Dec. 2, 1958 G. W. MEEK 2,862,254

STRUCTURAL BUILDING PANEL CONSTRUCTION

Filed June 10, 1954 3 Sheets-Sheet 1

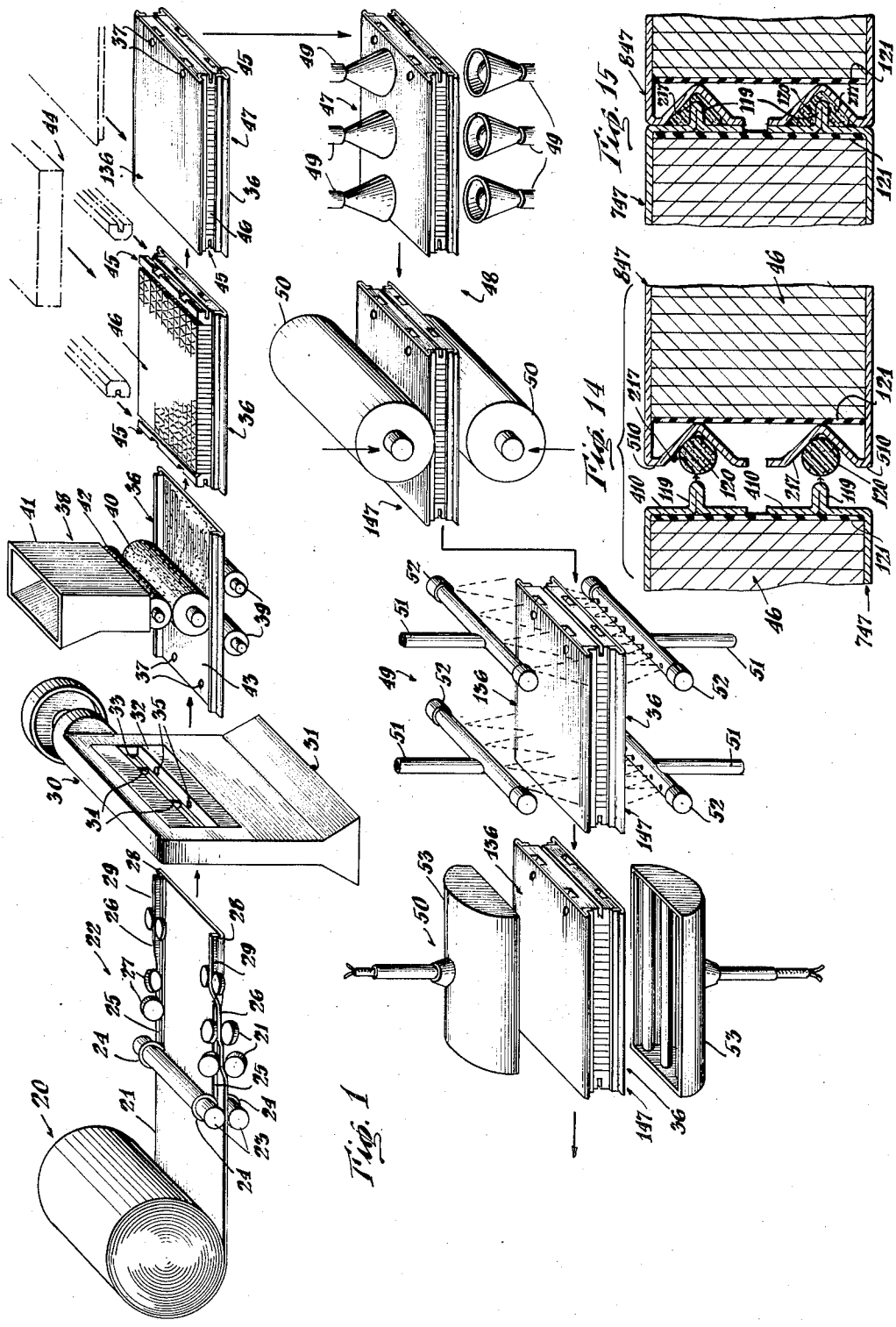


Fig. 1

Fig. 15

Fig. 14

Dec. 2, 1958 G. W. MEEK 2,862,254

STRUCTURAL BUILDING PANEL CONSTRUCTION

Filed June 10, 1954 3 Sheets-Sheet 2

Fig. 2

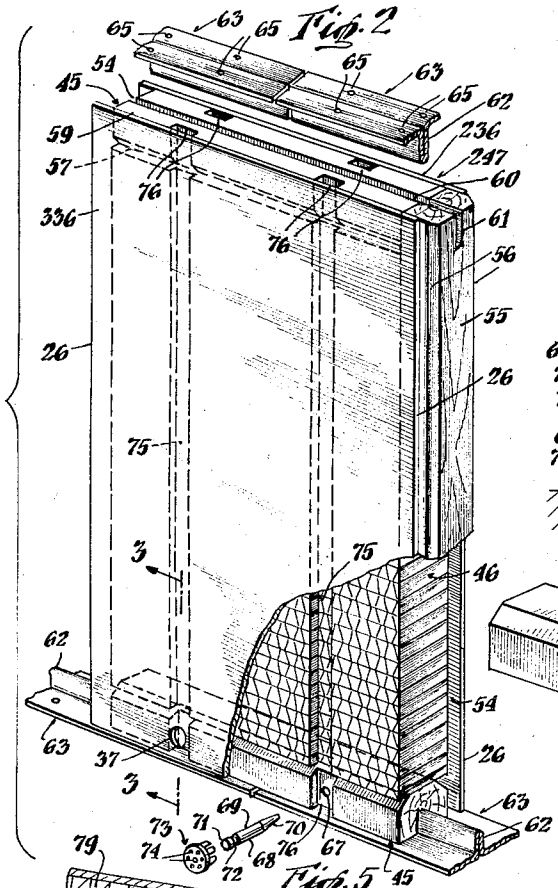


Fig. 3

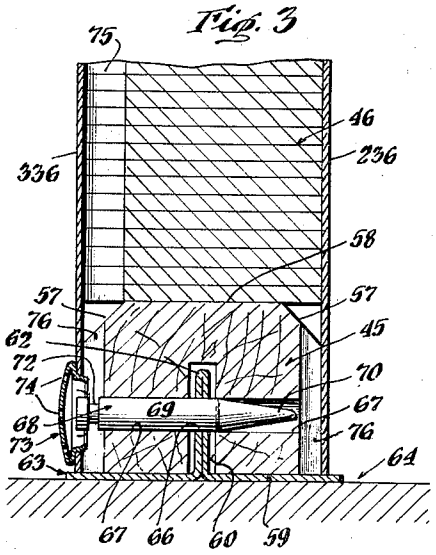


Fig. 4

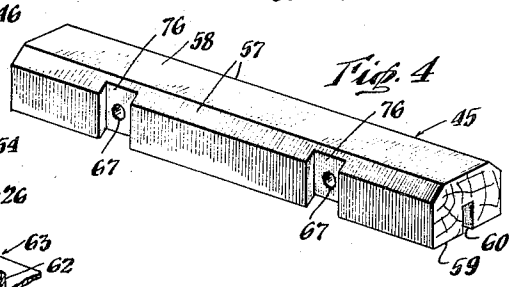


Fig. 5

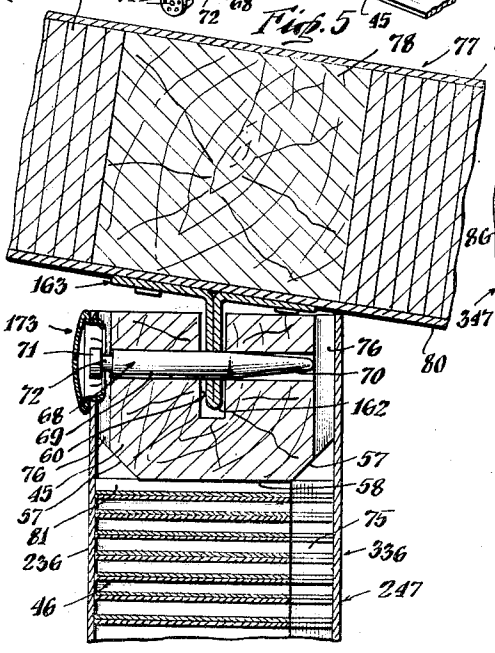


Fig. 6

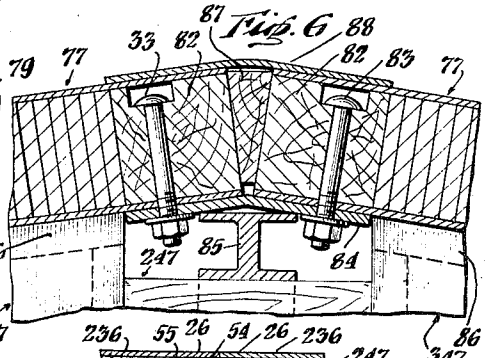


Fig. 7

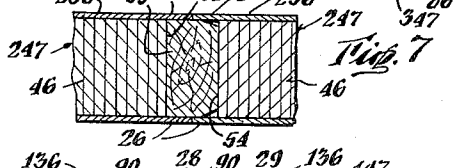
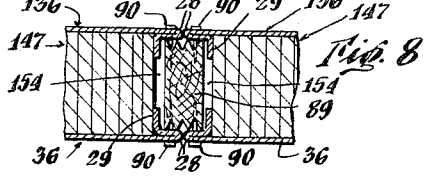


Fig. 8



Dec. 2, 1958 G. W. MEEK 2,862,254

STRUCTURAL BUILDING PANEL CONSTRUCTION

Filed June 10, 1954 3 Sheets-Sheet 3

