May 28, 1968 P. E. SEVERSON 3,385,013

PREFABRICATED DELTA BUILDING STRUCTURES

Filed July 26, 1965 2 Sheets-Sheet 1

FIG. 9

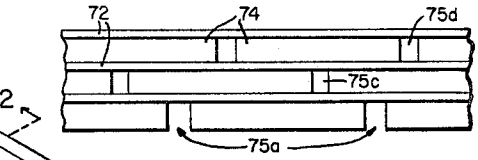


FIG. 1

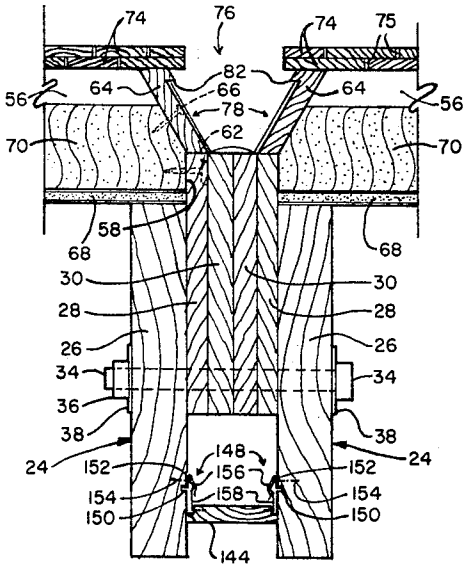


FIG. 3

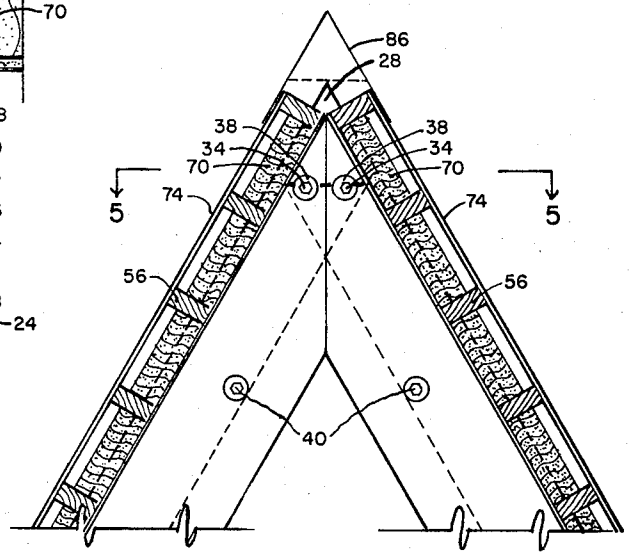


FIG. 2

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PREFABRICATED DELTA BUILDING STRUCTURES

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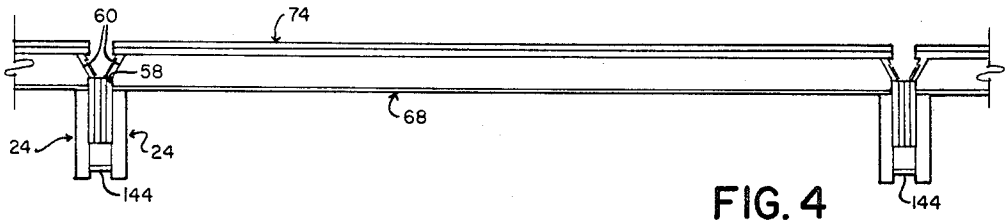


