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Toulson et al.

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[54] **BUILDING STRUCTURES**

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[52] **U.S. Cl.** **52/92**, 52/241, 52/303, 52/309, 52/586, 52/741

[51] **Int. Cl.** **E04b 7/02**

[58] **Field of Search** 51/92, 93, 234, 241, 293, 51/300, 303, 309, 584, 586, 741

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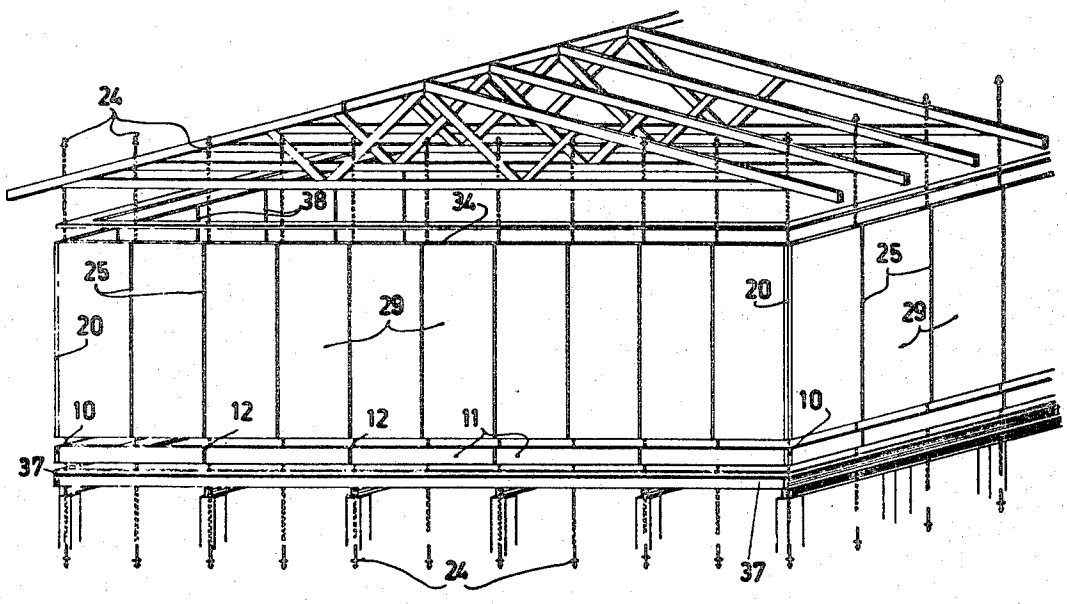
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Primary Examiner—Alfred C. Perham
Attorney, Agent, or Firm—Richards, Harris & Medlock

[57] **ABSTRACT**

An improved building structure comprising exterior bottom plate adapted for mounting around the perimeter of a foundation and having a tongue extending along the length of the plate with holes spaced along such tongue, a plurality of wall posts each having grooved ends and a lower stud of a length to pass through a selected one of the said holes when the lower groove end of the post fits upon the said tongue, a plurality of wall members, including joiner and window panels, each having a height equal to the length of the wall posts and grooved sides including a grooved bottom plate and a grooved vertical side to accomodate a vertical marginal part of an adjacent wall post, a top plate passing along and fitting within the top grooves of the wall posts and the wall members, the top plate having holes positioned to align with the wall posts, studs passing up from the posts and through the holes in the top plate for passing up through holes in roof trusses, the construction and arrangement being such that when the bottom studs are passed through holes in a foundation and secured and the top studs through holes in the roof trusses and secured, the roof trusses, the wall components and the bottom plate are of which the following is a specification.