Fig. 9

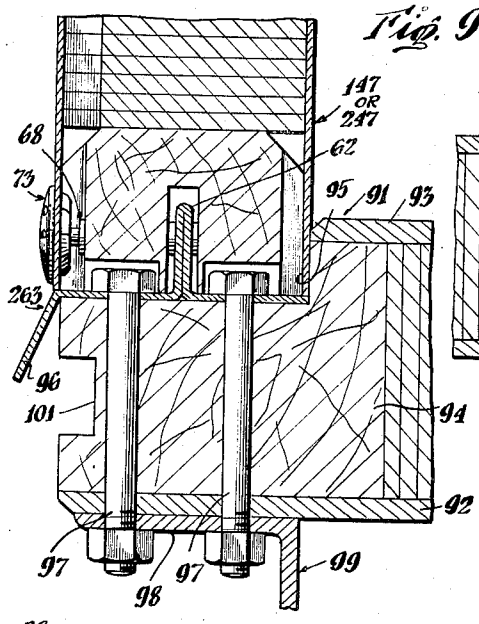


Fig. 10

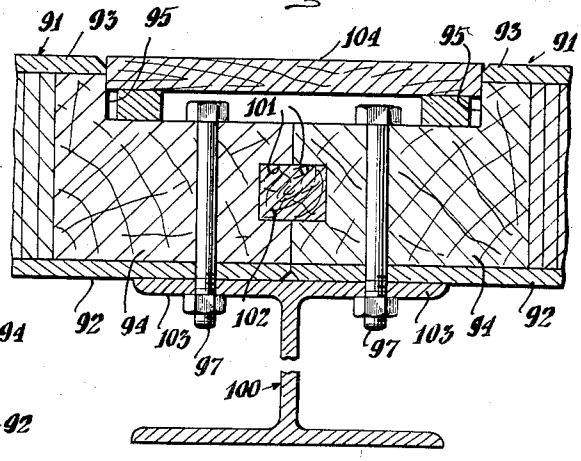


Fig. 11

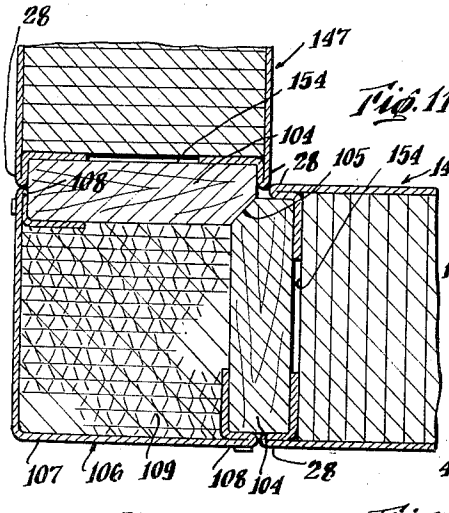


Fig. 12

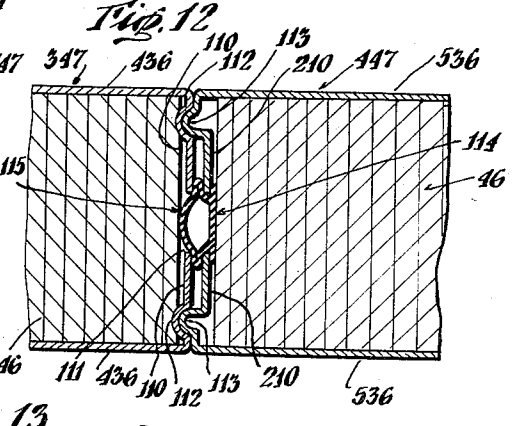
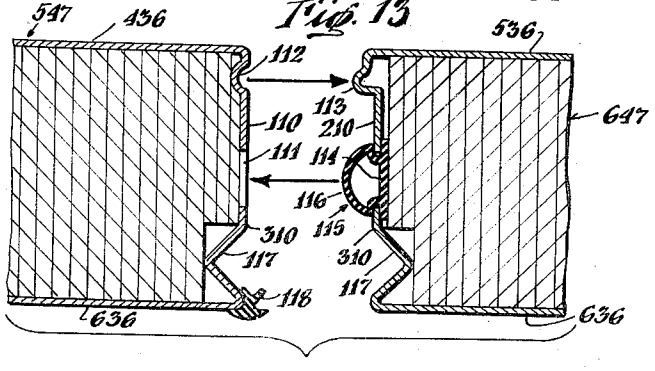


Fig. 13



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Patented Dec. 2, 1958

2,862,254

STRUCTURAL BUILDING PANEL CONSTRUCTION

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Application June 10, 1954, Serial No. 435,826

23 Claims. (Cl. 20—4)

The present invention relates to building panel structures and methods of constructing the same and, more particularly, to such panel means in the form of separate units readily connected together and with other units to form quickly erected buildings.