FIG. 4

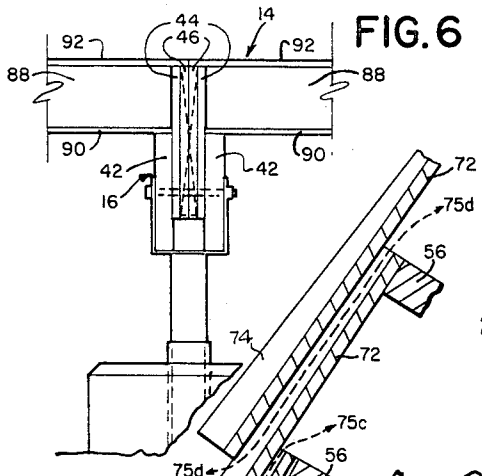


FIG. 6

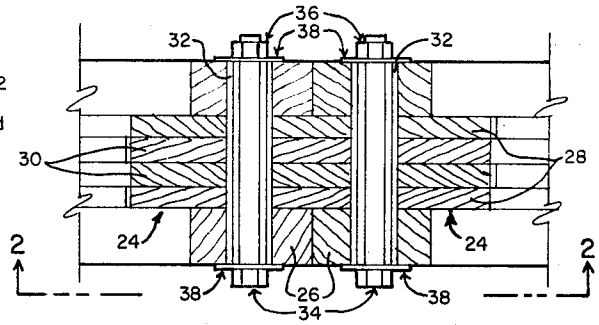


FIG. 5

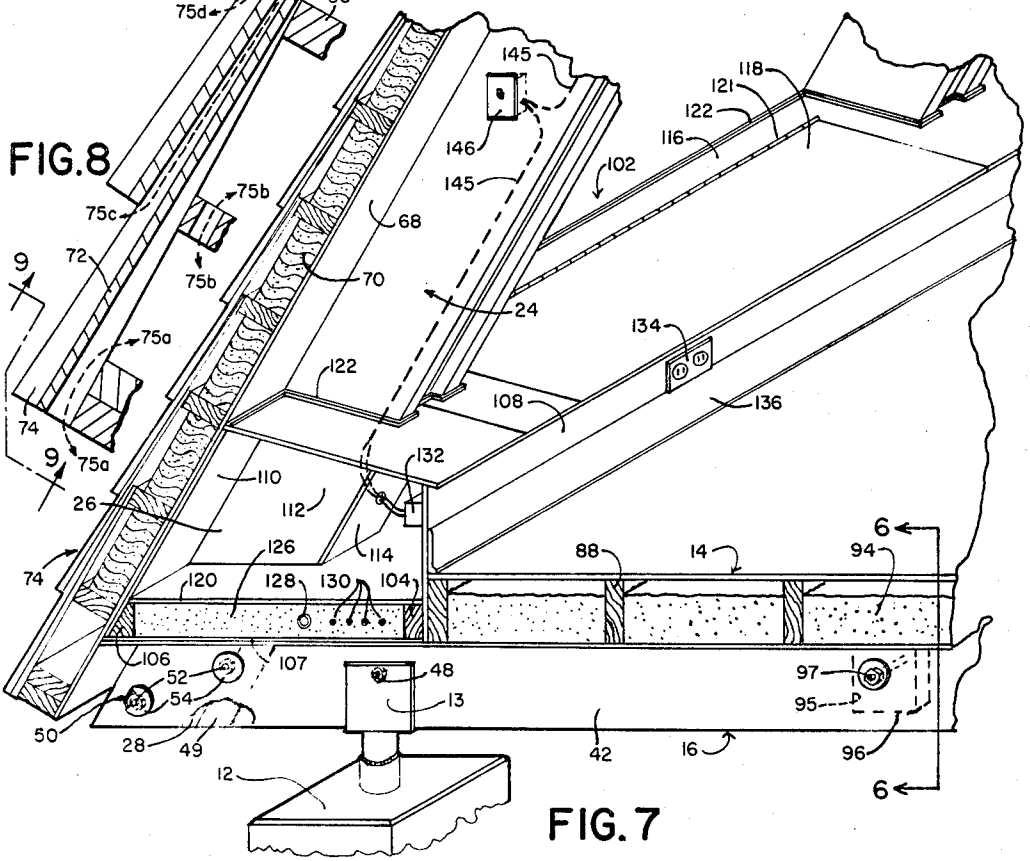


FIG. 8

FIG. 7

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3,385,013

PREFABRICATED DELTA BUILDING STRUCTURES

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20 Claims. (Cl. 52—90)

ABSTRACT OF THE DISCLOSURE

This invention has to do chiefly with peripheral shell features of prefabricated buildings of the delta type, and components thereof.

These features include:

(a) The provision of water-tight joints, including snapped-in-place gutters between adjacent wooden roof sections.

(b) The division of a roof section into tiered pockets, with insulation disposed in a lower portion of each pocket, and with a cover composed of overlapped courses of spaced shingles, and interposed strips of sheathing felt, so constructed and arranged that each pocket communicates freely with the atmosphere through channels bonded laterally by adjacent shingles of a course, and bounded, in part, above and below, by layers of sheathing felt.

(c) The arrangement of laminated roof beams of adjacent sections to provide continuous channels interiorly of the structure for accommodating utility conductors, together with ornamental hiding or cover strips removably secured in the channels.

(d) The provision of a prefabricated storage box, which desirably extends the full length of the building and in which prefabricated utility conductors with suitable inlets and outlets are housed.

(e) Practical and advantageous interrelationships of roof beams to one another, of floor stringers to one another, and of roof beams to floor stringers, for promoting fast, efficient, precise and sturdy assembly of the building, and subsequent disassembly when desired.

This invention relates to building structures, and more particularly, though not exclusively, to prefabricated houses of the delta type and components of such houses.

It is a primary object of the invention to provide an inexpensive, but comfortable, sturdy, durable and attractive building which can be erected very expeditiously and with a minimum of labor at the building site.

It is a further object to provide a prefabricated house, the components of which can be taken down, moved, reassembled and re-erected quickly, conveniently and economically.

To the foregoing ends, it is advantageous to make the building of the delta type. In such a structure the primary and essential framework of the entire building may consist essentially of parallel, horizontally disposed, composite, ground floor supporting stringers and oppositely sloping sets of parallel composite roof supporting beams.

Most advantageously, each roof side is composed of completely fabricated sections designed to extend from the peak of the roof down to a level below the ground flood. Each section desirably includes as unitary parts of its structure, massive, laminated, lap-jointed, interiorly disposed beams that extend continuously along its opposite longitudinal margins, the beams of adjacent sections being adapted to be brought together and united to form composite beams. With a structure of the kind outlined a building whose ground floor measures thirty-two feet long may desirably have its frame composed essentially of five composite stringers disposed on eight

foot centers and ten composite beams also disposed on eight foot centers. For each eight feet of added length, there would be one additional stringer and two additional composite beams. Limitation to the unit dimension of eight feet is not essential. It simply fits in well with conventionally available building materials.

The present invention is directed primarily to features which are embodied in the peripheral shell of the building, and which contribute importantly to the practical realization of a building structure of the kind referred to.

One of the chief difficulties involved in making a roof consist of a series of pre-covered sections disposed side by side in coplanar abutting relation has to do with making the roof watertight at the joints between the sections. This problem is solved in a simple and highly practical manner by the present invention.

Another important feature of the invention has to do with the construction of the room in a manner which provides effective insulation and which effectively avoids damage to the roof framing through moisture condensation. It is essential that a delta roof, itself, shall provide effective heat insulation within its own framework, there being no attic floor which may be insulated, and no possibility of providing an attic air space of any substantial area. Generally the framework of the roof, itself, consists chiefly of parallel beams which run from peak to eaves, with insulation strips stapled to the beams and with sheathing boards and sheathing felt overlying the beams and forming a vapor barrier. Shingles or other conventional covering materials are applied over the sheathing. This is completely wrong in principle. In the house of the present invention, on the other hand, concentration of heat by convection within the roof and particularly near the roof peak is avoided by making the roof framework consist chiefly of edgewise supported joists or studs which extend horizontally between massive beams, so that the studs divide the roof structure into a succession of segregated horizontal tiers or pockets. Shingles are applied row by row to the outer, edge faces of the joists, without the presence of any vapor barrier, so that the roof can breathe freely through spaces between the shingles. Thus, hot air, which is likely to be moisture laden, may escape freely from the spaces in the roof pockets which lie over the insulation and beneath the shingles, and be continually replaced by cooler air, generally of lower moisture content, from outside. This feature is a very advantageous one as the roof cools after sundown, and in cold weather when the outside air would always be colder and would generally have a lower moisture content than air trapped in the roof.

There are other difficulties involved in a prefabricated house of the delta type, such as (a) the practical prefabricating of the plumbing and electrical systems; (b) the avoidance of useless, unsightly, dirt collecting spaces in the angles formed where the ground floor meets the roof; (c) the providing of ample storage space; and (d) the closing and effective sealing of the junction of the roof and floor. These difficulties are solved by a common expedient, and in a simple and efficient manner, by the present invention.