11 Claims, 13 Drawing Figures



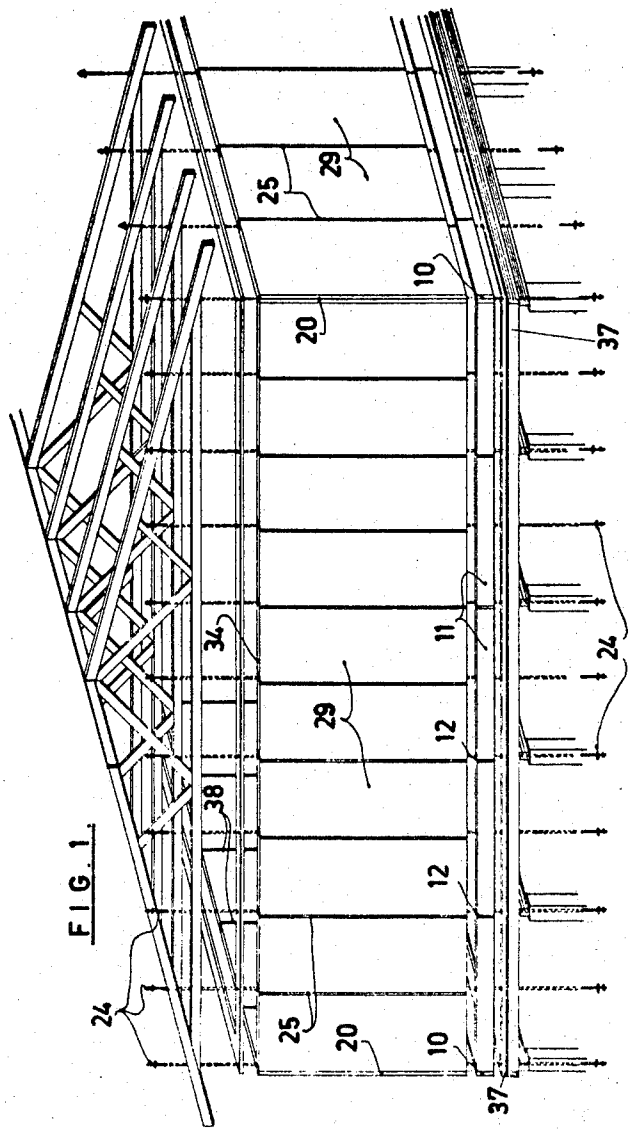


FIG. 1

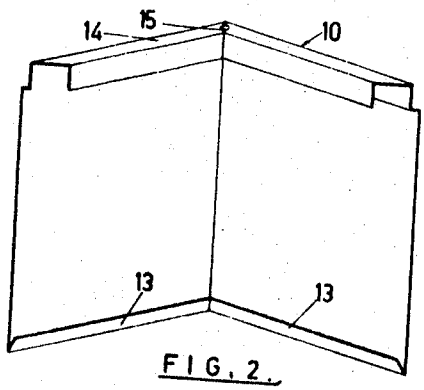


FIG. 2.

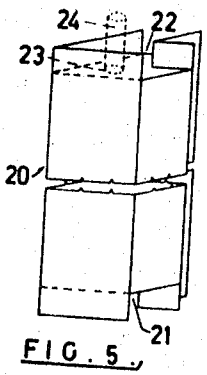


FIG. 5.

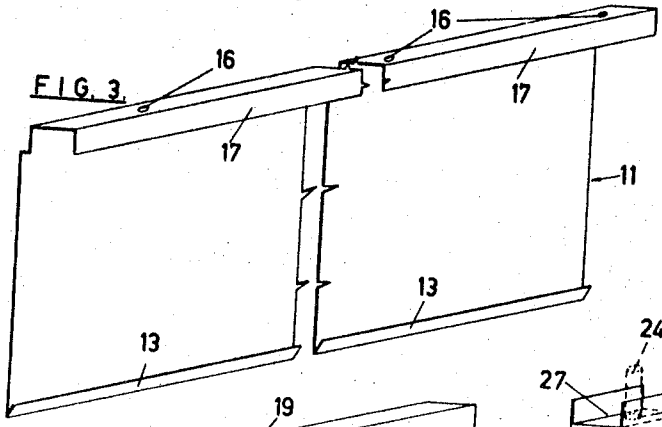


FIG. 3.

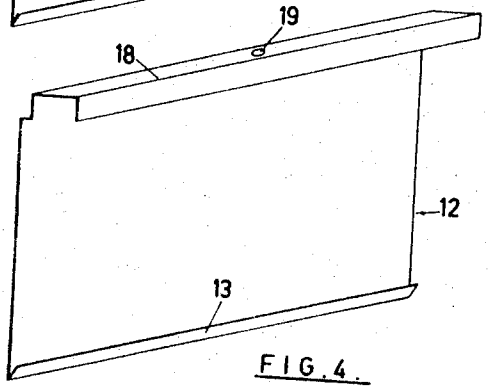


FIG. 4.

