Oct. 19, 1965 H. SKLAROFF 3,212,221

PREFABRICATED HOUSE CONSTRUCTION

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Fig. 1

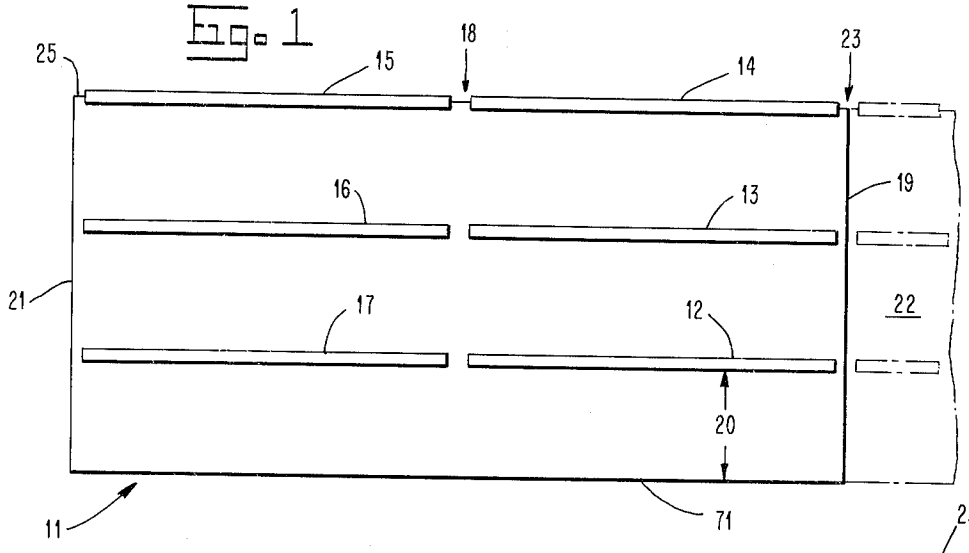
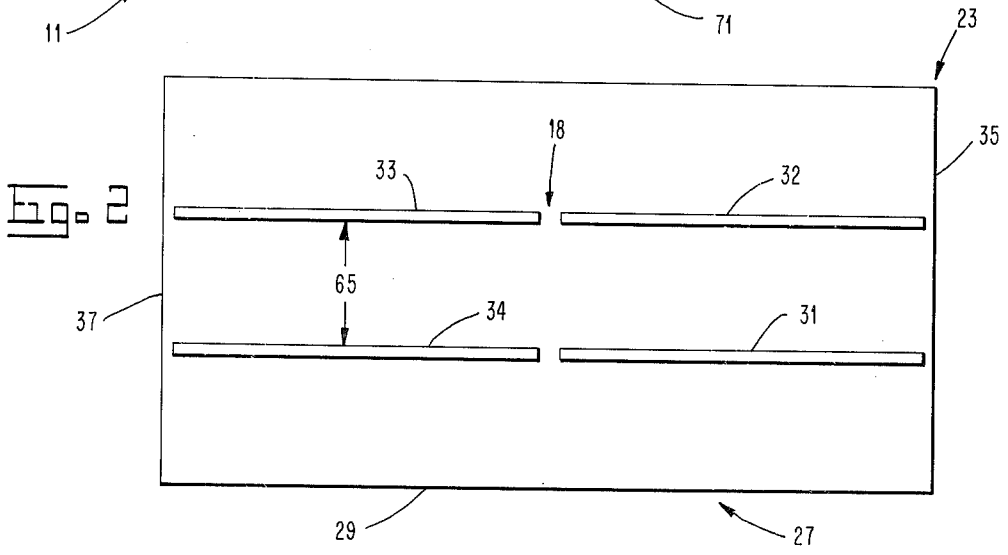