Another feature of the invention has to do with the way in which composite roof beams and composite floor stringers are associated with, and rigidly connected to, one another. The composite beams, through which the prefabricated roof sections are united, rest upon ends of the composite stringers and are narrowed at their lower ends to provide protruding tongues, which tongues fit snugly into forked ends of the composite stringers.

The interfitted tongues and forks are pre-bored for jigging the beams and stringers accurately in the desired, predetermined relationship, and are dowelled and bolted

together for securing and firmly maintaining that relationship.

A still further feature has to do with the provision of floor sections which include massive marginal stringers as integral parts of their structures.

Other objects and advantages will hereinafter appear.

In the drawing forming part of this specification,

FIGURE 1 is a perspective view of a practical and advantageous house of the delta type which is illustrative of the invention;

FIGURE 2 is a fragmentary, detail view in sectional elevation, taken upon the line **2**—**2** of FIGURE 1;

FIGURE 3 is an enlargement of a portion of FIGURE 4;

FIGURE 4 is a sectional view taken on the line **4**—**4** of FIGURE 1, the view being on a considerably larger scale than FIGURE 1, but section hatching being omitted because of the smallness of the scale;

FIGURE 5 is a fragmentary, detail, sectional view taken on the line **5**—**5** of FIGURE 2, and showing details of the beam union at the peak of the roof;

FIGURE 6 is a fragmentary view in sectional elevation, taken upon the line **6**—**6** of FIGURE 7;

FIGURE 7 is a fragmentary sectional view taken upon the line **7**—**7** of FIGURE 1;

FIGURE 8 is a vertical, staggered sectional view showing in detail the arrangement of shingles and felt which provides a breathing roof structure; and

FIGURE 9 is an edge view of the roof as viewed from the line **9**—**9** of FIGURE 8, looking in the direction of the arrows.

The house **10**, as shown in FIGURE 1, is desirably erected upon a suitable, level supporting structure, illustrated herein as consisting of piers **12** of poured concrete, and anchoring yokes **13** which are fixed in the piers. The complete house includes a variety of normal and/or optional prefabricated units such as bathroom, utility room, end wall, porch, stair, balcony and partition units. The significant novelty, however, resides substantially in what may be roughly called the peripheral shell of the house; i.e., the roof sides, the ground floor and combined storage and utility boxes which extend lengthwise of the house and bridge and seal the space between the ground floor and the roof. The description will, therefore, be substantially confined to these peripheral shell features.

While the invention is in no sense limited to any specific dimensions, the dimensions of certain parts will be stated in order to afford a more complete and realistic understanding of the structure of the very house chosen for illustration herein.

The ground floor **14** of the house shown measures thirty-two feet in length. It is composed of sections which include massive transverse, marginal supporting stringers **16**, which stringers extend from side to side of the building and are fixedly supported upon, and anchored to, the piers **12**.

The roof sides **17** and **18** provide both a roof and the lateral walls of the building. The roof sides and the ground floor combine to form an isosceles triangle, and in the illustrative case an equilateral triangle. Each roof side is composed of four sections **20**, each eight feet wide, and a narrow protruding front section **22**. Each of the sections **20**, with one exception, which will be referred to in detail later, extends continuously and uniformly from the peak of the roof down to the ground floor level.

Each of the roof sections includes along each of its longitudinal margins an internally located, laminated, lap-jointed beam **24**. (See particularly FIGURES 3 and 4.) As shown, each beam **24** is composed of three layers or laminae **26**, **28** and **30**.

It is important that the several layers of the beams correspond in thickness, respectively, with the corresponding layers of floor supporting stringers **16** and of one another. The layers **26**, in the illustrative case, are desirably milled from two by twelve timbers to a thickness of one and five-eighths inches and a width of ten and one-half inches, while the layers **28** and **30** may be composed of exterior grade plywood boards which are five-eighths and three-quarters inch in thickness, respectively, and which are both seven and three-quarters inches wide. All three layers are secured to one another by exterior grade adhesive.

For reasons which will be later explained, the layers **26**, **28** and **30** are related to one another as shown in FIGURE 4. FIGURE 4 shows two adjacent beams **24** juxtaposed and united to form a six layer composite beam, as would be done for joining two adjacent roof sections to one another. The outer edges of layers **28** and **30** of a beam **24** coincide with one another and are disposed outward beyond the outer edge of the layer **26** by one and one-half inches, while the inner edge of the layer **26** protrudes inward beyond the inner edges of the layers **28** and **30** by four and one-quarter inches.

When corresponding sections of opposite sides of the roof are erected in opposed relation, corresponding layers of the directly opposed beams are disposed in coplanar relation. In each beam **24**, the layer **26** is caused to terminate at its upper end in the vertical, central plane of the building, so that the layers **26** simply abut one another in that plane. On one of the beams, the layer **28** extends beyond the outer edge of the layer **26** of the opposed beam by one and one-half inches, to terminate flush with the outer edge of the layer **28** of the opposed beam. The layer **28** of the opposed beam is cut short, its upper end extending on a slope of sixty degrees in contact with the inner face of the layer **28** of the first beam. The relation of the layers **30** is the reverse of that of the layers **28**, the layer **30** of the first beam being cut short and the layer **30** of the opposed beam being extended (see FIG. 5). It will be seen that the arrangements at the ends of the first and second beams are different and complementary, so that they admit of an overlapping and interlocking relationship. If, at the factor, and without regard to the side of the house in which a roof section is to be installed, the roof sections are all made to include beams made like the first beam described above as right marginal beams, and beams made like thte opposed beam described above as left marginal beams, it will be seen that complentary beams will always oppose one another, because the right and left marginal beams of a section at one side of the roof will always be opposed, respectively, to left and right marginal beams at the opposite side of the roof. Thus, the normal sections of full width and length can always be made as duplicates of one another.

At the peak of the roof, where four of the beams **24** are progressively brought together, the four beams are joined by a pair of metallic dowel sleeves **32**, together with associated bolts **34**, nuts **36** and large washers **38**. The layers of the beams **24** are pre-bored to permit sleeves of substantial external diameter to be driven lightly through them. When the bores of an opposed pair of beams **24** have been brought into alignment, the sleeves, which may be pieces of ordinary galvanized steel pipe, say of one and three-eighths inches external diameter, and just a little shorter than the thickness of a composite beam, are driven in, each to approximately the full thickness of a single beam **24**; that is, to a depth equal to about half of the sleeve length. When a third beam (having a long layer **30**) is next put in place, the sleeves are further driven nearly through the layer **30**. When the fourth beam **24** is put in place, the partially inserted sleeves are driven the rest of the way into the interfitted, composite beams, and the bolts **34**, nuts **36** and washers **38** are applied, the washers being large enough in diameter to extend beyond the bores and bear against the beams themselves, but of sufficiently small internal diameter comfortably to receive, and to fit upon, the shanks of the bolts. The employment of dowel sleeves of substantial diameter is very advantageous, not only after the erection of the building has been completed, but during erection.