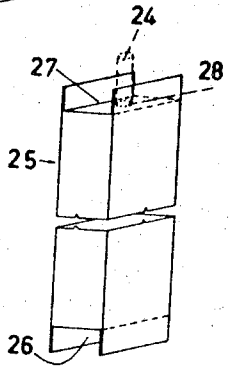


FIG. 6.

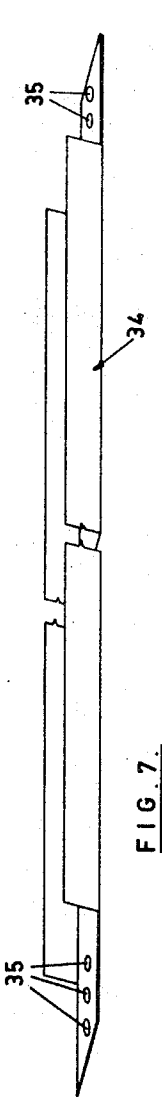


FIG. 7.

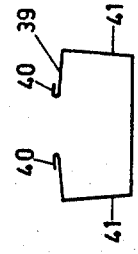


FIG. 9a.

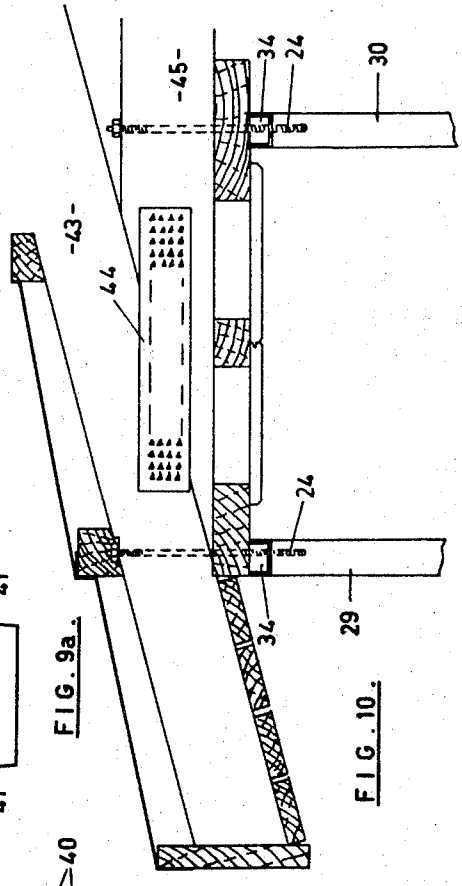


FIG. 10.

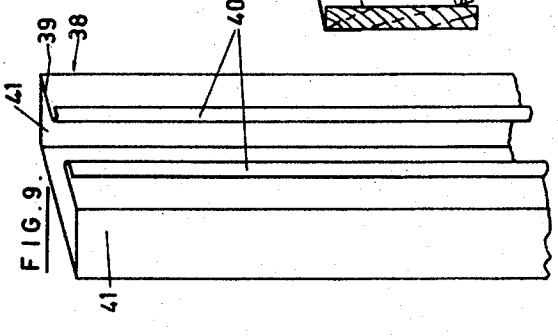


FIG. 9.