Fig. 2



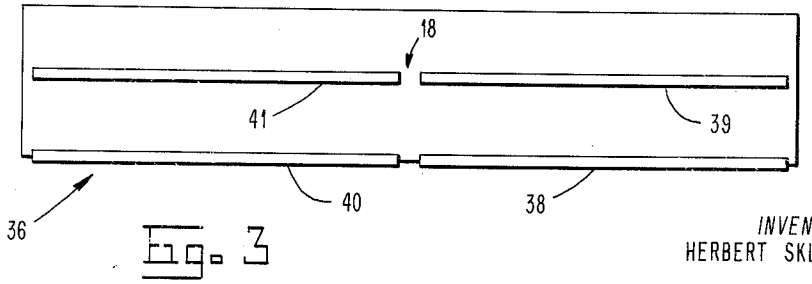


Fig. 3

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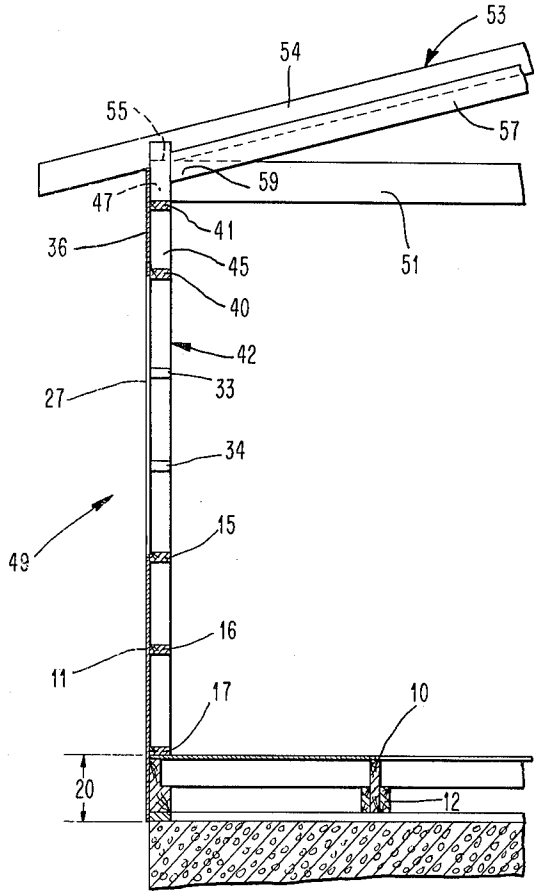

Fig. 5

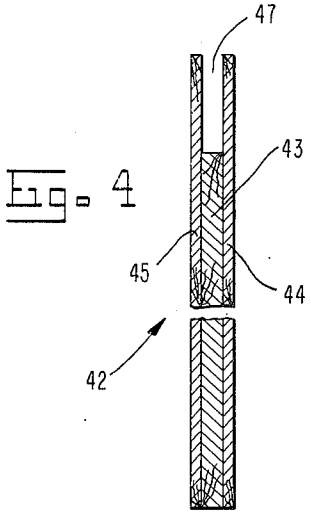

Fig. 4

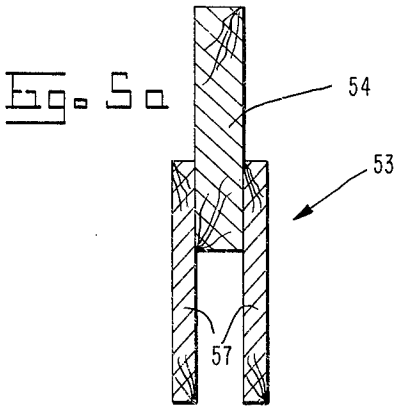

Fig. 5a

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PREFABRICATED HOUSE CONSTRUCTION