The roof sections are heavy and the forces tending to disturb the desired, normal relationships are very substantial. After erection, these disturbing forces are resisted jointly by completed connections of the roof beams to one another and to the floor stringers. Since these connections have to be effected by stages, and cannot be effected simultaneously, abnormal strains can be imposed during erection. The large diameter dowel sleeves have great strength and rigidity, but more important, they distribute the load over extended areas of the wooden beams, and thereby avoid enlargement of the bores and the consequent freedom for relative movement which would result from enlargement. The bores serve both as jig holes for assuring the assurate, predetermined association of the roof sections with one another, and as a means for facilitating the strong and rigid union of them. For each pair of adjacent beams **24** the joints described constitute terminal points of union of adjacent beams into composite beams, whereby adjacent roof sections are united in coplanar relation. Additional, smaller correspondingly located bores are provided (in the factory) at uniform, predetermined intervals along the beams, and through these bores adjacent beams are further united by bolts **40** to form a rigid unitary roof structure. These bores and the bolts **40** further serve as jigging means.

At the lower end of each composite beam, the layers **26** are cut on a bevel to provide horizontally disposed, supporting, lower shoulders which rest, respectively, upon side layers **42** of associated stringers **16**. The layers **28** and **30** of the two beams **24** form a projecting tongue which fits through a forked or notched end of the associated composite stringer formed by two of the stringers **16**.

Each composite stringer (FIG. 6) is similar in construction to a composite roof beam, in that it consists of two layers **42**, two layers **44**, and two layers **46**, which layers correspond in thickness, respectively, to the layers **26**, **28** and **30** of the roof beams. The three layers of each stringer **16** are united by exterior grade adhesive. Adjacent stringers **16** are clamped together by the yokes **13** and by bolt and nut combinations **48** through which they are attached to the yokes. The layers **44** and **46** are composed of exterior grade plywood boards. The layers **44** and **46** of the stringer are cut short of contact with the beam leayers **28** and **30** by a substantial amount and special filler blocks **49** are glued by exterior grade adhesive to the lower ends of the beam layers **28** and **30**.

The ends of the beam layers **28** and **30**, and the ends of the stringer layers **42** are pre-bored for the reception of dowel sleeves **50** whereby the stringers and the beams are caused to be firmly and rigidly united in accurately predetermined relation. Bolts **52**, nuts (not shown), and large washers **54** complete the assemblies, the same as in the case of sleeves **32**, bolts **34**, nuts **36** and washers **38** at the peak of the roof. Here, too, the dowel bores serve as jigging means for determining in advance and controlling accurately the assembly of the parts.

By the mere securing together of ten roof sections and five floor sections the rigid assembly of the peripheral shell of the house is completely effected and a shelter provided, and, assuming that the supportes are accurately located in advance in a common horizontal plane, there is no need in the erection of the building to resort to the use of plumb line or levels. By providing the roof sections of a uniform width not exceeding eight feet (except for the narrower front end sections) the roof sections can be carried flatwise on a boom truck of legal width to the building site, and can be conveniently erected through employment of the boom on the truck. Since the roof sections constitute both the lateral walls and the roof of the structure, the operations described above complete the erection of the lateral walls and the roof of the building.

In a roof composed of adjacent sections, as described, the provision of leak-proof joints between adjacent sections presents a serious problem. The manner in which this problem is solved represents an important feature of the invention.

It will be remembered that in each beam **24** the layers **28** and **30** are displaced outward relative to the layer **26**, the outer margins of the layers **28** and **30** projecting, say, about one and one-half inches beyond the outer boundaries of the layer **26**, and the inner boundary of the layer **26** protruding inward about four and one-quarter inches beyond the inner boundaries of the layers **28** and **30**.

The frame of each roof section includes two of the beams **24** located, respectively, at the opposite margins of the roof section. The roof framework is also made to include joists **56** whose ends comprise square-cut end portions **58** and beveled end portions **60**. The beam layers **28**, before having the layers **30** adhered to them, are attached to the square-cut end portions **58** of the joists **56** by nails **62** and by exterior grade adhesive. Wooden end strips **64** are secured by nails **66** to the beveled end portions **60** of the joists **56**. (See FIGURE 3 where a portion of the insulation is broken away.) Sheets **68** of three-eighths inch material, either plywood or wall board, are secured to the inner faces of the joists **56** to form a continuous inner wall. At their ends the sheets **68** engage the vertical walls of the beam layers **28**, and the upper side faces of the layers **26**.

Strips of fiberglass insulation **70** are located in the frame between the joists **56** and are desirably stapled to the joists to heat insulate the roof. The insulation is disposed in contact with the inner roof wall, but is desirably only about half as thick as the roof frame pockets. There is no vapor barrier over the joists. A rain protective cover is provided, the cover being composed of successive, overlapped rows of staggered wooden shingles or shakes **74** (indicated only in a fragmentary way in the drawing). Each row or course of shingles is backed directly throughout its width by a strip **72** of thirty-pound, asphalt impregnated felt, the strip being as wide as, but no wider than, the length of a shingle, and substantially eight feet long. Since the felt strips do not extend beyond the upper and lower edges of the shingle courses supported, respectively, by them and are spaced from one another by the thickness of a shingle course, and there is substantial space between the edges of adjacent shingles, free and unimpeded interchange of air between the individual, segregated roof pockets and the outside atmosphere is permitted. Each open space **75** shown between adjacent shingles in FIGURES 3 and 9 is a continuously open channel which places a roof pocket in communication with the atmosphere.