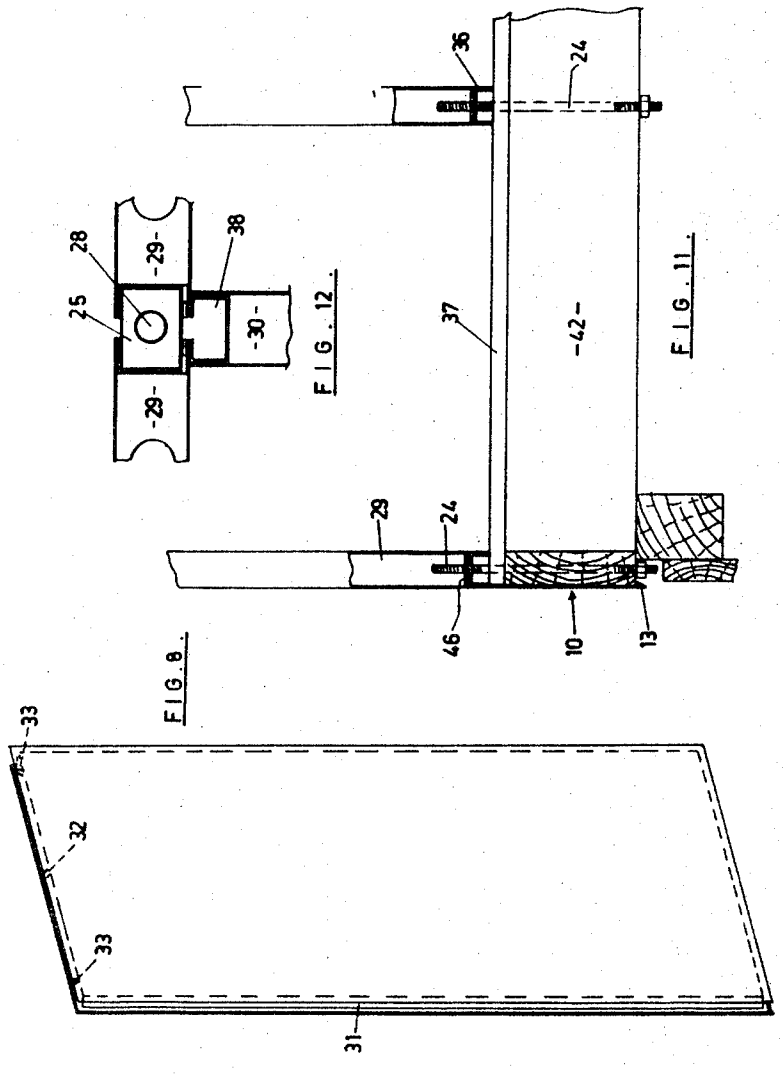


FIG. 12.

FIG. 11.

FIG. 8.

BUILDING STRUCTURES

This invention relates to improvements in building structures employing prefabricated components.

This type of construction is already known but the components require a fairly complicated means for assembling and locking the various components into an assembled structure.

The present invention is concerned with an improved building structure in which prefabricated components are readily and positively assembled together, and to a method of assembling prefabricated components into a building structure.

Accordingly, in one aspect the invention consists of an improved building structure comprising exterior bottom plate adapted for mounting around the perimeter of a foundation and having a tongue extending along the length of the plate with holes spaced along such tongue, a plurality of wall posts each having grooved ends and a lower stud of a length to pass through a selected one of the said holes when the lower groove end of the post fits upon the said tongue, a plurality of wall members, including joinery and window panels, each having a height equal to the length of the wall posts and grooved sides including a grooved bottom side fitting upon the tongue of the exterior bottom plate and a grooved vertical side to accommodate a vertical marginal part of an adjacent wall post, a top plate passing along and fitting within the top grooves of the wall posts and the wall members, the top plate having holes positioned to align with the wall posts, studs passing up from the posts and through the holes in the top plate for passing up through holes in roof trusses, the construction and arrangement being such that when the bottom studs are passed through holes in a foundation and secured and the top studs through holes in the roof trusses and secured, the roof trusses, the wall components and the bottom plate are locked to the foundation as a composite structure.

In another aspect the invention consists of an improved method of erecting a building structure comprising placing bottom exterior plate around the perimeter of a foundation, mounting wall posts upon the plate by inserting bottom studs of the posts through holes in the plate and holes in the foundation and secured by washers and nuts screwed onto bottom ends of the studs, mounting wall members including joinery and window panels between adjacent wall posts, a top plate passing over the top ends of the all posts and the top sides of the wall members, the top plate having holes for top studs from the wall posts passing up through the holes in the top plate and through holes in roof trusses and secured by washers and nuts so that the roof trusses, the wall components and the bottom plate are locked to the foundation as a composite structure.

In the following description of the invention reference will be made to the accompanying drawings in which:

FIG. **1** is a exploded perspective partial view of a building constructed according to the invention;

FIG. **2** is a perspective view of an external corner component of the bottom plate;

FIG. **3** is a part perspective view of a straight length component of the bottom plate;

FIG. **4** is a perspective view of a joining component of the bottom plate;

FIG. **5** is a part perspective view of an external corner wall post;

FIG. **6** is a part perspective view of an external wall post;

FIG. **7** is a part perspective view of a top plate component;

FIG. **8** is a perspective view of a wall member;

FIG. **9** is a partial length perspective view of a wall joining member;

FIG. **9***a* is a plan view of the joining member in FIG. **9**;

FIG. **10** is a detail view at the top plate of the building of FIG. **1**;

FIG. **11** is a detail part view at the bottom plate of the building of FIG. **2** and

FIG. **12** is a detail plan of an interior wall member joined to an exterior wall.