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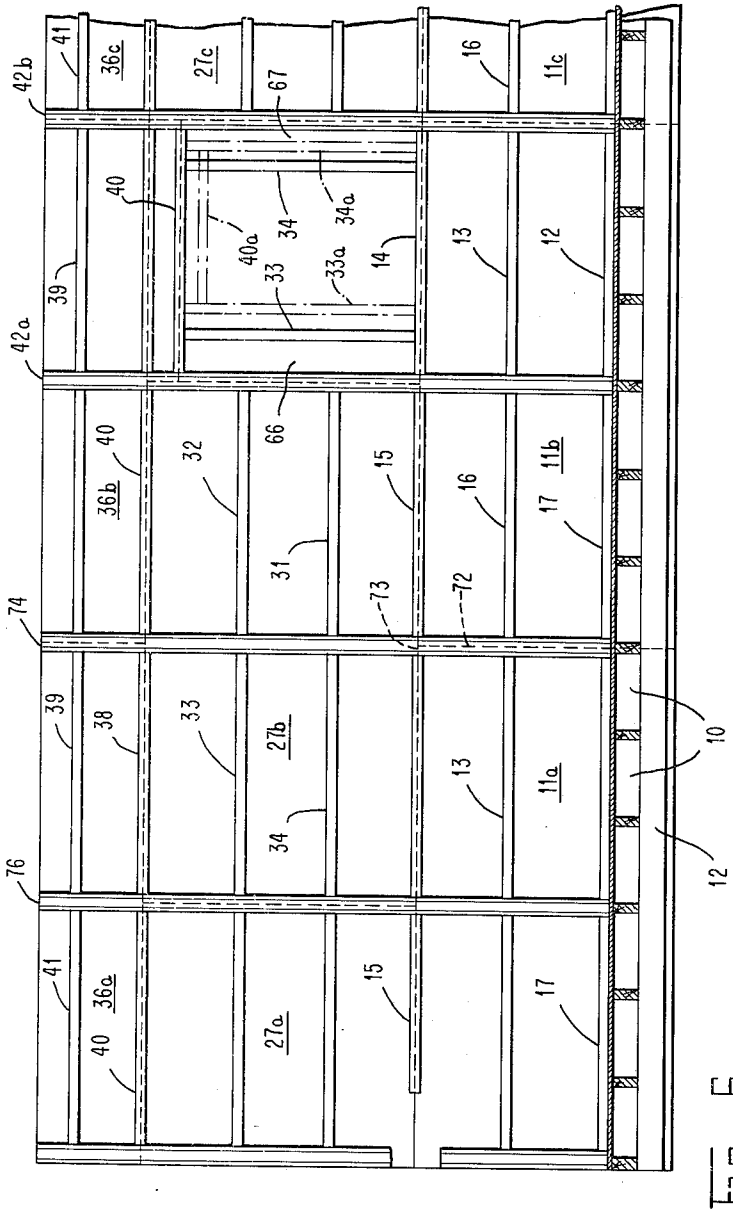

Fig. 6

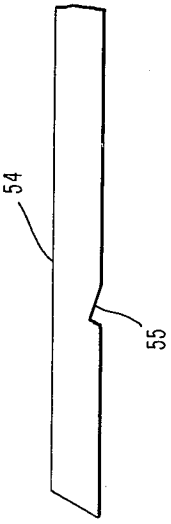

Fig. 7

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3,212,221

PREFABRICATED HOUSE CONSTRUCTION

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Filed Dec. 17, 1962, Ser. No. 245,170
5 Claims. (Cl. 52—93)

This invention relates to prefabricated buildings and more particularly to the side walls and roof frame construction. The invention described herein is a continuation-in-part of that described in my co-pending case entitled Building Construction Member, Serial No. 161,842, filed Dec. 26, 1961, now Patent No. 3,186,037.

Prefabricated buildings have become increasingly more in demand with the improved structural designs thereof. It has been found that prefabricated buildings, which can be built with factory precision and factory tolerances, are structurally more sound and less expensive than buildings built on the site.

Despite the obvious advantages, with respect to structural improvement attainable in a prefabricated building, certain undesirable design features and practices have been carried over into the prefabricated building art from "on site" building activity. For instance, improvement in trussed roof designs, or the mounting of such frames has not kept pace with other improvements in the prefabricated building art. It is equally true that improvements in wall designs and stud posts for interlocking therewith have lagged behind the improvement in other areas of the prefabricated building effort. The present invention is directed to improvements in the above mentioned and other areas of prefabricated building activity as will become apparent.

Accordingly, it is an object of the present invention to provide an improved prefabricated building.

It is a further object of the present invention to provide an improved wall structure wherein the wall sections are locked onto the stud posts by stringers secured to the wall sections.

It is another object of the present invention to provide means to lock the wall sections to each other at their abutting horizontal edges.