The passages **75** which place the pockets in communication with the atmosphere are designated **75***a*, **75***c*, **75***d* in FIGURE 8. Dotted arrows indicate the line of air flow paths. The passage **75***b* indicates how an otherwise inaccessible pocket may be ventilated. Special provision for breathing of the lowermost pocket can be made by boring the lowermost joist, and for the second pocket by making the first felt strip substantially narrower than the combined width of two pockets. The outer roof cover can, of course, be varied, if desired, by using other conventional covering materials, but the covering should provide for free breathing of the roof pockets while excluding rain.

Each wooden end strip **64** forms a continuous solid wall which, together with the outer face of associated beam layer **30**, bounds and forms part of an exteriorly disposed half-trough or rabbet. The shakes of the roof sections are made to overhang the half-troughs. When the adjacent roof sections are brought together, the shake edges are spaced far enough from one another to permit the insertion of a metallic gutter **76** between them.

The gutter **76** is in the shape of a broad based V, its side walls **78** flaring outward and being lodged in notches of the strips **64**. As shown, the gutter walls are

confined in the troughs by overhanging shoulder 82 which form the upper or outer boundaries of the gutter receiving notches 82.

Each gutter 76 desirably consists of an extruded member of resilient, non-rustable metal, long enough to extend from the peak to the eaves of the building.

In an unstrained condition, the gutter walls 78 would diverge by considerably more than sixty degrees shown. The pressure resiliently applied by the gutter walls to the divergent channel walls, urges the gutters outward, causing their free, outer edges to be pressed outward firmly and continuously, in a water-tight manner, against the shoulders 82. The strained condition of the gutters serves also to prevent rattling of the gutters under windy conditions, or other vibration producing conditions.

Each gutter is anchored at its upper end by a single screw 84, the screw being located under, and protected by, a roof cap 86.

The divergent disposition of the opposed strips 64 is especially advantageous because it enables the desired divergent relation of the notch bases to be provided without objectionably weakening the strips.

The gutter could, of course, be provided in sections. When this is done, each gutter section, other than the uppermost one, is overlapped for about four inches at its upper end by the gutter section next above it, and is secured in place by a single screw, driven through its base in the area which is overlapped.

The description of the normal width section of the roof is generally applicable to the narrow width roof sections 22, the only significant difference having to do with the difference in width of the narrow sections, and the fact that the narrow sections are not required to be uniform in width.

The construction of the prefabricated floor sections with their marginal supporting stringers is significantly impotrant.

The floor 14 is made to consist of sections which are wide enough to extend from composite stringer center to composite stringer center—in the illustrative case eight feet wide. Each section includes two marginal stringers 16 and a frame structure composed chiefly of cross studs 88, the studs being desirably disposed on sixteen inch centers, and having the stringer layers 44 nailed, and adhered by exterior grade adhesive, directly to their ends. The floor sections are continuously closed on the bottom by panels 90 of plywood, and are continuously closed and covered on the top by four by eight panels 92 of five-eighths inch plywood, the latter providing an unfinished tread surface which may be covered in any manner desired.

Before application of the panels 92, insulation 94, either in strip form or of the pour type, is put into the floor sections to fill them about half full. The framework of a floor section, including the joists 88 and the lower plywood cover 90, extends between the beam layers 44 and is supported upon the stringer layers 42. The upper plywood cover 92, however, extends across the stringer layers 44 and 46, rests upon them, and is coterminous with the layers 46.

The stringer layers 44 and 46 extend downward substantially beyond the framing of the floor sections and terminate in a common plane, but the stringer layers 42 extend considerably below the layers 44 and 46, so that a channel of substantial depth and width is provided at the lower side of each composite stringer, in which utility conductors may be protectively housed as required.

The layers 42 and 44 of the stringers extend continuously across and beyond the tread area of the floor, but the layers 46 are interrupted at regularly spaced intervals to provide slots or notches 95 of uniform dimensions. The notches of juxtaposed beams are located to register with one another, and in each pair of registering notches a filler block 96, having a cross-sectional area equal to that of the combined slots, is inserted. The stringer layers 42 and 44, and the filler blocks, are formed with bores which come into register when a filler block is thrust upward far enough to engage marginal areas of the upper plywood covers 92 of adjacent floor sections and bolt and nut combinations 97 are applied to secure the filler blocks in place and to clamp the stringers 16 together. The blocks 96 provide common solid support for adjacent margins of the covers 92, and interlock the adjacent stringers against any possibility of relative creeping.

The stringers provide broad and ample support for the framing of the floor sections through the layers 42, and are of strong and massive construction.

End portions of the stringers 16, beyond the side boundaries of the floor, provide solid support for combined storage and utility boxes 102 which close the spaces between the floor edges and the roof. Where the roof side is composed exclusively of sections which extend completely down to the ground floor level, the entire box 102 is made to extend uniformly from end to end of the interior of the building with external notches provided at intervals to accommodate the composite roof beams. A box of this kind will be first described, and then variations will be pointed out for accommodating a window insert.

The box 102 is made to include a continuous succession of inner and outer strips 104 and 106, which are respectively rectangular and triangular in cross-section, and to which bottom walls 107 of plywood are secured. Also secured to the strips 104 and 106, respectively, are vertical inner and sloping outer walls 108 and 110, the outer wall 110 extending upward adjacent the roof to a level of about one foot above the floor, and the inner wall 108 being desirably, though not necessarily, of somewhat less height than the wall 110. At each composite roof beam the box is formed with an external notch to accommodate the beam by removing portions of the outer wall and the cover of the box, and providing vertical wall pieces 112 and a sloping wall piece 114. The cover consists of fixed sections 116 which are notched at their ends to accommodate the beams 24 and which are made generally U-shaped to provide access openings. Each access opening is provided with a hinged lid 118, the lid being continuously connected along its outer edge to the associated fixed section 116 by a piano hinge 121. A continuous felt weatherstrip 122 is attached marginally to the fixed cover sections 116 to seal the space between the cover sections on the one hand and the adjacent ceiling and beam surfaces on the other.

The box 102 has a continuous false bottom composed of successive boards 120 which rest loosely upon the strips 104 and 106, and upon cross strips 123. The boards 120 divide the box into upper and lower compartments, the upper one being chiefly for general storage and the lower one for housing (1) a quantity of insulation 126 of the pour type, (2) at least one water supply pipe 128, and (3) electrical conductors 130. Junction boxes 132 and a plurality of electrical outlets 134 are provided at suitable points in the upper compartment. The box includes a baseboard or molding 136 which is attached to the exposed face of the inner wall 108 and rests upon the margin of the tread surface of the floor.

