engagement portions thereof and conforming to one laterally convergent side of each other as well as to one of said outwardly convergent sides on said structural member key-engagement portions.

11. In a structure, a panel, two structural members extending along one side of said panel and having profile extremities converging towards each other and meeting at a distance from said panel side, a stringer based on said panel side and therefrom reaching to said structural member extremities, and a linear key interposed between said stringer and structural members, said structural member extremities and said stringer having portions in joint and congruent slidable engagement with said key, said stringer bearing two shoulders frontally thereon astride said key engagement means, each of said structural member extremities bearing two shoulders astride said key-engagement means at an included angle smaller than between said stringer shoulders, said extremities of both members being in opposition with each other at two of said shoulders thereof and complementing each other angularly between the other shoulders thereof and being jointly in opposition to said stringer shoulders therewith, said structural members and said stringer being drawn by said key-engagement portions thereof in engagement with said key into abutment with one another at said shoulders in opposition thereof.

12. In a panel structure, spaced panels facing one another, a number of stress members between said panels, linear keys interposed between said panels and said stress members, means extending on said panels and means carried on said stress members for holding slidably onto said linear keys, and confronting faces along said panel key-holding means and faces along said stress member key-holding means for positioning and immobilizing themselves with respect to one another, said faces along said panel and stress member key-holding means being drawn into contact with one another in the presence of said linear keys.

13. In a structure, components and their relationships as set forth in claim 12, two of said faces being carried on said stress members along each of said keys, said faces being slanted convergently, and two of said faces being carried on each of said panel means in confronting positions with said stress member faces, said stress members being drawn into a wedged abutment with said panel means at said confronting faces thereof whereby said stress members and panel means coact as a unitary stress member.

14. In a structure, components and their relationships as set forth in claim 12, bulkheads intervening transversely between said stress members and being secured thereto, said stress members and bulkheads forming a unitary framework for supporting and positioning said panels relatively immovably.

15. In a structure, two panels in a spaced apart facing relationship of each other forming parts of a hollow wall, a structural member forming a part of a wall transverse to said hollow wall and extending at said hollow wall in a spaced apart relationship to said panels, stringers extending one on each of said panels and therefrom reaching into opposition with each other and with said structural member, and a linear key interposed between said stringers and said structural member, said stringers and said structural member having portions in joint and congruent slidable engagement with said key, said stringers and said structural member bearing faces in confronting positions of each other along said key-engagement means thereof, said stringers and said structural member being drawn by said key-engagement portions thereof into abutment with one another at said confronting faces thereof in the presence of said key in said engagement portions.

16. A panel structure including, a number of panels meeting at straight parting lines in two spaced facing rows, stress members between said panel rows, linear keys interposed between said panels and said stress members at and along said parting lines and at intervals therebetween,

juxtaposed means on said panels at said parting lines and intermediate means at intervals therebetween and means on said stress members for conjoining said panels separably with one another and with said stress members by said linear keys, said panel juxtaposed and intermediate conjoining means being each in an opposed longitudinal alinement with one of said stress member conjoining means, and confronting faces along said panel and stress member conjoining means for positioning and spacing one another and said panels, said juxtaposed conjoining means on said panels and said faces therealong being equivalent to said intermediate conjoining means and faces for random occurrence of said panel parting lines in relation to said stress members, said panels and said stress members being constrained in contact with one another at said confronting faces along said key-conjoining means thereof in the presence of said keys therein for relative immobility with one another.

17. In a structure, components and their relationships as set forth in claim 16, each of said panel intermediate key-conjoining means having two shoulders therealong, each two of said panel juxtaposed key-conjoining means having two shoulders therealong, and said stress members having two shoulders thereon in opposition to said panel means shoulders, said shoulders in opposition providing said confronting faces for said stress members and panel means drawn into contact with each other.

18. In a structure, components and their relationships as set forth in claim 16, said intermediate key-conjoining means of said panels and said key conjoining means of said stress members bearing walls conforming to the exterior of each other, said juxtaposed key-conjoining of each two panels and said key-conjoining means of said stress members bearing walls conforming to the exterior of each other, said conforming walls and exterior of said key-conjoining means providing said confronting faces for said stress members and panel means drawn into contact with each other.