In further describing the invention, the exterior bottom plate includes external angle components **10** and straight components **11** and **12.** Each exterior angle component **10** is fabricated preferably out of 18G galvanised metal sheet and is of a right angle shape in plan. The top edge of this angle component **10** has an upstanding tongue **14** of a predetermined height and width. A hole **15** is provided in such tongue **14** centrally at the corner thereof. The lower edge of the component **10** has an upturned lip **13.** The straight bottom plate components **11** and **12** consist of a length component **11** and a joining component **12** are of a desired length and have a cross-section similar to a side of the exterior angle component **10.** The length of each of the length components **11** is such as to provide for a number of holes **16** being drilled through its tongue **17** at desired pitch, for example at 3ft. centers. The joining component **12** is of a length such that it can join together adjacent ends of length components **11.** The joining is effected by overlapping the joining component **12** with the ends of adjacent length components **11.** This joining component **12** is formed with a tongue **18** the same as bottom plate components **10** and **11** which has a central hole **19.** Both components **11** and **12** are provided with the lower upturned lip **13** as on the external corner component **10.**

In component **10, 11** and **12** one form of tongue is shown (FIGS. **2–4**) but if preferred a second form as shown in FIG. **11** can be employed.

The wall posts are constructed of a length equal to wall height and are of a hollow steel section such as 1½ inch x 2 inch x 18G sheet metal. The sheet metal can be galvanised or Tenit butyrate plastics coated. If galvanised, a paint finish can be applied. For corners, an external angle wall post **20** is provided and has its bottom end grooved as at **21** to take the tongue **14** of the exterior floor angle component **10** and its top end grooved as at **22.** The top end plate of the angle wall post **20** is provided with a threaded hole **23** in which a stud **24** can be screwed to project therefrom. The lower grooved end **21** is also provided with a threaded hole (not shown) and a stud (also not shown) the said stud being of a length to suit the thickness of the building foundation. This lower stud is positioned such as to pass through the corner hole **15** of the exterior floor angle component **10** when the groove **21** of the angle wall post **20** is fitted over the tongue **14** of the said angle component **10.** The bottom end of each external wall post **25** is similarly grooved (as at **26**) and has a

similarly positioned hole (not shown) from which a stud **24** can project.

The upper end of each wall post **25** is likewise grooved (as at **27**) and has a similarly positioned hole **28** for a further stud **24.**

The wall members are of panel nature and include both exterior wall panels **29** and interior wall panels **30.** Both panels **29** and **30** are fabicated from 26G galvanised metal sheets and are of a hollow section. Each edge of the panel is provided with a groove **31.** The internal width of the groove **31** is about 1½ inch so that the longer side grooves can mate (see FIG. **12**) with the wall posts **20** and **25.** The top groove **31** of each of the panels **29** and **30** is provided with openings (shown in dotted) one of which **32** is an inlet for the admission of polyurethane or polystyrene so that the panel has a self-extinguishing polyurethane or polystyrene core. When the wall member forms an exterior panel **29** one side is coated with polyvinylidene fluoride resin, while the other side is polyvinyl covered and the core is of polyurethane material. For an interior panel **30** the wall member is coated on both sides with a polyvinyl covering and is filled with either polyurethane foam or polystyrene block.

Alternatively the exterior wall panels **27** are constructed of 26G galvanised metal sheet on its exterior with a self-extinguishing polyurethane core and a plywood, hardboard, metal sheet or Ivory board, and an interior lining. These are adhered together to form a strong permanent wall panel. The interior wall panels **28** are constructed with a metal edging strip of galvanised iron, self-extinguishing polyurethane or polystyrene core and a plywood, Formica wallboard, metal sheet or Ivory board as a surface material. On both surfaces of the interior panel this covering is used.