It is a further object of the present invention to provide a trussed roof structure which can be easily mounted on a pair of stud posts and which is locked to the stud posts even without securing means such as bolts, nails, etc.

It is a further object of the present invention to provide a modular wall section arrangement whereby the wall sections which form the major wall areas can be readily transformed into wall sections which provide window frames and the like.

It is another object of the present invention to provide a modular wall section arrangement wherein the wall sections overlap each other in staggered fashion so that no two adjacent joints occur at one perpendicular or horizontal line.

It is an even further object of the present invention to provide a trussed roof structure which directs the vertical compression force resulting from the weight of the roof through the depth of an associated ceiling joist to the vertical axes of a pair of associated supporting stud posts.

It is another object of the present invention to provide a trussed roof structure which has roof rafters that are characterized by extraordinary depth for structural strength and which are designed to lock onto associated ceiling joists.

The foregoing and other objects and features of the invention will be best understood by reference to the following description of the invention taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is a schematic view of a lower wall section;

FIG. 2 is a schematic view of a middle wall section;

FIG. 3 is a schematic view of an upper wall section;

FIG. 4 is a schematic front view of stud post;

FIG. 5 is a sectional schematic view showing a wall construction in combination with a trussed roof frame;

FIG. 5A is an end view of a roof rafter;

FIG. 6 is a schematic view of an inside wall showing a window frame formed by selected parts of the wall sections;

FIG. 7 is a side view of a roof rafter showing a notch cut therein to fit an associated ceiling joist.

When a building, such as a house, is constructed (assuming the foundation has been poured or is laid-up masonry), it is the practice to first secure anchored sills to the foundation. Thereafter floor joists are attached to the sills and to a midway girder. After the floor has been secured to the floor joists, the structure is considered solid enough to hold the wall frames of the house.

In "on site" building, the wall frames (not including sheathing) are usually assembled separately and then each frame is lifted into place and temporarily braced. When all of the outside walls have been raised they are permanently secured together. In a prefabricated house, wall panels, including the sheathing, are raised and secured together. In both the "on site" building and in the prefabricated building, the wall sections are secured together by wall plates which are the top horizontal elements of each wall frame.

After the walls are securely braced together, in either "on site" or prefabricated buildings, the roof rafters are secured to the wall plates, while the ceiling joists are each fastened to a pair of roof rafters (as well as to the wall plates) to form a trussed roof.

In accordance with the present invention, the roof rafters and ceiling joists can be preassembled to provide trussed roof frame segments. Each such frame segment can be mounted on a pair of stud posts on opposite sides of the house to permanently support and brace the associated stud posts without necessitating that each of the walls be first raised, temporarily braced and then permanently braced.

Further in accordance with the present invention, after the stud posts have been mounted and supported by the trussed-roof frame segments, relatively small (and interchangeable) wall sections having stringers running horizontally are easily locked onto the stud posts to give lateral support to the stud posts, through the stringers, in the same way that wall plates give lateral support to prior art studs.

It should be apparent, and will become more so hereinafter, that the relatively simple steps of assembling the stud posts with the trussed roof frames and then securing relatively small wall sections as just described provides an improved method of assembling a prefabricated building.

In addition, as will be appreciated from a later discussion, certain structural improvements accompany this easy assembly design of the present invention.

Consider FIGURES 1, 2 and 3 which depict three types of wall sections. FIGURE 1 shows a lower wall section **11** which in a preferred embodiment has a vertical dimension of four feet and a horizontal dimension of eight feet. A lower wall section of such dimensions is relatively easy to handle compared to a full wall section as heretofore employed. Obviously the lower wall section **11** could have other dimensions than four feet by eight feet.

As shown in FIGURE 1, there are two columns of stringers (**12** through **17**) with each column having three stringers. The stringers **12** through **17** are secured to the inside surface of wall section **11**.

The stringers **12**, **13** and **14** are separated respectively in a horizontal direction from their associated stringers **17**, **16** and **15** by a distance which is equal to the width of a stud post **42** (FIGURE 4). Each pair of stringers, for instance stringers **12** and **17**, form an open ended slot **18** which is the width of a stud post **42** (FIGURE 4). Further each of the stringers **12**, **13** and **14** is separated in a horizontal direction from the vertical edge **19** by a distance which is one half the width of stud post **42**.