19. In a structure, components and their relationships as set forth in claim 18, said key conjoining means on said stress members and said key-conjoining means of said intermediate and juxtaposed types on said panels having substantially flat and convergent sides on said exterior thereof and on said walls conforming thereto, said stress members and said panel means being wedged one into another at said exterior sides and walls of one another by being drawn into said contact thereat.

20. A panel structure including, a number of panels meeting at straight parting lines in two spaced facing rows, a number of stress members between said panel rows, caps extending on said stress members in spaced relation to and in alinement with said parting lines and at intervals therebetween, stringers standing on said panels intermediate said parting lines in opposed longitudinal alinement with said stress member caps thereat, juxtaposed edge stringers standing on said panels at said parting lines in opposed longitudinal alinement with said stress member caps thereat, and linear keys interposed between said stringers and said stress member caps, said panel intermediate and edge stringers and said stress member caps having means thereon holding slidably onto said linear keys for uniting said panels with one another and with said stress members and having confronting faces along said key-holding means thereof, said intermediate stringers and said juxtaposed edge stringers being drawn into contact with said stress member caps at said confronting faces thereof by said key-holding means thereof in the presence of said keys therein for relative immobility with respect to said caps and for relative immobility of said edge stringers and panels at said parting lines.

21. A panel structure including, a number of panels meeting at straight parting lines in two spaced facing rows, a number of stress members between said panel rows, said stress members being disposed crosswise of said panel parting lines, stringers extending on said stress members in spaced relation to and in alinement with said parting lines and at intervals therebetween, stringers standing on said panels intermediate said parting lines in opposed longitudinal alinement with said stress member stringers thereat, juxtaposed edge stringers standing on said panels at said parting lines in opposed longitudinal alinement with said stress member stringers thereat, and linear keys interposed between said panel and said stress member stringers, said panel intermediate and edge stringers and said stress member stringers having means thereon holding slidably onto said linear keys for uniting said panels with one another and with said stress members and having confronting faces along said key-holding means thereof, said intermediate stringers and said juxtaposed edge stringers being drawn into contact with said stress member stringers at said confronting faces thereof by said key holding means thereof in the presence of said keys therein for relative immobility with respect to one another and for relative immobility of said edge stringers and panels at said parting lines.

22. A panel structure including, a number of panels meeting at straight parting lines in two spaced facing rows, a number of stress members between said panel rows, said stress members being inclined laterally toward each other to form a truss, each two inclined members in said truss meeting each other in spaced relation to said panels, stringers standing on said panels intermediate said parting lines, juxtaposed edge stringers standing on said panels at said parting lines, linear keys interposed between said panel stringers and said truss members, means extending on said truss members and holding slidably onto said linear keys, and means on said panel intermediate and on said edge stringers holding slidably onto said linear keys in conjunction with said truss member means for uniting said panels with one another and with said truss, said panel stringer and said truss member key-holding means having confronting faces therealong, said intermediate stringers and said juxtaposed edge stringers being drawn into contact with said truss member key-holding means at said confronting faces thereof in the presence of said keys therein for relative immobility with respect to one another and for relative immobility of said edge stringers and panels at said parting lines with respect to each other.

23. In a structure, panels meeting with one another at parting lines in two rows distanced from each other, certain of said parting lines in both rows being coincident with each other and others being non-coincident, stress members disposed between said panel rows distantly therefrom, linear keys interposed between said stress members and said panels at said parting lines and at intervals apart therefrom, means on said stress members carrying lengthwise interrupted portions in slidable engagement with said keys and having abutment faces therealong, intermediate stringers standing on said panels apart from said parting lines and having walls directed toward said stress member means and carrying lengthwise interrupted portions in slidable engagement with said keys congruently with said engagement portions on said stress member means and having faces therealong in abutment with said faces on said means, and stringers standing on said panels in juxtaposition at said parting lines therein, each two of said stringers in juxtaposition having walls directed toward one of said stress member means and carrying lengthwise interrupted portions in slidable engagement with one of said keys congruently with each other and with said engagement portions on said means and having faces therealong in abutment with said faces on said means, each two of said stringers in juxtaposition forming jointly an equivalent of said interrupted portions and faces on one of said intermediate stringers whereby panels of different widths will be associable with one another in both of said rows thereof and will be key-locked by said stringers with any of said stress members

in said coincident and non-coincident relationships of said parting lines thereof.