A general object of the present invention is to provide such panel means in unit forms readily adapted to economical mass production, the units being sturdy and sufficiently load-supporting as to require no supporting frame structure for certain constructions, the units being easily and quickly fastened together in a secure and substantially weather-tight manner by unskilled persons assuring complete satisfaction of an amateur's "do-it-yourself" desires; and an efficient continuous line assembly procedure of turning out such panel units in standard duplicate units.

A more specific object of the present invention is to provide such a procedure featured by timed movement of panel parts successively along an assembly line where they may be properly prepared and readily assembled with automatic application of adhesive material which is set during progress along the line effectively to bond the parts together.

Another object of the present invention is to provide such panel units in a form whereby pins or pegs may be employed in a simple manner to mount them to each other and to floor and roof structures.

An additional object of the present invention is to provide in such panel units means to reduce internal condensation with suitable provision for relief of moisture-laden air from the interior thereof economically associated with the pin or peg securing means.

A further object of the present invention is to provide means for readily battening and sealing together meeting edges of adjacent wall panel units as the panel units are mounted in simple fashion in juxtaposed relation.

A still further object of the present invention is to provide structural embodiments of the invention which are readily manufactured and allow efficient use thereof.

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

The invention accordingly comprises the several steps and the relation of one or more of such steps with respect to each of the others, the apparatus embodying features of construction, combinations and arrangement of parts which are adapted to effect such steps, and the article which possesses the characteristics, properties and relation of elements, all as exemplified in the detailed disclosure hereinafter set forth, and the scope of the invention will be indicated in the claims.

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

Fig. 1 is a schematic showing diagrammatically illustrating practice of an embodiment of the procedure of the present invention for mass producing the unique panel units;

Fig. 2 is an exploded perspective view to reduced scale, with parts broken away and in section, of a typical panel unit of the present invention and associated supporting and connecting means employable therewith in its erection as a building wall unit;

Fig. 3 is a sectional detail to about two-thirds actual scale, with parts broken away, taken substantially on line 3—3 of Fig. 2 to show details of a bottom portion of the Fig. 2 panel unit, and including in elevation certain pin or peg fastening and venting means detachably shown in the foreground of the lower part of Fig. 2;

Fig. 4 is a perspective view of one of the two header elements or pieces illustrated in Fig. 2;

Fig. 5 is a sectional detail to the scale of Fig. 3, with parts broken away, of a top portion of the Fig. 2 panel unit and of associated roof structure mounted thereon;

Fig. 6 is an elevational detail, with parts in section and broken away, of a gable portion of a building constructed with side wall panel units of the present invention designed for that location, the shown ridge portion of the building roof being sectioned;

Fig. 7 is a sectional detail, with parts broken away, of the splined connection of two juxtaposed wall panel units of the Fig. 2 type;

Fig. 8 is a sectional view similar to Fig. 7 showing a modified form of the connection;

Fig. 9 is a sectional detail to the scale of Figs. 3 and 5, with parts broken away, of the bottom portion of the wall panel unit illustrated in Figs. 2, 3 and 5, and associated floor structure supporting the same;

Fig. 10 is a sectional detail, with parts broken away, of additional portions of floor structure illustrated in Fig. 9;

Fig. 11 is a transverse sectional view to about the same scale of Figs. 3, 5 and 9, with parts broken away, of corner wall structure showing a battened joint between end and side wall units, of the Figs. 1 and 8 type, as provided by an intervening corner filler structure;

Fig. 12 is a sectional detail similar to Fig. 8 but to about the scale of Figs. 3, 5, 9 and 11, of still another embodiment of the joint between juxtaposed mated wall units of the present invention;

Fig. 13 is an exploded sectional view of structure similar to that shown in Fig. 12, indicating the details of opposed edge structures of the mating wall units like in most respects to those of Fig. 12 and a like intervening sealing or gasketing means prior to the units being pushed together to form a joint similar to that of Fig. 12;

Fig. 14 is an exploded sectional view similar to Fig. 13 of a further embodiment of joint structure between adjacent wall units; and

Fig. 15 is a sectional detail similar to Fig. 12 of the structure shown in Fig. 14.

Referring to the drawings, in which like numerals identify similar parts throughout, it will be seen from Fig. 1 that an embodiment of the structural building panel unit of the present invention may be readily manufactured on a mass basis by a continuous line assembly procedure. The panel units, each of which for illustrative purposes may be a standard wall panel unit, are to be assembled together in the construction of the walls of a building, for example, of the cottage or barracks type, etc. Each wall panel unit includes inside and outside sheathing sheets or plates with interposed core means. Such wall panel units may be standardized as rectangular structures of convenient dimensions, such as about four feet wide and about eight feet long, or two feet wide and eight to fourteen feet long. The sheathing sheets or plates may be formed of a variety of materials, such as sheet metal, e. g., sheet steel or aluminum, fiber or wood sheets, asbestos board, etc., and may be of laminated construction. For example, the sheathing sheets or plates may be formed of suitable plywood with the plies thereof lam-

inated or bonded together by suitable waterproof adhesive, and natural wood grain in outside plies may constitute a desirable decorative feature or provide a desired pleasing ornamental effect, although obscuring coating material, such as paint, may be employed both for decorative and protective purposes. Structurally, such panel units may be constructed in the manner proposed in Munters Patent 2,417,435 of March 18, 1947, wherein the sheathing plates, which may be of steel sheeting of about 20 to 26 gauge (0.031" to 0.015"), are intervened by suitable porous core means in the form of corrugated or honeycombed material having transverse air chambers extending between the inner faces of the plates and provided by the folds in the corrugated sheet material. Such sheathing sheets or plates may be provided in precut form and fed successively from a stack thereof to the line assembly apparatus which, as a first step of the procedure of manufacturing the wall units, may apply bonding adhesive successively to the inner faces of the plates. However, it may be preferred to provide the sheathing sheet material in the form of a roll or coiled strip thereof, as diagrammatically illustrated at **20** in Fig. 1.

In accordance with the procedure diagrammatically illustrated in Fig. 1, the sheathing sheet or plate material is fed from the supply roll **20** in the form of bendable sheet metal, such as coated steel strip **21**, to edge-forming or shaping means at an edge-shaping station **22**. The edgeshaping means at the station **22** may include a pair of grooving rolls **23**, **23** provided with annular ribs **24—24**, suitably arranged relative to each other as to form marginal grooves **25**, **25** in the strip **21** to define fold lines. The edge portions **26**, **26** of the strip **21** are then progressively turned back upon the main body of the sheet along the fold lines, and then upwardly by suitable pairs of rollers **27—27**, or any other apparatus well known in the art for performing such folding and shaping operation on edges of moving strips of sheet metal. As a result, each edge portion **26** of the strip **21** is folded back upon itself to provide a reverse bend forming a beaded edge **28** and then upwardly substantially normal to the main body of the strip to form an upturned, substantially right-angled edge flange **29**.