Similarly the stringers **15**, **16** and **17** are separated from the vertical edge **21** by a distance which is equal to one half the width of stud post **42**.

When wall section **11** is joined to a similar wall section **22** (with their vertical edges abutting, such as vertical edges **19**) the stringers of wall section **11** form with the stringers of the adjacent wall section **22** and open ended slot **23** which is equal to the width of slot **18** and of course is equal to the width of stud post **42**.

It should be noted that the stringers **14** and **15** overlap the horizontal edge **25** of wall section **11** by a distance equal to one half the width of the stringers. The above described over-lap enables a middle wall section (or simply another wall section) such as wall section **27** (FIGURE 2) to be secured to wall section **11** by the stringers **14** and **15** when the lower horizontal edge **29** (of wall section **27**) abuts the upper horizontal edge **25** (of wall section **11**). In this fashion the various wall sections can be secured together to form a large wall structure.

It should be further noted that the lower sheathing dimension **20** is designed so that when the wall section **11** is secured to the stud posts, the sheathing section **20** will cover the outer portion of the building from the sub floor to the sill. This arrangement can be seen in FIGURE 5.

Referring to FIGURE 2, it can be seen that the middle wall section **27** only has two stringers in each column. The stringers **31** and **32** are separated from the stringers **33** and **34** to form the open ended slot **18** which is the counter part of slot **18** of wall section **11** (FIGURE 1). Further as shown in FIGURE 2, the stringers **31** and **32** are formed to provide one half of a slot **23** between their respective ends and vertical edge **35**. On the opposite side, the stringers **33** and **34** form one half of a slot **23** between their respective ends and vertical edge **37**.

In FIGURE 3 an upper end wall section **36** is shown. The stringers **38** through **40** form a slot **18** as shown; half slots between their respective ends and the vertical edges; and an overlap (stringers **38** and **40**) to enable the upper wall section **36** to be secured to the middle wall section **27**.

The wall section **36** when rotated ninety degrees serves to provide a support to which a window frame can be secured as will be discussed later.

In FIGURE 4 there is depicted a stud post **42** having a middle section **43** and two outer sections **44** and **45**. Since the strength of a post, with respect to horizontal forces, is proportional to the cube of the depth of the post, a stud post must have at least a certain minimum depth. In a preferred embodiment, the stud posts are four inches wide. However, since in the present invention, certain of the stud posts are required to accommodate the trussed roof frames (see FIGURE 5), it is necessary to provide an open ended slot **47** at the top of the stud post **42**. In order to provide both the required depth as well as the open end slot **47**, the stud posts on two sides of the building are made up of three sections as shown in FIGURE 4.

In FIGURE 5, there is shown a cut away wall which is secured to a trussed roof section. Wherever possible the identification numerals of FIGURES 1 through 4 will be used to described similar elements in FIGURE 5.

The wall **49** is made up of three wall sections **11**, **27** and **36**, as respectively described in connection with FIGURES 1, 2 and 3. The wall sections **11**, **27** and **36** are secured to the stud post **42**. The stud post **42** fits into a

continuous open ended solt **18** described above in connection with FIGURES 1, 2 and 3. The stringers give lateral support to the building as the respective ends of each stringer abut an associated pair of stud posts.

It should be understood that although only three modular wall sections **11**, **27** and **36** are shown, a full wall could be made up of a number of these modular sections. For instance, two lower sections **11** could be mounted one on top of the other, i.e. the lower edge **71** of the tape section **11** could be overlapped by stringers **14** and **15** of the wall section **11**. Thereafter, a middle section **27** and an upper section **36** could be mounted on the double lower section to provide a wall of much greater height than the height of wall **49** in FIGURE 5. It can be readily appreciated that, depending on the dimensions of the building, all sorts of combinations of the modular wall sections can be employed and by altering the wall section dimensions per se, any odd sized walls can be accommodated.