As clearly seen in FIGURE 7, the lower compartment of the box 102 terminates below the floor level. This is important where one of the roof sections 16 is terminated above the floor level and a window unit 138 is installed. In such a case the section beams 24 continue down to and beyond the floor level as usual, and the window unit provides a continuation of one side of the gutter trough to the lower boundary of the roof. The window unit 138 includes vertical wall portions 140 which necessarily interrupt the continuity of the upper compartment of the box 102, but because the lower compartment lies below the floor level the continuity of that compartment can be and is maintained. The window unit itself includes a covering 142 whose upper surface is at floor level. The cover-

ing 142 covers and conceals a section of the lower compartment of the box. When the specifications of a particular building call for a feature like the window unit shown (and they commonly do), the box for that side of the house is furnished in an appropriately modified form, but still as a single unit which extends the full length of the interior of the house. The modified box is installed before the window unit. The cross strips 123 in the lower compartment have notches which extend downward through their upper faces for accommodating the utility conductors 128 and 130.

It will be remembered that the massive roof beams extend inward from the roof. They are exposed to view interiorly of the house and present an attractive and ornamental appearance. The fact that the inner extremities of the beam layers 26 extend farther in than the layers 28 and 30 contributes in a practical way to the securement of an ornamental effect because it obviates the possibility of having exposed, adjacent inner surfaces of the composite beams slightly and unintentionally out of true coplanar relation. A slight discrepancy of this kind would look like an important flaw or defect in the structure.

Provision is desirably made of cover strips 144, adapted to be releasably secured in the channels which are formed at the inner sides of the composite roof beams, these strips being provided primarily for covering and concealing utility conductors housed in the channels. The confronting spaced faces of the inner margins of the beam layers 26 are formed with narrow channels 146 which are merely shallow saw cuts. Resilient metallic clips 148, shaped as shown, have outturned toe portions 150 lodged in the channels 146 for locating them with accuracy, arms 152 which extend outward (toward the roof) and which are secured in place by brads 154, and inwardly extending, reversely curved pocket-forming spring arms 156. Each strip 144 has secured at intervals along its opposite concealed margins humped retaining arms 158. The arms 158 are shaped to cam themselves into the retaining pockets formed within the clips 148 and to be retained yieldingly against withdrawal by the clips. The arms normally cover a portion of the channel which is more than two inches deep. A portion of the channel having a depth of the order of one inch is left exposed to view at the exposed side of the cover strip. The cover strip can be withdrawn and replaced, at will, so that the utility conductors (if any) concealed in the channel are not rendered inaccessible by the strip.

The portion of the channel which is not filled or concealed by the cover strip may be utilized where desired for receiving a marginal portion of a partition (not shown) to assist in maintaining the partition in a desired location, and in an upright attitude. Electrical cables 145 are shown as leading to a beam carried switch 146 and thence toward an overhead light (not shown) in FIGURE 7. These wires may be installed in a prefabricated roof section at the factory, but will require connection in the junction box at the building site.

The exterior decoration of the house after erection of the building presents no substantial problem, since nothing more than minor touchups are required. If a shake roof is provided, as illustrated, the roof will, according to conventional practice, be left unpainted. Other types of roof coverings come in suitable colors and require no painting. The house end, window and porch units can be most conveniently stained or painted at the factory and will require nothing more than minor touchups.

Interiorly, the beams may be stained in advance. The ceilings can be covered in advance with various decorative materials as specified by the purchaser. The floor covering, if of hardwood, tile or linoleum, can be applied in large sections, and wall to wall carpeting can also be had which extends for the full width and length of the floor.

The term "layer" as used herein in connection with the beams and stringers is intended to apply to one or more adjacent, related thicknesses of material, unless such construction is precluded by the immediate context.

A word may be in order concerning the assembly procedure followed with reference to the peripheral frame elements described.

The floor sections are first put in place in the yokes 13 and bolted together. The boxes 102 are then put in place since this enables plumbing and electrical operations to be proceeded with while the erection of the frame goes forward. With the aid of a boom truck, a first roof section is erected, and temporarily connected to the associated composite floor stringer by partially inserted dowel sleeves. Temporary braces having suction cups at their lower ends are bolted to the beams to avoid excessive strain at the stringer joints and the roof section is released by the boom. The opposing beam is then erected at the opposite side of the building, and is temporarily connected to the first section and to the associated stringers by partially inserted dowel sleeves. A section having a long beam layer 30 is next put into place, the dowel sleeves at the lower end are driven fully into place, those at the top are driven in as far as practicable, and the juxtaposed pair of beams are thoroughly bolted together. Temporary braces may be applied to the third section before it is released by the boom. When a fourth section, opposed to the third, is next put into place, the upper and lower joints involving the two pairs of sections, which have had to be left incomplete to this point, are completed. The further erecting procedure will be obvious.

I have described what I believe to be the best embodiments of my invention. I do not wish, however, to be confined to the embodiments shown, but what I desire to cover by letters patent is set forth in the appended claims.

What I claim is:

1. A prefabricated house unit consisting of a pitch-roof section, having straight, parallel side boundaries, and adapted to extend from top to bottom of the roof and to be disposed alongside a like roof section in coplanar relation therewith and rigidly attached thereto; said section including a water protective cover portion and a supporting framework, and formed with a marginal, external half-trough or rabbet, which half-trough has a continuous, watertight lateral wall, the wall being constructed and arranged to provide a continuous, longitudinally extending notch, and the notch having its upper boundary formed by a continuous, downwardly facing shoulder, the construction and arrangement being such that when two such roof sections are secured side by side in abutting relation, they will jointly form a trough of uniform, predetermined cross-section into which a resilient, outwardly flared, gutter member may be snapped, and in which such a gutter member may be retained under compression, with the upper edges of the gutter member lodged in the opposed notches and overhung by the downwardly facing shoulders thereof.

2. A prefabricated, pitch-roof section as set forth in claim 1 in which each water protective cover portion overhangs the associated marginal half-trough to a limited extent, but not far enough to preclude the intended insertion under strain of a gutter section.