The strip **21**, provided with shaped edges as it passes through the edge-forming or shaping station **22**, is then fed to a severing and punching station **30** where it may be passed through suitable guillotine means **31**, there only diagrammatically illustrated without reference to specific details, since such devices are well known to the prior art. As is usual, such a guillotine may comprise a fixed bed blade **32** relative to which a guillotine blade **33** is periodically reciprocated. Such blades, of course, are suitably shaped so as to sever the shaped strip **21** without distorting the formed edges thereof. The guillotine **31** also preferably carries suitable punching means to provide holes in the sheathing sheet or plate as it is severed as the leading portion of the strip **21**. Such punching means may be in the form of a pair of punching pins **34**, **34**, mounted with the reciprocating blade **33** to be brought down into alignment with suitable holes **35**, **35** in the bed plate **32** so as to punch into the sheathing sheet or plate **36** (severed as the leading end portion of the strip **21**) a pair of holes **37**, **37** in the trailing end of the plate.

Such finished plate structure **36** is illustrated at an adhesive-applying station **38** in Fig. 1 as it is being progressed through suitable adhesive-applying means, which may comprise supporting bed rolls **39**, **39**, an adhesive-applying roller **40**, and a supply hopper or tank **41** from which the adhesive, preferably of a waterproof character and in liquid form, is fed to the applying roller by a transfer roller **42**. The applying roller **40** uniformly coats the inner face **43** of the plate **36** with adhesive as the plate is fed forward through the adhesive-applying means and deliver thereby to an assembly station **44**.

At the assembly station **44**, the sheathing plate **36**, having its adhesively-smeared inner face **43** disposed upwardly, may be slowly carried along by suitable endless conveyer means (not illustrated, as being familiar to the conveyor art). At the assembly station **44**, preferably as the sheathing plate **36** is moved slowly forward, other elements are assembled thereon. For example, a pair of end spacing means in the form of end header elements **45**, **45** may be laterally moved to and placed upon the adhesively-smeared inner face **43** of the plate **36** and rested upon the end marginal portions thereof with similar placement therebetween of core means **46** which may be of the Munters type, mentioned above. Such lateral feed and placement of the header elements **45**, **45** and the core means **46** are diagrammatically illustrated by dot-dash lines and arrows at the assembly station **44**. Thereafter, the header elements **45**, **45** and core means **46** supported on the plate **36** are overlaid at the assembly station **44** with a second sheathing plate **136**, which preferably is similar in all respects to the first-mentioned plate except for a reversal in orientation so that its holes **37**, **37** are in the leading end of the assembled wall panel unit **47** and, of course, its inner face is also suitably smeared with bonding adhesive. In fact, the means to form the top plate **136** may be similar to that provided at the edge-shaping station **22**, the severing and punching station **30**, and the adhesive-applying station **38**, with the addition of suitable turnover mechanism if it is desired to dispense with the manual operation to perform that function. The reversed top plate **136** may then be fed laterally, such as from the dot-dash position illustrated at assembly station **44**, down over the header elements **45**, **45** and core means **46**, as illustrated in full lines, either manually or by suitable transfer mechanism, as diagrammatically suggested by an arrow at assembly station **44**.

It will be noted that each assembled panel unit **47** has a pair of core-to-sheet interfaces with each interface formed by an inner face of one of the pair of sheathing sheet units and one of the side faces of the core means unit as a result of the sandwiching of the latter between the pair of the sheathing sheet units. Suitable spraying means may be substituted for the transfer roller adhesive-applying equipment illustrated in Fig. 1 at **38** to apply adhesive to the inner face **43** of the sheathing sheet **36** as the latter is moved along. The companion sheathing sheet **136** may be provided by inverting every other one of the successively-fed, adhesive-smeared sheathing sheets **36** in lieu of supplying the former to the assembly station **44** from a branch line. It is to be understood that in the practice of the continuous procedure of manufacturing the structural building panel units of the present invention, the adhesive alternately may be applied to each side face of the core means unit **46** as it is transferred to the assembly station **44**, rather than to the companion interface faces of the sheathing sheet units, and by equipment similar to the transfer roller adhesive-applying means illustrated in Fig. 1 or by suitable spraying means. In applying the adhesive to the side faces of the core means unit **46** by spraying equipment, it is found that a minimum of the adhesive will be sprayed down into the cells of the core means when the latter is of the honeycomb or corrugated types if the spray is directed to the edges of the cells at an oblique angle, thereby concentrating the applied adhesive to the edges of the core means structure, which constitute the side faces of the core means unit. It is also to be understood that the adhesive may be applied both to the inner faces of the sheathing sheet units **36** and **136** and to the side faces of the core means unit **46**, if desired, instead of being applied only to one of the pair of core and sheet faces constituting each interface and in the manners indicated above. Furthermore, assembly of the elements of each panel unit **47** at the assembly station **44** may, of course, be accomplished while the sheathing sheet unit

which constitutes the bottommost element of the sandwich is being moved forward through that station, such as by being slowly transported along by a moving belt, so that there is no pause in the movement of that sheet unit during assembly of the other elements of the sandwich thereon; but, of course, continuous movement is not essential to practice of the assembly procedure since, during the steps of shaping, handling, applying adhesive, etc., there may be temporary pause in the forward travel of the elements to and through the various stations.

The assembled panel unit **47** is then fed forward to suitable bonding or setting means which may be of a character to apply at a heating and pressing station **48** to the elements sandwiched together suitable curing heat and pressure. For example, the assembled panel unit **47** may then be fed forward between banks of heating devices, such as lamps **49—49**, and thence through pressure-applying means, which may be in the form of a pair of opposed loaded rolls **50, 50** biased toward each other, as diagrammatically illustrated in Fig. 1. As a result, the adhesive, with which the inner faces of the sheathing plates **36** and **136** are smeared, is suitably set up securely to bond together the various elements of the sandwich, including the two sheathing plates and the interposed header elements **45, 45** and core means **46**.

If the sheathing plates **36** and **136** have outer faces of a character which are ornamentally attractive and have the visual appeal essential to a marketable finished product, or if the units are to be sold uncompleted for finishing by the buyer, no additional processing of the bonded panel units **147** (after leaving the heating and pressing station **48**) is necessary. If, however, it is desired to apply to the outer faces of the sheathing plates **36** and **136** decorative and/or protective coating material, such as paint containing colored pigments, the bonded panel units **147** may be successively fed through a coating or paint-spraying station **49** and then through a coating or paint-drying station **50**. As is understood in the art, suitable coating or paint-spraying equipment may comprise supply ducts **51—51** terminating in suitable spraying nozzle means **52—52** arranged on opposite sides of the path of travel of the unit to be sprayed therewith, which here is the bonded panel unit **147**, such spraying equipment being diagrammatically illustrated in Fig. 1. The paint-drying equipment at the drying station **50** is also only diagrammatically illustrated as comprising electrically-energized heat-radiating means **53, 53**, also arranged on opposite sides of the path of movement of the bonded panel unit **147**.