The stud post **42** has an open ended slot **47** into which the ceiling joist **51** fits. The ceiling joist **51** rests on the middle section **43** (FIGURE 4) of the stud post **42** and is secured to the outer sections **43** and **44** (FIGURE 4) of stud post **42**.

The roof rafter **53** has a notch **55** cut therein (see FIGURE 7) to fit the corner of the ceiling joist **51**. The roof rafter **53** is also fitted into the open ended slot **47** (FIGURE 4) of stud post **42** to rest on ceiling joist **51** and to be secured to the outer sections **45** and **44** (FIGURE 4) of stud post **42**.

Further as can be determined from FIGURE 5, the roof rafter **53** has two outside sections or laminations **57** and a middle section **54** (see FIGURE 5A). One of the outside sections **57** can be seen and it should be understood that there is a similar outer section on the rear side of rafter **53**. The outer sections (section **57** and its counter part) serve a two fold purpose. First the outer sections provide increased depth for the roof rafter **53** which, as understood, provides increased strength for the rafter **53**. Secondly the outer section **57** (and likewise the rear outer section) abuts the outer section **45** (FIGURE 4) of stud post **42** as well as overlapping the ceiling joist **51** in the area **59**. Therefore, the roof rafter **53** can be easily preassembled with the ceiling joist **51** by being secured thereto at the overlap area **59**. Since the roof rafter **53** is secured to the ceiling joist at **59** and since the outer section **57** abuts the stud post outer section **45**, it follows that the trussed roof section can be fitted and locked into the slot **47** (FIGURE 4) of stud post **42** even without securing means such as nails or bolts, although such securing means are actually used.

In FIGURE 5A, it can be seen that the middle section **54** of rafter **53** extends above the two outside laminations **57**. The middle section **54** accommodates the slots in the roof panels which are similar to the side panel members described herein and particularly described in my co-pending application, Serial No. 161,842. It should be further noted that members **53** may be used as floor joists since they can accommodate floor panels in the same way as the roof panels, also as described in my co-pending case (supra).

When the building design calls for a window in a wall, the wall sections shown in FIGURES 2 and 3 can be employed. Window frames must be secured to something similar to a stud and in "on site" building such window frames are indeed secured to studs. In the present invention a window support, i.e. means for supporting the window frames, can be provided by rotating a wall section, such as wall section **36**, so that its stringers are positioned vertical rather than horizontal. By precutting the wall sections to proper size, the section can be simply secured to the stud post and provide a stringer as a stud for a window frame.

Consider FIGURE 6 which shows a view of the inside of a prefabricated building employing the present novel structure and which shows in particular how a window frame, or window support, can be created by altering the wall sections **11**, **27** and **36**. Wherever possible identification numbers related to identical elements in other figures will be used.

In FIGURE 6 it can be seen that the modular wall sections **27** and **11** are arranged in a staggered brick-like fashion, i.e. the edge **72** where two of the lower sections **11** are in abutment lies perpendicular at point **73** to the middle of the overlapping modular wall section **27***b*. This brick-like arrangement lends structural strength to the wall since each post is supported by two adjacent posts by virtue of its modular wall section which is locked thereto at its middle slot **18**. For instance the post **74** is supported by posts **42***a* and **75** through the modular wall section **27***b* secured thereto at its middle slot **18**.

There is shown in FIGURE 6 two middle wall sections **27***a* and **27***b* or portions thereof and three lower wall sections **11***a*, **11***b* and **11***c* or portions thereof. Consider that the middle wall section **27**, shown in FIGURE 2, is cut through the middle of slot **18** so that there results two sections of the wall each having two stringers. Next consider that one of these sections with stringers **33** and **34** thereon is rotated ninety degrees, and the middle sheathing portion **65** is removed so that each stringer **33** and **34** is flush with the adjacent (newly cut) edge of the sheathing to which it is attached. By the above described alterations, there would be created two window wall sections each of which has one stringer thereon and wherein said stringer is flush with the newly cut edge of the wall sheathing. Two such window wall sections **66** and **67** are shown in FIGURE 6. The window wall section **66** is secured to the stud post **42***a* while the window wall section **67** is secured to the stud post **42***b*. Accordingly the stringers **33** and **34**, in FIGURE 6, form two sides of a window frame or provide two stud like supports to which a window frame can be secured. It should be clear that by altering the wall sections **11**, **27** and **36** according to different lengths, the window frame can be formed at a plurality of locations such as shown by the dashed line stringers **33***a* and **34***a*.

The bottom support for the window frame as shown in FIGURE 6 is provided by stringer **14** (FIGURE 1) of the lower wall section **11**. The top support for the window frame is provided by stringer **40** of an altered upper wall section **36**, the alteration of which would be similar to that described earlier, but in accordance with the dimension necessary to fit the location between stud posts **42***a* and **42***b*.

While I have described above the principles of my invention in connection with a specific structure, it is to be clearly understood that this description is made only by way of example and not as a limitation to the scope of my invention as set forth in the objects thereof and in the accompanying claims.

I claim:

1. In a prefabricated building the combination of:

(a) a building framework including a plurality of stud posts, ceiling joists and roof rafters;

(b) a plurality of wall sections each of which has an inside surface and an outside surface and each having a plurality of horizontal stringers secured to its inside surface;

(c) said stringers being separated in a horizontal direction from each other to form an open ended slot which is equal in width to the width of one of said stud posts and further each of said stringers being separated in a horizontal direction from the vertical edge of its associated wall section by a distance equal to one half of the width of one of said stud posts, such that when two of said wall sections abut each other along their vertical edges their respective stringers form an open ended slot at said abutment,

having a width which is equal to the width of one of said stud posts;

(d) said wall sections being secured to said stud posts such that said stud posts fit into said open ended slots formed by said stringers;

(e) a portion of said plurality of stud posts, being located along a certain pair of opposite sides of said building, and having a middle lamination and two outer laminations each of which has a wide side, said two outer laminations being secured to said middle section with their wide sides in abutment, and said two outer lanminations being of different length than the middle lamination to provide an open ended slot at the top of said stud post;

(f) each of said ceiling joists fitting into a pair of said open ended slots respectively of a pair of associated stud posts, and said ceiling joists being secured to the outer laminations of said stud posts and resting on the tops of said middle lamination;

(g) each of said roof rafters having a middle lamination and two outer laminations with said outer laminations abutting the two outer laminations of an associated one of said stud posts;

(h) and each of said ceiling joists being secured to the outer laminations of an associated pair of said roof rafters.

2. In a prefabricated building the combination according to claim **1** wherein said wall sections include at least some lower, middle and upper wall sections and wherein each of said lower wall sections has its upper-most stringers extending over its upper horizontal edge to provide a means for overlapping and securing said lower wall sections to one or more adjacent middle wall section.

3. In a prefabricated building according to claim **2** wherein each of said upper wall sections has its lowermost stringer extending over its lower horizontal edge to provide a means for overlapping and securing said upper wall section to associated ones of said middle wall sections.

4. In a prefabricated building the combination according to claim **1** wherein certain of said wall sections are disposed vertically and wherein said wall sections are formed and fitted to certain of said stud posts to enable their stringers to provide vertical support means for a window frame.

5. In a prefabricated building the combination of:

(a) a building framework including a plurality of stud posts, ceiling joists and roof rafters;

(b) a portion of said plurality of stud posts, being located along a certain pair of opposite sides of said building, and having a middle lamination and two outer laminations each of which has a wide side, said two outer laminations being secured to said middle lamination with their wide sides in abutment with said middle lamination, and said two outer laminations being of different length than the middle lamination to provide an open ended slot at the top of said stud post;

(c) each of said ceiling joists fitting into a pair of said open ended slots respectively of a pair of associated stud posts, said last mentioned stud posts located opposite each other on opposite sides of said building, and said ceiling joists being secured to the outer laminations of said last-mentioned stud posts and resting on the tops of said middle lamination;

(d) each of said roof rafters having a middle lamination and two outer laminations with said outer laminations formed to abut the two outer laminations of an associated one of said stud posts;

(e) and each of said ceiling joists being secured to the outer laminations of an associated pair of said roof rafters.

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