Both wall panels **29** and **30** are of dimensions about 8 feet x 3 feet with a core thickness substantially equal to the width of the tongue of the floor plates **10, 11** and **12,** i.e. about 1½ inch. Further each wall panel **29** and **30** has provided in it upper groove openings **33** which provide electrical wiring access. The groove **39** in upper side of each wall panel **29** and **30** also serves to receive the cross-section of a top plate **34** said top plate **34** being preferably of inverted channel section to fit flush with the top edges of the posts **20** and **25** and the said wall panels **29** and **30.** This top plate **34** has holes **35** to align with the holes in the tops of the wall posts **20** and **25,** and wall members **29** and **30.** Weathering strips **46** can be inserted between channel sections and top and bottom plates.

For interior walls **30,** a pre-drilled plate **36** is provided for fixing to the floor **37** (see FIG. **11**) of the building on the centre line of the wall.

The interior wall panels **30** are attached to the exterior walls of a building, as shown in FIG. **12,** by way of a wall joining member **38.** This wall joining member **38** consists of 24G galvanised sheet formed into a length of substantially romboid cross sectional shape (FIG. **9***a*). The longer side **39** of romboid shape, however, is cut midway in its length and each part is folded back to form a hook **40.** The side of the joining member **38** opposite the hooked side is of a width compatible with the groove **31** on the wall panel **30,** i.e., 1½ inches. In use (as shown in FIG. **12**) the outwardly sloping side walls **41** are pressed inwards so that the hooks **40** come together whereupon they are slipped in behind the side edges of the exterior wall panels **29** engaged on a exterior wall post **25.** When the hooks **40** are in place the sides **41** are released so that the joining member **38** locks into position. The interior wall panel groove **31** can thus engage the joining member **38** to assist in holding the panel **30** in position.

The top plate **34** can include tie components and straight components. Each tie plate has a hole positioned to suit the hole in the top end of a wall post **20** or **25** and a turned down end shaped to engage into an adjacent hole of an adjacent top plate **34.**

In further describing the method of erecting the structure a suitable foundation is provided. This foundation can be a wooden floor foundation, comprising flooring **37** on joists **42,** upon which the exterior bottom plate components **10, 11** and **12** are placed around the perimeter of the foundation. This plate also serves as a flashing for weathering with the lips **13** engaging on the underside of the flooring foundation. Using the holes provided in the exterior bottom plate as a template, holes are drilled through the floor **37** and floor joists **42** of the timber foundation. The studs **24** at the bottom ends of the wall posts **20** and **25** are now passed through the respective aligning holes in the exterior bottom plates **10, 11** and **12,** the floor **37** and the loor joists **42** and secured by washers and nuts screwed on to bottom ends of the studs projecting from the underside of the floor joists. In the case of a concrete floor, the holes are similarly drilled and the wall post studs pass through aligning holes in the bottom plates and the concrete floor and similarly secured with washers and nuts underneath the concrete floor. The top plate **34** is not fitted into the grooved top ends **22** and **27** of the wall posts **20** and **25** and the top grooved sides **31** of the wall panels **29** and corner tie plates having their turn-downed ends engaging into a hole of an adjacent top plate **34.**

Another stud **24** is screwed into the top end of each wall post **20** and **25** and then through the hole in the tie plate where applicable and through holes formed in the roof truss **43** and secured with a washer and nut screwed onto the stud **24.** The roof truses are of lumber and assembled with nailplates **44** for maximum strength. These may vary in size of lumber to suit the span of the house. The floor **37** is thus secured to roof trusses **43** at the 3 feet intervals along the exterior walls giving maximum strength. Any type of roofing may be used, i.e., corrugated iron, Decramastic tiles, slates, etc., fixed to appropriately spaced purlines. Ceiling joists are fixed between the trusses to carry the appropriate ceiling required.

The wall posts are positioned on the 3 feet center holes to all walls with a wall panel or joinery panel having similar sides similar to those of the wall panels. These joinery panels can include window frames of full panel size to allow for a standard wall panel to be interchanged with a standard wall panel. Window frames can be anodised aluminium with louvre or awning type windows. If desired a single nonopening picture window can be used. Door frames can be of timber treated Tanalith 3.5 lbs./cu. ft. multisalt retention treatment (Wolmanizing) and full panel size.

Interior walls are fixed in a similar way to the exterior walls by fixing the predrilled plate **36** to the floor **37** on the centre line of walls where required. A short stud or bolt is then screwed into a wall post **25** which is then placed in the fixed plate **36.** There is no need to take the bolt through the floor **37** except when wooden

floors and foundations are likely to experience cyclonic conditions. The other end of the post is then bolted through the top plate **34** and the bottom chord **45** of the roof truss as detailed above.

Doors are 6 feet 6 inches x 2 feet 8 inches with a small fixed panel above. The doors of flush drum type and termite-treated. Cupboards can be installed by screws passing into wall posts with metal-threaded screws.

All plumbing pipes are assembled and laid out on the building site before pouring the concrete floor or before fixing the wooden floor so that all pipes are correctly positioned to enter kitchen or bathroom units from vertically below the position of taps. All pipes leading to the various units go inside each unit cabinet. Electrical wiring is carried through the holes **33** positioned in each wall panel. These wires can be brought to the surface by drilling a hole or positioning a switch box at the required height as the wiring holes run the full length of each panel.

We claim:

1. An improved building structure comprising exterior bottom plate adapted for mounting around the perimeter of a foundation and having a tongue extending along the length of the plate with holes spaced along such tongue, a plurality of wall posts each having grooved ends and a lower stud of a length to pass through a selected one of the said holes when the lower groove end of the post fits upon the said tongue, a plurality of wall members, including joinery and window panels, each having a height equal to the length of the wall posts and grooved sides including a grooved bottom side fitting upon the tongue of the exterior bottom plate and a grooved vertical side to accommodate a vertical marginal part of an adjacent wall post, a top plate passing along said fitting within the top grooves of the wall posts and the wall members, the top plate having holes positioned to align with the wall posts, studs passing up from the posts and through the holes in the top plate for passing up through holes in roof trusses, the construction and arrangement being such that when the bottom studs are passed through holes in a foundation and secured and the top studs through holes in the roof trusses and secured, the roof trusses, the wall components and the bottom plate are locked to the foundation as a composite structure.

2. A structure as claimed in claim **1** wherein the bottom plate comprises external angle components, straight length components and joining components for combining adjacent straight length components, all components having an upstanding tongue on their top edge, the tongue being of a predetermined height and width, the angle component being of a right angle shape in plan.

3. A structure as claimed in claim **2** wherein the bottom plate components are each fabricated out of sheet metal and each have an upturned lip formed on their lower edge.

4. A structure as claimed in claim **2** wherein the joining component has a hole medially in the length of the tongue, the angle component has a hole provided in the tongue centrally at the corner thereof and the straight length components have a number of holes provided in the tongue and spaced at a regular pitch.

5. A structure as claimed in claim **1** wherein the wall posts are constructed of a length equal to wall height of the structure and are of a hollow section, there being an external angle wall post for corners of the structure of right angle shape in plan and an external/interior wall post of rectangular shape in plan.

6. A structure as claimed in claim **5** wherein each grooved end of the wall posts is provided with a central screw threaded hole in which the stud is located.

7. A structure as claimed in claim **1** wherein the wall members are of panel nature fabricated from sheet material and of hollow section, the top groove of each wall member being provided with at least one opening through which at least one polymer from a group consisting of polyurethane and polystyrene can be admitted to fill the hollow panel and thus provide a core in the said panel.

8. A structure as claimed in claim **7** wherein one surface of said wall member is coated with a polyvinyl and the other is coated with at least one polymer from the group of polyvinylidene fluoride and polyvinyl resin.

9. A structure as claimed in claim **1** wherein the top plate consists of an inverted channel section substantially of the same cross sectional dimensions as the tongue of the bottom plate and is provided with a series of holes to align with holes in the tops of the wall posts and wall members.

10. A structure as claimed in claim **1** wherein a joining member is provided for wall to wall junctions, the joining member being formed from a length of sheet material, substantially equal to the length of the wall posts, into a romboid cross sectional shape in plan, the longer side of the romboid section being cut midway in its length and each part folded back to form a hook portion.

11. An improved method of erecting a building structure comprising placing bottom exterior plate around the perimeter of a foundation, mounting wall posts upon the plate by insertbottom studs of the posts through holes in the plate and holes in the foundation and secured by washers and nuts screwed onto bottom ends of the studs, mounting wall members including joinery and window panels between adjacent wall posts, a top plate passing over the top ends of the wall posts and the top sides of the wall members, the top plate having holes for top studs from the wall posts passing up through the holes in the top plate and through holes in roof trusses and secured by washers and nuts so that the roof trusses, the wall components and the bottom plate are locked to the foundation as a composite structure.

* * * * *