24. In a structure, panels meeting at straight parting lines in two spaced apart facing rows, principal stress members interjacent said panel rows, certain of said members being disposed at said panel parting lines, others of said members being disposed at intervals apart from said parting lines, linear keys interposed between said panels and said members, means along said keys engaged thereby for locking said panels in each row separably to one another and to said members by said keys, means on said stress members bearing said key-engaged means therefor, intermediate stringers on said panels apart from said parting lines, and stringers on said panels in juxtaposition to each other at and along said parting lines, said intermediate stringers and said stringers in juxtaposition being auxiliary stress members complemental to said principal stress members and having each at least one wall standing on the panel thereof and reaching to and bearing said key-engaged means for said panel, each two of said stringers in juxtaposition being combined to form an equivalent of one of said intermediate stringers and of said key-engaged means thereon whereby said panels in both rows are key-locked in said meeting and facing relationships thereof through said stress members at whichever ones said panel parting lines will occur.

25. In a structure, two panels meeting angularly with each other at a straight parting line, a third panel extending along said parting line distantly from said meeting panels, a stress member extending between said meeting panels and said third panel in a spaced relationship thereto at and along said parting line, linear keys interposed between said stress member and said meeting panels and said third panel, said stress member having lengthwise interrupted portions in slidable engagement with said keys and having abutment faces therealong, a stringer standing on said third panel, and stringers standing in juxtaposition on said meeting panels at said parting line therein, said third panel stringer and said stringers in juxtaposition having walls directed toward said stress member and carrying lengthwise interrupted portions in slidable engagement with the respective keys congruently with said stress member engagement portions and having faces therealong in opposition to said stress member faces, said third panel stringer and said stringers in juxtaposition being drawn into contact of said faces thereof with said stress member faces by said key-engagement portions thereof in engagement with said key for relative immobility of said stringers with respect to said stress member and of said three panels with respect to one another.

26. In a structure, two panels meeting with each other at a straight parting line, two other panels meeting with each other at a straight parting line distanced from and coextensive with said first parting line, at least two of said panels meeting angularly with each other at said parting line thereof, a stress member extending between said panels at and along said parting lines therein in a distanced relationship thereto, linear keys interposed between said stress member and said panels, said stress member having lengthwise interrupted portions in slidable engagement with said keys and having abutment faces therealong, and stringers standing on said meeting panels in juxtaposition to each other at said parting lines therein, each two of said stringers in juxtaposition having walls directed toward said stress member and carrying lengthwise interrupted portions in slidable engagement with one of said keys congruently with each other and with said stress member engagement portions and having faces in opposition to said stress member faces, said stringers in juxtaposition being drawn into contact of said faces thereof with said stress member faces by said key-engagement means thereof in engagement with said keys for relative immobility of said stringers with respect to said stress member and of each two of said meeting panels with respect to each other and to the other two meeting panels.

27. A structure including, flat and angularly bent panels meeting with one another at parting lines in straight and angular rows coextensive with and distanced from each other and forming intersections in a pattern of hollow walls, said parting lines in said rows being located both in coincidental and non-coincidental relationships with one another, certain of said parting lines being located at certain of said intersections and others apart therefrom, studs disposed at intervals between said panel rows distantly therefrom, at least one of said studs extending along each of said parting lines, linear keys interposed between said studs and said panels, said studs having lengthwise interrupted portions thereon in slidable engagement with said keys and having abutment faces therealong, intermediate stringers standing on said panels apart from said parting lines therein, each of said stringers having walls directed toward at least one of said studs and carrying lengthwise interrupted portions in slidable engagement with one of said keys congruently with said stud engagement portions and having faces therealong in abutment with said stud faces, stringers standing in juxtaposition on said panels at said parting lines therein, each two of said stringers in juxtaposition having walls directed toward at least one of said studs and carrying lengthwise interrupted portions in slidable engagement with one of said keys congruently with each other and with said stud engagement portions and having faces therealong in abutment with said stud faces, said engagement portions and said abutment faces on said stringers in juxtaposition being proportioned to complement one another in forming an equivalent of said intermediate stringer engagement portions and abutment faces whereby said panel parting lines may occur at any one of said studs in said coincidental and non-coincidental relationships in said coextensive rows.

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