3. In a prefabricated house, a roof structure which includes adjacent roof sections of the kind set forth in claim 1 disposed in coplanar, continuously abutting relation, and having their frame portions rigidly secured to one another, said roof structure further characterized by the fact that the trough formed by adjacent roof sections has its sides flared outwardly so that the trough is wider at the mouth than at the base, but so limited in width that the flaring gutter, in an unstressed condition, would have a wider mouth but no wider base than the trough, the construction and arrangement being such that the gutter, when inserted in the trough, tends to cam itself outward and to press its upper edges into water-tight engagement with the overhanging shoulders of the trough.

4. In a prefabricated house of the delta type, characterized by the fact that it can be quickly, conveniently and efficiently assembled and erected, a rigid roof structure composed of sections, each section having a cover portion, and a part, at least, of the sections having frames disposed in abutting, coplanar relation and extending from the top to the bottom of the roof, and means rigidly connecting adjacent frames to one another, the frame of each such section including longitudinally extending side beams, each of which includes a terminal layer and an adjacent interior layer, the abutted and united beams being disposed to extend inward from the cover portion of the roof and to be exposed interiorly of the building, with the terminal beam layers terminating at their inner boundaries short, by a substantial amount, of the inner boundaries of the adjacent interior beam layers, so that a channel of substantial depth and width is formed between the inwardly protruding margins of the interior beam layers, and an ornamental cover strip secured in the channel in position to provide a concealed passage in which one or more utility conductors may be housed.

5. A prefabricated building of the delta type which comprises, in combination, a ground floor, opposed roof sides which slope oppositely downward from the apex of the building to ground floor level, the ground floor being made up of sections, of equal and uniform width, and each including as unitary parts thereof parallel, marginal supporting stringers which extend from side to side of the building, the stringers of adjacent floor sections being disposed in juxtaposed relation and united to form composite stringers, each roof side being made up of sections each of uniform width, with each section having parallel supporting beams located along its lower margins, and extending from the apex of the building down into intersecting relation with the floor stringers, the beams of adjacent roof sections being disposed in juxtaposed relation and united with one another to form composite beams, each composite beam being disposed directly over a stringer and being narrowed to provide supporting shoulders and a protruding tongue at its lower end, and the composite stringers being forked at their ends to receive, and snugly embrace, the beam tongues, said forked ends and tongues being provided with jig bores, and a plurality of through fastening means each passed through an aligned set of beam and stringer bores and firmly and rigidly uniting the beams and stringers to one another.

6. A prefabricated building as set forth in claim 5 in which each composite beam of one roof side is disposed in a common plane with a composite beam of the opposite roof side, the corresponding composite beams being formed to abut and interfit with one another at the apex of the building, the interfitting portions of the beams having alignable sets of jig bores formed through them, and through fastening means passed through the respective sets of bores and rigidly and fixedly uniting the interfitted beam ends in predetermined relation with one another.

7. A peripheral shell assembly group adapted for use in a prefabricated building of the delta type, said group consisting of a floor unit and two roof units, all of uniform, substantially identical, widths, which, when associated with one another according to plan will form a rigid and sturdy segment or section of the length of the building,

the floor unit comprising a tread portion and a supporting frame portion, which frame portion includes a plurality of side-by-side permanently united stringer layers along each of its longitudinal margins,

and each roof unit comprising a cover portion and a frame portion, which frame portion includes a plurality of side-by-side permanently united beam layers along each of its longitudinal margins,

the beams and stringers being arranged to extend into intersecting relation, by having the inner pair of stringer layers of a length different from that of the outer pair of stringer layers, so that a first pair extends into the intersecting area while the second pair terminates short thereof, and the inner pairs of beam layers of a different length at their lower ends from the outer pairs of beam layers, so that a second pair extends into the intersecting area, and the first pair terminates short thereof in a horizontal plane, the construction and arrangement being such that, when assembled, one pair of beam layers rests squarely upon the horizontal upper surfaces of a corresponding pair of stringer layers, and that the outer layers of one unit snugly embrace the inner layers of the other, to compel registration of the units.

8. A peripheral shell assembly as set forth in claim 7 in which the end portions of the contiguous beam and stringer layers of a section, which are long enough to extend into the intersectioning area, are each provided with a plurality of jig bores, identically located, for the reception of through fasteners, whereby the securement of the roof unit at a desired pitch may be mechanically assured, and registration of adjoining sections or segments may be mechanically assured.

9. A peripheral shell assembly as set forth in claim 8 in which the beams and stringers, intermediate their ends, are formed with horizontal bores in predetermined areas for the reception of section-uniting through fasteners, whereby exact lengthwise registration of corresponding units of adjoining sections is mechanically assured, and such units are caused mutually to reinforce one another.

10. In a prefabricated building of the delta type, in combination, a series of parallel horizontal stringers, a floor of substantial thickness supported on the stringers but terminated short of the stringer ends by substantial amounts, opposite roof segments which slope downward in opposite directions from the apex of the building to the floor level, and storage boxes disposed upon the stringer ends, said boxes being of substantial height and width and filling the gap between the flooring and the interior surfaces of the respective roof sides, each box having a sectional false bottom which divides the box into upper and lower compartments with the lower compartment, at least, extending substantially the full interior length of the building, and pre-installed utility connections and fittings housed in the lower compartments of the boxes.

11. In a prefabricated building, the structure as set forth in claim 10 which further includes substantially uninterrupted layers of heat insulating material in the lower compartments of the boxes.

12. In a prefabricated house, the structure as set forth in claim 11 in which each box is provided with a series of extended, hinged lids for affording substantially free access to the interiors of the boxes.

13. In a prefabricated building, a floor structure which comprises, in combination, a series of prefabricated floor sections of like construction, each section including a pair of parallel, marginal supporting stringers with each stringer of laminated, lap-jointed construction, and composed of an outer or terminal layer and a more massive inside layer, intervening framing connecting the stringers, and an upper covering or tread structure on the framing, the framing of each section resting upon, and being directly supported by, the inside stringer layers of the section and coterminous with the outer vertical faces of said inside layers, and the tread structure extending beyond the framing, and having marginal portions which rest directly upon the terminal stringer layers of the section, and are coterminous with such terminal layers, each terminal layer of each stringer extending well below the framing, in overlapping relation to the massive associated inside layer, and being permanently united with the latter, the stringers of adjacent sections having horizontal preformed jig bores extending through all the inside and terminal layers thereof, in corresponding locations,

through which stringers of adjacent floor sections may be accurately, mechanically located in predetermined relation, and then united by through fasteners with one another to form composite stringers.