A suitable means for connecting together the vertical or longitudinal side edges of juxtaposed and aligned wall panel units of the type illustrated at **147** in Fig. 1 is illustrated in Fig. 8, as will be more fully explained hereinafter, but it may be desired, in constructing such a bonded wall panel unit, to omit forming or shaping of the longitudinal edges thereof. For example, such a modified form of bonded wall panel unit is illustrated at **247** in Fig. 2 and, as there indicated, may comprise an inside sheathing sheet or plate **236** and an outside sheathing sheet or plate **336**, transversely spaced from each other by header elements **45, 45** and core means **46**. The paired edges **26, 26** and **26, 26** of the inside and outside plates **236** and **336** are left free from deformation and with the body of core material **46** and the header elements **45, 45** foreshortened laterally so as to be of less width to provide therebetween along the side edges of the bonded panel unit longitudinally-extending or vertical grooves or channels **54, 54** for reception of suitable connecting battening means. As will be seen from Figs. 2 and 7, such battening means may be in the form of an elongated spline member **55** formed of suitable material, preferably in the form of a strip of wood. Such spline member **55** may be shaped by chamfering off edges at **56, 56** to provide a tapered nose, facilitating force-fitting into one channel **54**. If desired, the spline member **55** may be provided as one of the elements of the bonded panel unit during the sandwiching together of its other elements so that it will be securely adhesively-fixed in position, as illustrated in Fig. 2. In that event, only one such spline member **55** would be provided for each panel unit with its unchamfered side seated and adhesively-anchored in one side channel **54**, leaving the other side channel free for reception of the tapered nose of the like spline member of an adjacent wall panel unit when brought to alignment and juxtaposition thereof.

As will be seen from Figs. 2 to 5 incl., each header element **45** preferably is in the form of an elongated strip of wood, or other suitable material, having longitudinal inner edges at **57, 57** chamfered off along the inner face **58** thereof to provide channel-connecting lateral passages, as will be explained more fully hereinafter. The outer panel end face **59** of the header element or strip **45** is preferably provided with a longitudinally-extending slot **60** with which is preferably aligned a groove **61** in the end of spline member **55**. The longitudinal slot **60** and the groove **61**, aligned therewith, are receptive of fin **62** forming the leg of T-shaped bracket strip **63**.

Each bracket strip **63** may be formed by shaping a flat strip of sheet metal, or fiberglass reinforced plastic (with the use of heat), with provision of a reversed fold longitudinally along the center line to form the fin **62** as a medial rib, as is best seen in Figs. 2 and 3. Each bracket strip **63** may be of a standard length, such as about two or four feet along, so that ends of successive bracket strips may be abutted substantially medially of each wall panel unit, as proposed in Fig. 2, so that there will be no break lines at the battened joints between juxtaposed panel units. As indicated in Fig. 3, such bracket strip **63** may be employed for secure anchorage to suitable floor structure, diagrammatically illustrated at **64** and, if desired, such strips may be secured to the latter by nails driven through holes **65—65**, illustrated in Fig. 2. As will be best understood from Fig. 3, the fins **62** are provided with a series of transverse holes **66—66**, each of which, when the aligned fins are seated in the header element slot **60**, will be suitably aligned with a transverse hole **67** in header element **45**. Each transverse hole **67** is aligned with one of the holes **37** in the outside plate **336** and, although for simplicity of manufacture preferably extends entirely therethrough, it need not extend much beyond the slot **60** and to the depth to which an anchoring or connecting peg or pin **68** it to be driven.

As will be best understood from Figs. 2, 3 and 5, the connecting or anchoring pin or peg **68** preferably includes an elongated cylindrical main section **69** merged with a tapered tip section **70** and having at the outer end a pulling head **71**, preferably of the same diameter as the main section and formed, if desired, by providing an annular necking groove **72** in the latter. Thus, when one of the bonded wall panel units **247** is seated down over an anchored bracket strip **63** or a pair thereof, as proposed in Figs. 2 and 3, one of the transverse holes **67** in the bottom header element **45** is brought to approximate alignment with one of the holes **66** in one of the fins **62**, and one of the anchoring pins **68** is inserted through the one of the holes **37** in the outside plate **336** which is aligned with these holes **66** and **67** and driven inward to approximately the position illustrated in Fig. 3, so as tightly to tie or anchor the parts together.

In accordance with the present invention, protective means are preferably provided for covering the anchoring pins **68—68**. Such protective means is in the form of pin-protective plug means securely seated in the hole **37** in the outside plate **336** and preferably is in the form of a snap-in cap **73**. When such snap-in cap **73** is employed for filling or blocking either of the holes **37** in the outside plate **336**, it is preferably provided with a plurality of perforations **74—74** for passage of air, as will be explained more fully hereinafter. However, such snap-in

caps will be provided for a particular job in two forms, perforated and unperforated, since as is illustrated at **173**, the unperforated snap-in caps are to be employed for filling or blocking the holes **37, 37** in the top portion of the inside plate, since it is not desired intentionally to provide for free passage of air from the inside of the building into the interior of the wall panel units or the core material therein.

Although various sealing means have been devised securely to gasket the vertical joints between adjacent wall panel units, as will appear hereinafter, it is found that the differential in moisture vapor pressure between the interior and exterior of a building involves the hazard of leakage of moisture-laden air through such joints to the interior of such panel units. If such leakage occurs in the winter time, when the outside plate is at a temperature lower than the inside air, there may be a tendency for development of condensation against the inner face of the colder outside plate, if the dew point of the leaked inside air is higher than that of the dew point of the colder external air. In accordance with one feature of the present invention, such hazard of condensation may be minimized by providing vertical passages between the core means and the inner face of the outside plate. As proposed in Fig. 2, such vertical passages may be provided in the form of vertical channels **75, 75** in the outer side of the core means **46**. This may be readily accomplished by providing the core means **46** in sections with those sections which are disposed along the lines of the channels **75, 75** being of less transverse dimension, i. e., the corrugations in those sections are foreshortened. Such channels **75, 75** provide chambers to which leaked interior air may diffuse and travel to concentrate any tendency for condensation to those locations. However, if outlet ways are provided, which communicate the channels **75, 75** to the outside air, the leaked interior air usually will bleed off under normal conditions before condensation of appreciable extent, such as that requiring drainage, can occur. Such communicating outlet ways may be provided, as is preferred. by forming notches **76, 76** in the outside face of the bottom header element **45**, preferably aligned with the vertical channels **75, 75**; and the perforations **74—74** of the snap-in caps **73, 73** provide the orifices of the outlet ways communicating with the vertical channels since the pin holes **67, 67** are preferably located in the header notches, as is best seen from Fig. 4.

Although such relative locations of the channels **75, 75**, notches **76, 76**, and perforated snap-in caps **73, 73** are preferred for simplicity of manufacture, it is not essential that they be so aligned. The chamfering at **57** of the inner edge of the outside face of the bottom header element **45**, which is juxtaposed to the core means **46**, defines, with end surfaces of the latter and the inside face of the outside plate **336**, a channel-connecting lateral passage. Thus, if the outlet ways comprising perforations **74—74** in snap-in caps **73, 73** and the notches **76, 76** are communicated to this lateral passage provided by the chamfering at **57**, there is communication via the latter to the channels **75, 75**. Location of the pin holes **67, 67** in the notches **76, 76** not only permits the snap-in caps **73, 73**, when provided with the perforations **74—74**, to serve the dual function of protectively covering the pin heads **71, 71** and providing outlet orifices, but also facilitates the use of the snap-in caps since the notches provide relief for the skirts of the latter so that they may be made sufficiently long to assure quite secure anchorage in the holes **37, 37** in the outside plate **336**. Since, from a manufacturing point of view, it is desirable that the header elements **45, 45**, whether they be intended for use at the tops or bottoms of wall panel units, be of standard form, it is preferred that the chamfering at **57** be duplicated at both sides and the notches provided on both sides in transverse alignment of the pin holes **67, 67** with the latter reaching through from the notches on one side to those on the other. As a result, the anchoring pins **68, 68** for the bottom ends of each of the panel units **247** can be driven in from the outside through the holes **37, 37** in the outside plate **336** and from the inside through the similar holes in the top portion of the inside plate **236**. Thus, the only structure which dictates particular orientation of a wall panel unit **247** is the location of the vertical channels **75, 75**, and this side may be identified by suitable indicia.

It is desirable to provide for the pin anchorage of the top ends of the panel units from the inside, as is illustrated in Fig. 5, since the slope of roof structure, such as that illustrated at **77**, may make access to pin holes in the outside plate difficult, if not impossible. For this reason, the snap-in caps, which are to be plugged into the holes **37, 37** in the top end of the inside plate **236**, are made imperforate, as indicated at **173**, so as to avoid as much as possible the passage of vapor-laden interior air into the wall panel unit **247**. Panel units, somewhat similar to those proposed for the wall panel units, may be provided for the roof construction **77**, having, if desired, a strengthening strip **78** of wood, or the like, interposed between sections **79, 79** of core material, into which nails may be driven through the bottom sheathing plate **80** to fasten thereto the anchoring strip **163** having an apertured anchoring fin **162** disposed obliquely to the base thereof, as indicated in Fig. 5. In view of the possibility of leakage of interior air to the core means of the wall panel unit **247**, the lateral passage provided by chamfering at **57** of the inner edge which is adjacent the inner face of the inside plate **236** may also cooperate with the transverse air chambers or passages provided by the core material corrugations to transfer leaked interior air directly to the channel-connecting triangular lateral passage provided by the other chamfering at **57** adjacent the inner face of the outside plate **336**, as is illustrated at **81** in Fig. 5. The preferred corrugated core means of the wall panel unit **247** is shown in true section in Fig. 5, while being only diagrammatically illustrated in the other figures.

As indicated in Fig. 6, the roof panel units **77, 77** preferably are provided with header end elements **82, 82** of wood, or the like, carrying bolts **83, 83** which extend down through an angled support or bearing plate **84**, in turn supported by, if desired, an I-beam joist **85**. The joist **85** may, if desired, be supported by posts inward of wall panel unit **247** preferably flanked by special wall panel units **347, 347**, each having a roof wedge portion **86** for fitting to the slope of the roof structure; and, of course, suitable filler pieces may be employed to fill in the gap illustrated in Fig. 6. Also, it is possible to use similar wall panel units, such as **247**, for the entire end wall structure and, when the roof load is relatively light, to support bearing structure, such as angled plate **84**, at each end upon the top edge of the middle wall panel unit by a stub post. In such a structure, right triangular gable filler pieces will be employed in pairs at each end to fill in the gaps between the top ends of the rectangular wall panel units and the gabled roof structure. Preferably, a wedge-shaped filler strip **87** is inserted between the ends of roof panel units **77, 77** and the joint is covered with an angled ridge plate **88**.

As previously indicated, the structure of the battened vertical joint between juxtaposed wall panel units **247**, which employs the spline member **55** in boxed space between opposed pairs of the side edges of the inside and outside sheathing plates, is illustrated in Fig. 7. As indicated in Fig. 8, a somewhat similar structure may be employed to provide a vertical battened joint between juxtaposed wall panel units of the type illustrated at **147** in Fig. 1. As shown in Fig. 8, such battened joint may comprise a batten strip **89** inserted in the boxed space provided by the opposed side grooves or channels **154, 154** between the laterally-extending beaded edges **23—23**,

While the spline member 55 of the Figs. 2 and 7 embodiments has one portion snugly fitted into one of the side edge grooves or channels 54 and adhesively-affixed therein, preferably during the adhesive bonding of the sandwich elements together in the Fig. 7 embodiment, and with its tapered nose adapted to be driven into the opposed channel 54 of the juxtaposed wall panel unit, the batten strip 89 of the Fig. 8 embodiment may be securely anchored in the boxed space by nails 90—90 driven through the beaded edges 28—28, which may be perforated at intervals for that purpose.

As illustrated in Figs. 9 and 10, the floor structure of such a building may also be built up from a plurality of standard floor panels 91—91, somewhat similar in construction to the wall panel units and the roof panel units. For example, a floor panel unit 91 may have a bottom sheathing plate 92, which extends laterally beyond a top sheathing plate 93 with an interposed end header element 94 rabbeted at 95 beyond the edge of the top plate and there carrying a finned anchoring strip 263 similar to the anchoring strip 63 except that it is provided with an oblique drip skirt 96. Bolts 97, 97 may extend down through the base of the anchoring strip 263, the header element 94, the bottom sheathing plate 92, and through a lateral flange 98 of a foundation channel angle 99, as shown.

As illustrated in Fig. 10, the floor panel units 91, 91 may be joined together by juxtaposing the edges of their bottom plates 92, 92 and supporting the latter on a foundation I-beam 100. The end edges of the header elements 94, 94 are provided with opposed and aligned channels 101, 101, one of which is shown in Fig. 9. A spline strip 102 is fitted into the opposed channels 101, 101; and bolts 97, 97 extend down through the header elements 94, 94, the extended portions of the bottom sheathing plates 92, 92, and flanges 103, 103 of the foundation I-beam 100. The wide open-top channel formed by the rabbets 95, 95 is filled in and the bolt heads covered by a suitable bridging and filler strip structure 104.

As indicated in Fig. 11, the joints at the corners of the wall structure of the building may be filled in by means which also serve to anchor together the side edges of the wall panel units, which are there disposed normal to each other. For example, as illustrated in Fig. 11, two wall panel units of the Fig. 1 type 147, 147 may be connected together by seating in the side edge groove or channel 154 of each wall panel unit between its beaded edges 28, 28 a spline strip 104. Each spline strip 104 is chamfered off along one edge at 105 at an angle of 45° so that the chamfered faces may be brought to abutment of each other in face-to-face contact when the wall panel units 147, 147 are disposed normal to each other, as indicated in Fig. 11. In fact, the spline strips 104, 104 preferably form fixed elements of a columnar corner structure 106, comprising a sheathing angle 107 having beaded and flanged edges 108, 108 similar to the beaded and flanged edges 28, 28 of the wall panel unit 147 and to which the spline strips 104, 104 are fastened, such as by nails, in the illustrated manner. The space between the spline strips 104, 104 and the sheathing angle 107 is filled in with a body 109 of core material which may be of the character illustrated at 46 in the preceding figures. In assembling the parts of the corner joint structure illustrated in Fig. 11, the columnar corner structure 106 is erected on suitable base structure, such as floor structure of the type illustrated in Figs. 9 and 10, and then the wall units 147, 147 are moved successively along normal planes until their side edge channels 154, 154 receptively receive the spline strips 104, 104, so that when the panel units are securely anchored to anchoring strips, as proposed in Fig. 3, the parts of the corner joint structure are all securely connected and held together.

As illustrated in Figs. 12 and 13, the side edge structure of the wall panel units may be modified to provide

a sealed or gasketed joint between juxtaposed side edges of wall panel units 347 and 447, which may be similar in all other respects to the wall panel unit structure illustrated in Fig. 1. The edges 110, 110 of the sheathing plates 436, 436 of the wall panel unit 347 are turned inwardly at right angles but in transversely-spaced relation to provide therebetween a longitudinally-extending recess 111. Each inturned flange 110 is also preferably provided with an inwardly-rolled bead 112 to form on the exterior thereof a groove. The juxtaposed inturned edge flanges 210, 210 of sheathing plates 536, 536 of the adjacent wall panel unit 447 are provided with outwardly-rolled beads 113, 113, with the latter longitudinally-extending outturned beads projected or seated into the longitudinally-extending grooves provided by the inturned beads 112, 112. The recess provided by the transverse spacing of the longitudinal edges of the inturned flanges 210, 210 receptively receives a flanged rib 114, which extends longitudinally along one side of a tubular elastic gasket member or strip 115, that rib being easily snapped into position, as will be seen from Figs. 12 and 13. Of course, if desired, the gasket strip 115 may have its flanged rib 114 seated between the edges of the flanges 210, 210 at the time the elements of the panel unit 447 are sandwiched together. The tubular gasket member 115 is crowned or convexed along its opposite side 116, as is best seen in Fig. 13, so as to be snugly fitted with distortion into the recess 111 between edges of the inturned flanges 110, 110, as is illustrated in Fig. 12, when the wall panel units 347 and 447 are moved to juxtaposition. Thus, the gasket member 115 seals off the space between opposed end edges of the inturned flanges 210, 210 of wall panel unit 447 with the rib 114 seated in and filling the recess 111 provided thereby and the convexed opposite side 116 distortably fits into and seals off the similar recess 111 of the edge of the other wall panel unit 347, which exists between the opposed end edges of its inturned flanges 110, 110, efficiently to block off travel of interior air to the outside through the joint and also to the interior of the panel units. Of course, the gasketing member also provides a seal at the joint to serve the purpose of an effective weather strip means.

As proposed in Fig. 13, the juxtaposed panel units of the Fig. 12 structure may be modified so that unit 547, similar in many respects to panel unit 347, having as an outside plate, sheathing sheet 436 provided with the inturned bead 112, may have, as an inside sheathing sheet, plate 636 with its inturned edge flange 310 provided with a longitudinally-extending inwardly-rolled V-shaped groove 117. The companion wall panel unit 647 has a similar inside sheathing plate 636, provided with a like V-shaped groove 117 along its side edge, so that those grooves are arranged in opposed relation together to provide a longitudinally-extending channel for electrical wiring and plumbing when the wall units are moved to juxtaposition to form a joint similar to that proposed in Fig. 12. The channel provided by the opposed grooves 117, 117 for electrical wiring and plumbing may be sealed off from interior air by any suitable sealing strip, such as that illustrated at 118, which, like gasket member 115, may be formed of any suitable elastic material, such as a rubber-like composition.

In Figs. 14 and 15 is illustrated a further embodiment of joint structure. As there proposed, one wall panel unit 747 may have its inturned edge flanges 410, 410 provided with longitudinally-extending beads 119, 119 in the form of fins. The companion wall panel unit 847 may have its inturned edge flanges 510, 510 provided with rolled-in V-shaped grooves 217, 217 similar to those provided in the edge flanges 310, 310 of the sheathing plates 636, 636 of the wall panel units of the Fig. 13 construction. Into the longitudinally-extending grooves 217, 217 are seated strips or rods 120, 120 of deformable gasketing material, such as caulking compound which may be similar to modeling clay, or porous, rubber-like mate-

rial, such as sponge rubber, but preferably are of a very soft elastic composition, commonly marketed under the trade name of "Permagum." As illustrated in Fig. 15, when the wall panel units **747** and **847** are moved toward each other with their side edges brought to juxtaposition, the longitudinally-extending fins **119**, **119** are inserted or projected into the longitudinally-extending V-shaped grooves **217**, **217** and distort in the latter the rods or strips **120**, **120** of gasketing or sealing composition. It may be desired to supplement the seals provided by the Fig. 15 joint with fluid-impervious membranes, such as those illustrated at **121**—**121** in Figs. 14 and 15, of rubber or rubber-like material, metal foil, e. g. aluminum foil, etc., which will be incorporated at the time the core means is assembled between the sheathing plates so that the edges of the membranes will be adhesively bonded to the inner faces of the sheathing plates.

It will be understood that in accordance with the present invention, wall panel units, roof panel units, and floor panel units may be provided in different designs to be accommodated to the erection of different types of buildings, while incorporating the basic features of the present invention. For example, the wall panel units may be provided in standard styles, which may include window openings, door openings, and filler portions for adaptation to differently-shaped spaces. Thus, one may purchase a packaged building in knocked-down condition, consisting of the proper number of standard parts, which he may readily put together in a simple manner without any particular skill. For small buildings, such as cottages, motel units and barracks, no particular load-supporting means need be additionally provided, other than the usual simple foundations, since the wall panel units of the present invention are capable of supporting unusually heavy loads, in and of themselves, and quite effectively will support roof structure with sufficient margin to accommodate anticipated snow loads. It is contemplated to provide such units with sheathing sheets of a character which are of a finished and sufficiently ornamental quality as to make unnecessary any additional decorative treatment but, of course, if desired, one may readily apply paint to the exterior surfaces thereof and wallpaper to interior surfaces to satisfy any specific demands.

It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained and, since certain changes may be made in carrying out the above process, in the described product and in the constructions set forth without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

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

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

1. A rectangular structural building panel wall unit having two side edges and top and bottom ends comprising, in combination, a pair of spaced inside and outside rectangular sheathing plates, spacing means acting to laterally space said plates apart, said spacing means comprising top and bottom header elements interposed between and secured to top ends and bottom ends of said inside and outside plates, porous core means located between said plates, means defining in said core means adjacent to the inner face of the outside plate, a plurality of spaced vertical channels extending from end to end of said unit, said outside plate having holes in the bottom end thereof, and said bottom header element having ways in the outer side thereof communicating with said channels, with the outlet holes in the outside plate communicating with said ways.

2. The wall panel unit as defined in claim 1 characterized by said ways in said bottom header element being in the form of notches aligned with said channels.

3. The wall panel unit as defined in claim 1 characterized by said header elements and core means being so shaped with respect to each other as to provide therebetween lateral passages connecting said channels adjacent the inner face of said outside plate.

4. The wall panel unit as defined in claim 3 characterized by said ways in said bottom header element being in the form of notches with the channel-connecting lateral passages being provided in the outer sides of said header elements adjacent the core means to connect said notches as well as said channels.

5. The wall panel unit as defined in claim 4 characterized by said lateral passages being formed by chamfering the edge of the outer side of each of said header elements which is juxtaposed to said core means whereby each lateral passage is a triangular channel bounded by the inner face of said outside plate, the core means and the oblique chamfered face of said header element.

6. The wall panel unit as defined in claim 4 characterized by said top and bottom header elements having similar lateral passages provided in both the inner and outer sides thereof with interconnecting passages extending transversely through said core means from the lateral passages at the top and bottom adjacent the inner face of the inside plate to those adjacent the inner face of the outside plate.

7. The wall panel unit as defined in claim 1 characterized by said header elements each having a longitudinally-extending slot in its outside panel end face in the vicinity of each way for reception of an apertured anchoring fin, each of said header elements having a transverse hole extending to the slot aligned with each of its ways for reception of a transverse anchoring pin to be positioned into the anchoring fin aperture, each of said header element transverse holes being aligned with a hole in one of said plates for permitting insertion through the latter of the anchoring pins, said plate holes at the bottom end of said unit being said outlet holes in said outside plate.

8. The wall panel unit as defined in claim 4 characterized by the provision of a pin-protective plug means for each of said outlet holes in said outside plate, each of said plug means being apertured to permit passage of air therethrough.

9. The wall panel unit as defined in claim 8 characterized by each of said plug means being in the form of a snap-in cap having a plurality of perforations therein.

10. Means for anchoring and connecting structural building panel units comprising, in combination, a plate sheathing one face of such panel unit and having a hole in an end portion thereof, a header element constituting a lateral end of said unit located behind said plate end portion, said header element having a fin-respective slot in its outside face extending generally parallel to said plate and a transverse hole extending from the latter to and beyond said slot in alignment with the hole in said plate, apertured anchoring fin means inserted in said slot with a hole therein aligned with the holes in said header element and plate, and an anchoring pin inserted through the hole in said plate and driven into the aligned holes in said header element and fin.

11. The panel anchoring and connecting means as defined in claim 10 characterized by protective plug means in the hole in said plate covering the outer end of said pin.

12. The panel anchoring and connecting means as defined in claim 11 characterized by said plug means being a snap-in cap.

13. The panel anchoring and connecting means as defined in claim 10 characterized by said pin having its outer end provided with a pulling head.

14. The panel anchoring and connecting means as defined in claim 13 characterized by said pin having an elongated cylindrical main section merged at one end with a

tapered tip section and at the other end with a headed section, the head being of a diameter substantially equal to that of the main section and defined from the latter by an annular necking groove.

15. The panel anchoring and connecting means as defined in claim 10 characterized by each of said panel units being substantially rectangular and defined by inside and outside transversely spaced plates, a pair of said header elements being interposed between and secured to end portions of said plates at opposite ends of said panel unit, each of said header elements having the fin-receiving slot therein extending longitudinally the full length thereof and traversed by a plurality of said pin-receiving holes aligned with a like plurality of holes in one of said plates, said anchoring fin means being elongated and having pin-receiving holes therein aligned with the pin-receiving holes in said header element.

16. The panel anchoring and connecting means as defined in claim 15 characterized by a plurality of protective plug means mounted in the plate pin-receiving holes covering and protecting said pins.

17. The panel anchoring and connecting means as defined in claim 16 characterized by said outside plate having such holes in the bottom end thereof, said plug means which are mounted in these holes in said outside plate being perforated snap-in caps.

18. The panel anchoring and connectiong means as defined in claim 15 characterized by the side edges of the inside and outside plates of each panel unit extending laterally from the panel unit proper to define side edge grooves, the side edge grooves of adjacent panel units being arranged in opposition to each other to define a boxed space, and an elongated spline member fitted into the boxed space to tie side edges of adjacent panel units together.

19. Means providing a seal between side edges of adjacent building panel units comprising, in combination, a pair of juxtaposed panel units each having transversely-spaced inside and outside sheathing plates with interposed core means, said sheathing plates of each of said panel units having inturned transversely-extending and opposed side edges at least partially covering said core means at the end edge of each of said panel units, bead means extending out along the end edge of one of said panel units formed by shaping of one of said inturned plate edges, and a cooperating groove formed in the juxtaposed inturned plate edge of the adjacent panel unit and with said bead means receptively mounted therein, and sealing means distortably wedged between the juxtaposed end edges of said panel units.

20. The panel structure as defined in claim 19 characterized by said sealing means being in the form of an elongated strip of gasketing material seated in said groove and distortably clamped therein by said bead means.

21. Means providing a seal between side edges of adjacent building panel units comprising, in combination, a pair of adjacent panel units having opposed juxtaposed edges, the juxtaposed edges of said panel units being of appreciable width and each having a recess extending longitudinally therealong with the recesses of the juxtaposed edges being opposed, and an elongated tubular member of elastic material having along one side rib means snapped into one of the recesses for anchorage to the panel unit which has this recess, said tubular member being wider than the other opposed recess and being convex along its other side for snug fitting in the latter recess.

22. Means for providing a seal between the side edges of adjacent building panel units comprising, in combination, a pair of panel units arranged with their ends in contact, each of said units having a pair of spaced sheathing plates provided at their ends with integral inturned flanges, the pair of flanges on one end of one of the units being formed with a plurality of longitudinally-extending recesses, the pair of flanges on one end of the second unit being formed with a plurality of projecting beads fitting into said recesses, and a longitudinally-extending, distortable gasket member mounted between the edges of the adjacent panel units and between the grooves and beads thereon and compressed when the beads on one of the units are fitted into the recesses of the other unit.

23. Means for providing a seal between the side edges of adjacent building panel units comprising, in combination, a pair of panel units arranged with their ends in contact, each of said units being provided with a pair of spaced sheathing plates provided at their ends with inturned flanges, one flange on one of the units being formed with a longitudinal bead, a flange on the second unit being formed with a longitudinal groove into which said bead fits, a second flange on each of the units being formed with a channel, which channels come together in co-operation when the ends of the two units are abutted and which co-operating channels form a longitudinal passage between the two units for the reception of electrical wiring, said passage being located near one face of the abutting panels and the bead-and-groove connection being located near the opposite face of the panels.

References Cited in the file of this patent

UNITED STATES PATENTS

2,218,465	Gunnison	Oct. 15, 1940
2,280,687	Connelly	Apr. 21, 1942
2,373,808	Brown	Apr. 17, 1945
2,385,352	Davis	Sept. 25, 1945
2,394,146	Brunton	Feb. 5, 1946
2,394,443	Guignon	Feb. 5, 1946
2,438,671	Marana	Mar. 30, 1948
2,585,082	Bollinger	Feb. 12, 1952
2,593,714	Robinson	Apr. 22, 1952
2,651,391	Havens	Sept. 8, 1953
2,664,809	Morell	Jan. 5, 1954
2,668,788	Waldherr	Feb. 9, 1954
2,700,634	Ackerlind	Jan. 25, 1955
2,709,402	Malm	May 31, 1955
2,764,929	Tegarty	Oct. 2, 1956