14. In a prefabricated building, a floor structure which comprises, in combination, a series of floor sections of like construction, each section including a pair of marginal supporting stringers with each stringer of laminated, lap-jointed construction, and composed of a terminal layer, an intermediate layer, and an inside layer which is more massive than the other two, intervening framing connecting the stringers, an upper covering or tread layer on the framing, the framing being supported on the inside layers of the two stringers and coterminous with the outer vertical faces thereof, and the upper covering layer extending beyond the framing, and having marginal portions which rest directly upon the intermediate and terminal layers of the respective stringers and are coterminous with the terminal layers of the stringers, the stringers of adjacent sections having jig bores formed through them, through which stringers of adjacent floor sections may be accurately mechanically located in predetermined relation and united with one another into composite stringers, the lower faces of the terminal and intermediate layers of juxtaposed stringers terminating in a common plane, but the lower ends of the inside layers extending substantially farther downward, the construction and arrangement being such that when two stringers have been juxtaposed and united to form a composite stringer, a continuous and substantial protective channel of uniform width and depth is provided along the bottom of the composite stringer for housing utility conductors.

15. In a prefabricated building, a floor structure which comprises, in combination, a series of floor sections of like construction, each section including a pair of marginal supporting stringers with each stringer of laminated, lap-jointed construction, and composed of a terminal layer, an intermediate layer, and an inside layer which is more massive than the other two, intervening framing connecting the stringers, an upper covering or tread layer on the framing, the framing being supported on the inside layers of the two stringers and coterminous with the outer vertical faces thereof, and the upper covering layer extending beyond the framing, and having marginal portions which rest directly upon the intermediate and terminal layers of the respective stringers and are coterminous with the terminal layers of the stringers, the stringers of adjacent sections having jig bores formed through them, through which stringers of adjacent floor sections may be accurately located in predetermined relation and united with one another into composite stringers, the intermediate and inside layers of a stringer extending continuously from end to end of the stringer, but the terminal layers being interrupted at uniform, predetermined intervals so that correspondingly located slots or notches of like width are provided in the confronting faces of juxtaposed stringers, and in which a filler block is inserted and secured in each pair of confronting slots for interlocking the confronting stringers in predetermined relation, and through fastening means are provided for securing the juxtaposed stringers and the filler block in fixed relation, with the filler block in position to engage and support the overlying marginal portions of the adjacent upper covering layers.

16. In a prefabricated building, a floor structure which comprises, in combination, a series of floor sections of like construction, each section including a pair of marginal supporting stringers with each stringer of laminated, lap-jointed construction, and composed of a terminal layer, an intermediate layer, and an inside layer which is more massive than the other two, intervening framing connecting the stringers, an upper covering or tread layer on the framing, the framing being supported on the inside layers of the two stringers and coterminous with the outer vertical faces thereof, and the upper covering layer extending beyond the framing, and having marginal portions which rest directly upon the intermediate and terminal layers of the respective stringers and are coterminous with the terminal layers of the stringers, the stringers of adjacent sections having jig bores formed through them, through which stringers of adjacent floor sections may be accurately located in predetermined relation and united with one another into composite stringers, and a lower cover layer for each floor section and a substantial and effective amount of heat insulating material in each of the floor section compartments.

17. In a prefabricated house, a roof structure composed of sections of uniform width, and each including inwardly disposed, marginal supporting beams as unitary parts thereof, each beam being of laminated, lap-jointed construction, and composed of terminal, intermediate and inside layers, the beams of adjacent sections being adapted to be juxtaposed and united to form composite beams, the terminal and intermediate layers of the beams terminating at their inner boundaries in a common plane, but the inside layers extending uniformly inward for a substantial distance beyond the inner boundaries of the terminal, and intermediate layers so that each composite beam has a channel of substantial width and depth formed in its under side, in which utility conductors may be lodged, and a cover strip mounted in the channel to define a closed passage in the base of the channel, and to conceal the contents of said channel.

18. In a prefabricated building, a roof structure as set forth in claim 17 in which the channeled portion of each composite beam and each associated cover strip are provided with complementary portions of spring fastener devices, so constructed and arranged that each cover strip can be snapped into place in the channel and can be removed at will, when removal is required.

19. A sloping house roof comprising, in combination, a series of massive beams which run from peak to eaves, and which divide the roof into zones or sections, each section including a multiplicity of parallel joists which run horizontally from beam to beam, a lower cover attached to the joists and forming with the joists a succession of segregated, tiered pockets, an effective layer of insulating material secured in the inner part of each pocket, and a covering on top of the joists consisting essentially of overlapped and staggered courses of spaced shingles applied course by course to the joists, together with separate strips of waterproof felt, each of a width appropriately limited for directly backing one course of shingles throughout more than the exposed width of each course, but no more than the total width of the course, the construction and arrangement being such that the covering protects effectively against ingress of rain, but provides, through the spaces bounded laterally by the spaced edges of adjacent shingles and transversely by the felt strips, for free, direct, and unimpeded interchange of air between each pocket and the outside atmosphere.

20. A prefabricated house of the delta type adapted for erection section by section comprising, in combination, a roof having oppositely sloping sides with each side composed of rectangular sections, nearly all of which extend from the peak of the roof down to ground floor level, with each section including as unitary parts thereof a pair of massive, supporting internally disposed marginal beams, ground floor supporting parallel stringers spaced center to center at distances corresponding to the widths of the roof sections, the stringer ends being disposed in overlapping relation to the lower ends of the beams, means rigidly securing the lower beam ends and associated stringers in fixed and rigid relation to one another, means rigidly connecting intermediate portions of adjacent beams to one another, means rigidly connecting correspondingly located pairs of beams at opposite sides of the roof to one another, prefabricated, continuously extending utility and storage boxes of substantial height and width sup-

ported on the stringers and spanning the spaces between the floor and the under sides of the roof, and prefabricated conductors of water and electricity, having suitable inlet and outlet connections, disposed within said boxes, the boxes being constructed and arranged for installation on the stringers before the section by section installation of the roof.

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CERTIFICATE OF CORRECTION

Patent No. 3,385,013 May 28, 1968

Page E. Severson

It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 15, cancel the division line, and insert the division line, between lines 43 and 44.

Signed and sealed this 9th day of December 1969.

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents