

Sept. 22, 1959

A. KATZ

2,904,927

MODULAR CONSTRUCTION KIT

Filed May 8, 1958

3 Sheets-Sheet 1

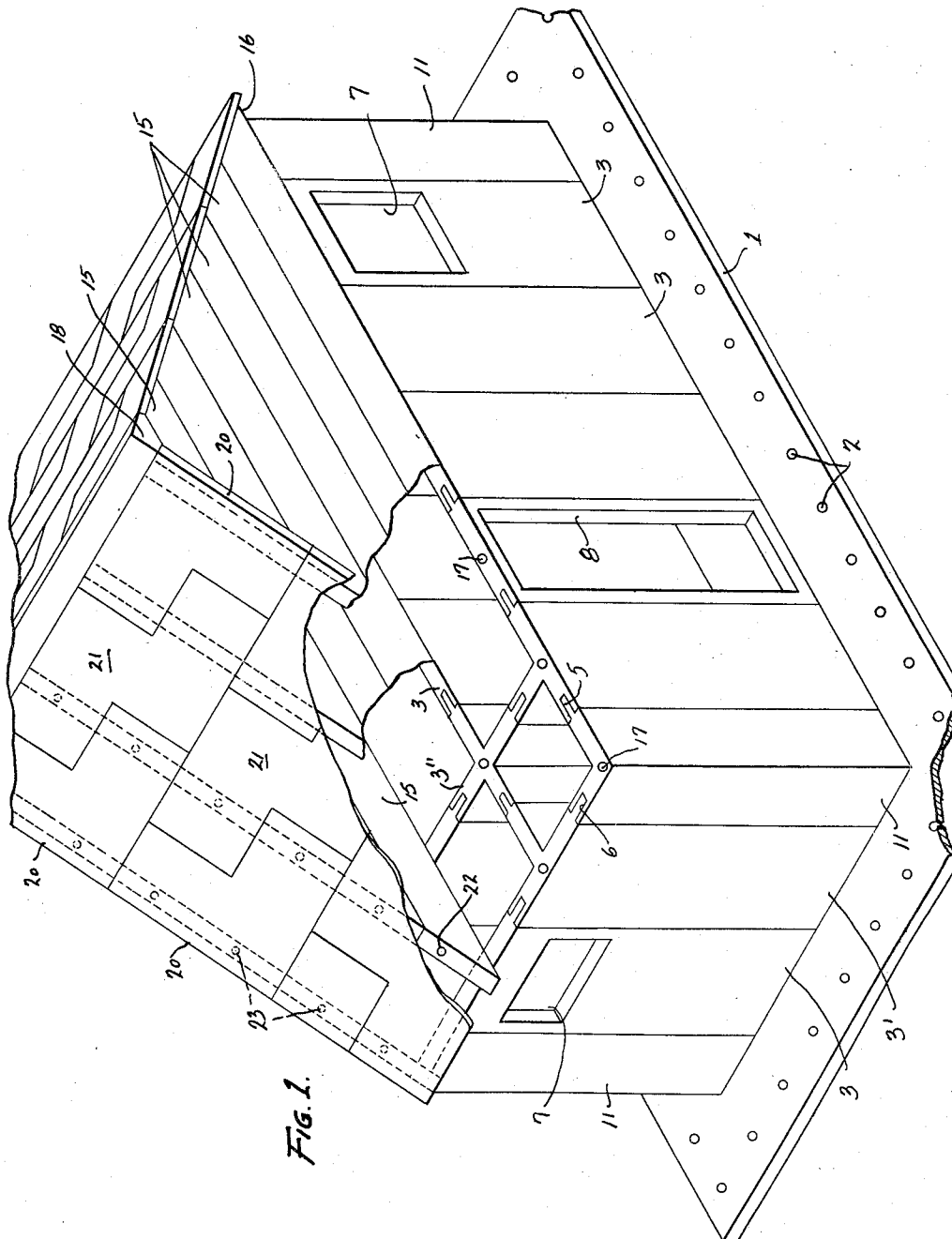


Fig. 1.

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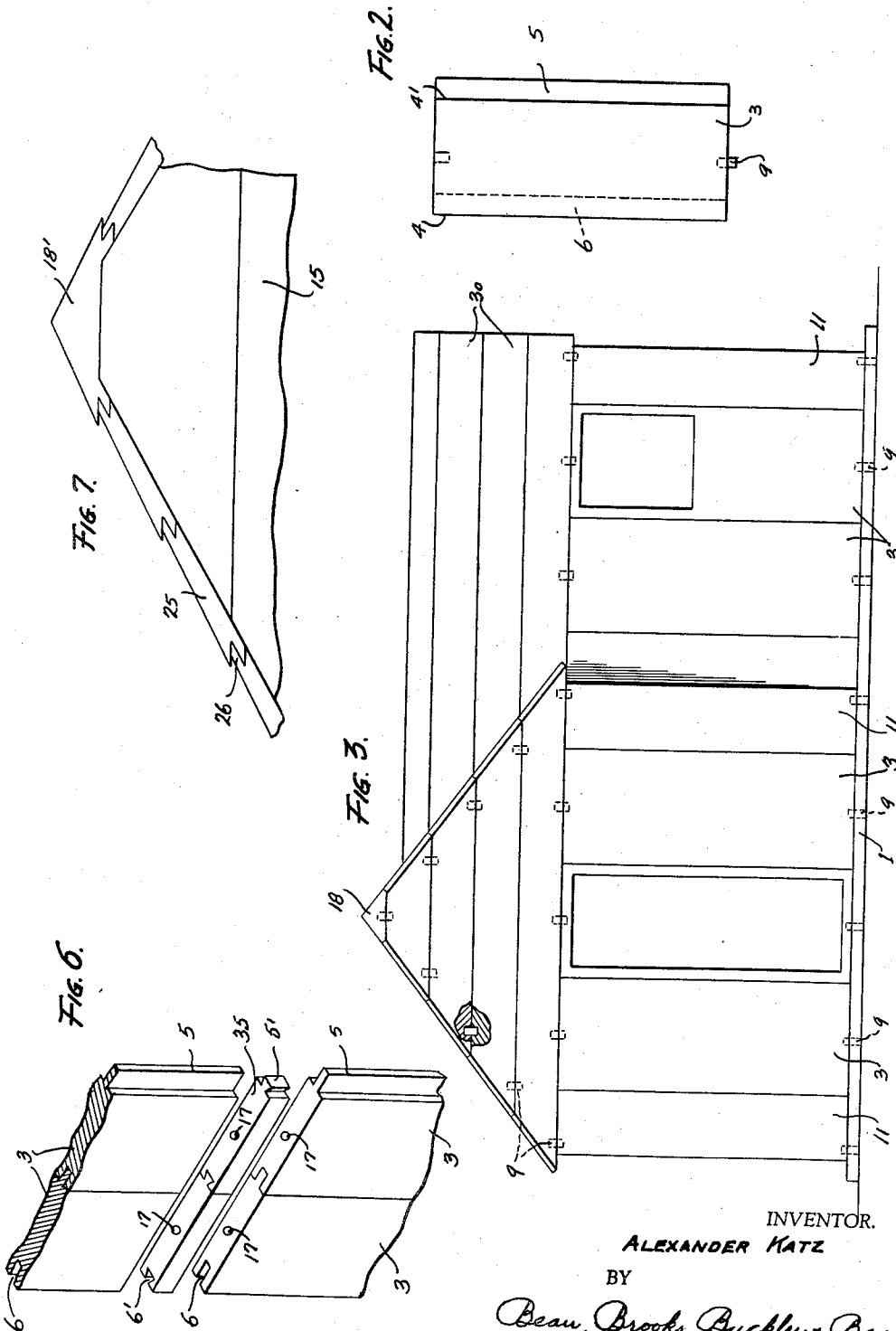
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3 Sheets-Sheet 2



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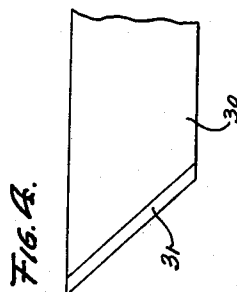
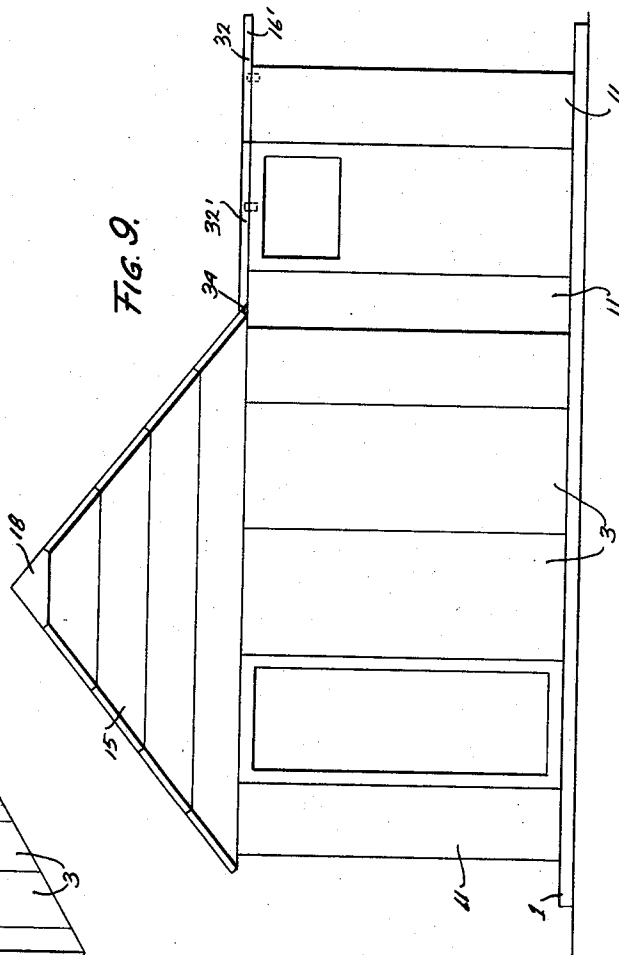
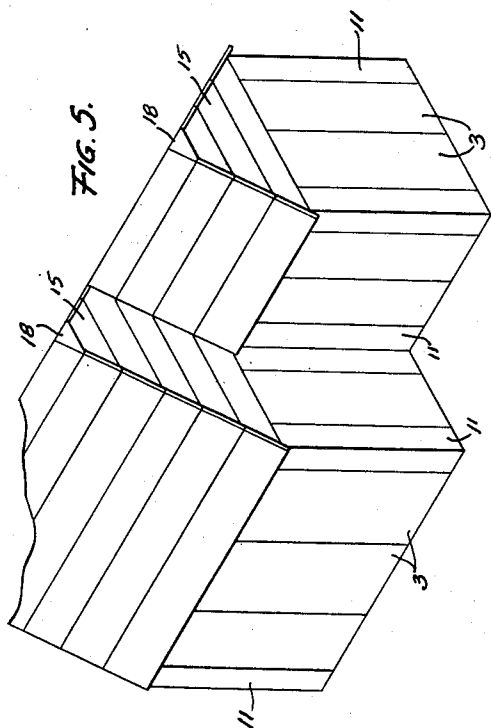
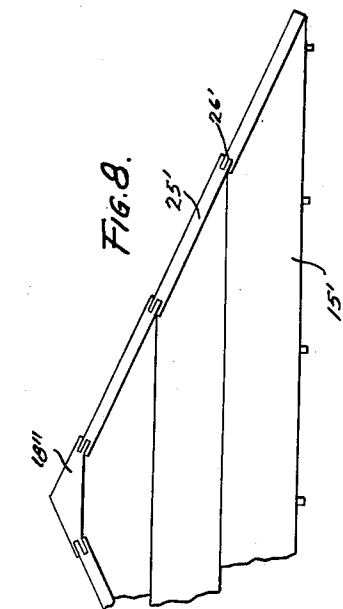
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3 Sheets-Sheet 3



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1

2,904,927

MODULAR CONSTRUCTION KIT

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Application May 8, 1958, Serial No. 734,039

13 Claims. (Cl. 46—19)

This invention relates to a modular construction kit which is primarily designed for use by children as an educational toy, but which is susceptible of use by architects, designers and others desiring to construct scale models of building structures.

Many conventional construction kits for children are composed of parts that are either too small for young children to manipulate with convenience, are so fragile and/or complicated in their interlocking engagement with one another that children with their natural clumsiness and lack of manual dexterity find it very difficult to complete the desired construction project.

Accordingly, a primary object of my invention is to provide a building construction kit utilizing members which are easily manipulated by young children and which can be readily engaged and disengaged while at the same time providing an extremely sturdy assembled structure which will withstand clumsy handling and accidental blows.

Another object of my invention is to provide the foregoing in a construction kit of the modular type enabling the construction of building structures of many different types and sizes, with a minimum number of different parts.

A further object of my invention is to provide the foregoing in a modular construction kit which is relatively inexpensive and extremely durable.

A modular construction kit constructed in accord with my invention is characterized in one aspect thereof by the provision of a base, a number of wall and corner members all of the same width along a medial line between the opposite side edges thereof, a tongue projecting from one side edge of each of the wall and corner members, means defining a tongue receiving groove in each of the opposite side edges thereof, and at least one pin projecting from the bottom edge of each of the wall and corner members, the pins being centered the same distance from the adjacent side edge of each of said members and the base having pin receiving openings therein spaced apart a distance corresponding to the spacing between adjacent pins in adjacent wall and corner members.

In another aspect thereof, a modular construction kit constructed in accord with my invention is characterized by the provision of a number of gable members of different lengths adapted to be superposed on the wall and corner members with progressively shorter gable members being superposed on each other, the gable members bearing on their top and bottom edges pins and pin receiving openings spaced apart a distance which is a whole multiple of the spacing between pins or pin receiving holes in the top edges of the wall and corner members, and the length of said gable members less a constant consisting of any overhang and the thickness of said wall members being a whole multiple of a base length comprising either the width of said wall and corner elements or a power of two thereof.

In another aspect thereof, a modular construction kit

2

constructed in accord with my invention is characterized by the provision of roof members adapted to lie against the ends of the gable members and including generally L-shaped, reversible end members and generally Z-shaped intermediate members all proportioned to the width of the wall members.

The foregoing and other objects, advantages and characterizing features of a modular construction kit constructed in accord with my invention will become clearly apparent from the ensuing detailed description of a presently preferred embodiment and certain modifications thereof, in conjunction with the accompanying drawings illustrating the same wherein like reference numerals denote like parts throughout the various views and wherein:

Fig. 1 is a perspective view of an assembled building structure constructed with the kit of my invention, with certain parts being broken away for clarity and to show details and with other parts being broken away for ease of illustration;

Fig. 2 is an elevational view of one of the wall members comprising a basic unit of my invention;

Fig. 3 is an elevational view of another type of building structure constructed with the kit of my invention, certain parts being shown in section;

Fig. 4 is a fragmentary bottom plan view of a roof member used in constructing the building of Fig. 3;

Fig. 5 is a perspective view of still another type of building structure constructed with the kit of my invention, certain parts being broken away for ease of illustration;

Fig. 6 is a fragmentary view of a reinforcing girt member for use in constructing a multiple story structure;

Fig. 7 is a fragmentary end elevational view of a modified gabled roof construction;

Fig. 8 is a generally similar fragmentary end elevational view of still another form of gabled roof construction; and

Fig. 9 is an elevational view of still another building structure, incorporating in part a flat roof.

Referring now in particular to the embodiment illustrated in Fig. 1, a modular construction kit in accord with my invention comprises a base 1 having a number of pin receiving openings 2 therein, which openings are spaced apart a predetermined distance, based on a modular unit of measure, as will be discussed in detail hereafter. The base 1 resembles a peg board, and is fabricated of wood or any other material suitable for the intended purpose.

Base 1 comprises the foundation upon which building structures are constructed utilizing wall members 3 of uniform thickness, and uniform width measured from one side edge 4 to the opposite side edge 4' thereof (Fig. 2). Each wall member 3 has a tongue 5 projecting from the side edge 4' thereof, and a tongue receiving groove 6 in the opposite side edge 4 thereof, whereby the tongue 5 of one wall member 3 is adapted to fit the groove 6 of an adjacent wall member 3.

As noted, wall members 3 all are of the same width, some of them comprising blank wall members, and others having window openings 7 or door openings 8 cut out therefrom. Because the provision of the window and door openings 7, 8 does not in any way affect the wall elements 3 as a basic modular unit, they are all considered to be the same for purposes of the invention, with the width between the opposite side edges 4, 4' thereof comprising a basic modular unit of measure. Also, certain wall members are generally T-shaped, as illustrated at 3' in Fig. 1, and intermediate generally X-shaped wall members 3'' can be provided. The width of each arm of member 3'', measured from tongue 5 to groove 6, is equal to the basic width between the opposite sides 4 and 4', and the length of the stem of members 3'

3
equals one-half the basic width minus one-half the thickness of members 3.

Each wall member 3, 3' and 3'' has a centrally disposed pin 9 depending from the bottom edge thereof for being received in the openings 2 of base 1, whereby a number of wall members can be aligned on base 1 with pins 9 entering holes 2 and with tongues 5 engaging grooves 6 as clearly illustrated in Fig. 1.

Members 11 are provided at the corners, which corner members include right angularly related arms having a tongue 5 projecting from one edge and a groove 6 in the other edge, the distance from one edge to the other, measured along the mid-section of corner members 11, being the same as the width between sides 4 and 4' of wall members 3, whereby the wall and corner members have the same width. In this way, corner members 11 comprise basic modular units along with wall members 3 and preserve the modular characteristics thereof when used in conjunction therewith, the corner members 11 having pins 9 depending therefrom in the same manner as wall members 3.

So that the various units can be assembled in any desired modular pattern, the spacing between pins 9 bears a predetermined relation to the wall member width comprising the basic modular unit of measure, and is matched by the spacing between holes 2. While it is possible to provide each wall member 3, and corner member 11, with two pins 9, or any power of two thereof, it is believed that the only practical arrangement is to provide one pin 9 for each member centered exactly mid-way between the opposite sides thereof, and this is the arrangement illustrated in the accompanying drawings.

In this way, a truly modular unit is provided wherein the base 1 will receive any number of wall members 3, 3' and 3'', and corner members 11, positioned thereon in any desired modular pattern. The various wall and corner members interfit with the tongues 5 of one engaging the grooves 6 of another, and with the pins 9 depending therefrom fitting in the holes 2 in base 1, providing an exterior wall structure which is extremely sturdy even apart from any interior walls.

A construction kit of my invention also provides parts for constructing gabled and/or flat roof structures.

Considering first the gabled roof structure, I provide a number of gable members 15 of different lengths adapted to be superposed along the top edge of the wall and corner members with progressively shorter gable members being superposed on each other.

The gable members all have the same height, or width and are of lengths which preserve the basic modular unit of the invention. To this end the length of each gable member 15, measured along its bottom edge, less a constant comprising any overhang at the opposite ends and the thickness of a wall member, comprises a whole multiple of a base length which base length is either equal to the width of the wall members or a power of two thereof. This relationship is essential for the following reasons. As previously noted, the width of the wall members, from one side edge 4 to the opposite side edge 4, thereof, comprises the basic modular unit of measurement. The gable members 15 have an overhang 16 at each end thereof comprising the distance which the gable members extend beyond the corner or wall members at each end, and this overhang is the same for each gable member. The thickness of a wall or corner member must be taken into account, because the width of each outer face of a corner member exceeds one-half the width of a wall member by an amount equal to one-half the thickness of the corner member, the wall members and corner members having the same thickness. In other words, the pin receiving hole 17 on the top edge of each corner member 11 is centered exactly midway between the opposite side edges thereof, so as to be spaced from each side edge a distance exactly equal to one-half the width of a wall member. This means that the hole 17

is centered in the angle of the corner member, and therefore is spaced from each outer face thereof a distance equal to one-half the thickness thereof. Therefore, the length of each gable member 15 comprises a whole multiple of a base length, which is equal to or a power of two times the wall member width comprising the basic modular unit of measurement, plus a constant which remains the same for each gable member and which comprises any overhang 16 at each end and the thickness of a wall or corner member.

In the drawings, a one to one ratio is maintained between the base length of gable members 15 and the width of wall members 3. This means that the gable member 15 adjacent ridge pole 18 has a length, less the constant noted above, exactly equal to the width of wall members 3, with the succeeding gable members therebelow being two, three, four, five and six times that length, respectively, plus the same constant.

If, instead of providing a building structure having six modular units across the front, as in Fig. 1, it is desired to provide a structure having only four such units, comprising three wall members 3 and two corner members 11, then all that is required is to eliminate the two lowermost gable members 15, and the one immediately thereabove will engage the wall and corner members while maintaining the same overhang and roof slope, as illustrated in Figs. 3 and 9. Therefore, in a relatively simple and expedient manner, the gable members of my invention have such a predetermined relation to each other, and to the wall and corner members, as to permit a wide variation in the size and shape of the building structure while maintaining the same roof line or slope and overhang.

As illustrated in Fig. 3, each gable member has spaced pins 9 projecting from its bottom edge and correspondingly spaced pin receiving openings along its upper edge, the pins and openings being spaced apart lengthwise of the gable members a distance comprising a whole multiple of the base length defined above. Putting this another way, each gable member carries on its bottom edge pins 9 spaced inwardly from the opposite ends thereof a distance exactly equal to the overhang at one end plus one-half the thickness of wall members 3, with a similarly positioned pin receiving opening in its upper edge. This is made clearly evident from Fig. 3, and means that each gable member will fit a corresponding course of wall and corner members.

Of course, it is not necessary that the pins project from the bottom edge of the gable members, with pin receiving holes 17 in the top edge of the wall and corner members. Instead, the wall and corner members could carry pins received in holes in the bottom edge of the gable members, with pins projecting from the top edge of gable members. However, it is believed that the illustrated arrangement, with pins 9 always depending from the various members is to be preferred because then there are no upwardly projecting pins at any time.

The roof angle is determined by the slope between the top and bottom corners of gable members 15, this slope being fixed by the relation between the width of wall members 3 to the width or height of gable members 15. Each gable member is of the same height or width, and the angle of the slope at the gable member ends, measured from the horizontal, is the angle whose tangent is the gable member height to the wall member width. This roof slope stays the same, no matter how many gable members are used, therefore maintaining the modular characteristics of my invention while enabling a wide variety in the type and size of structures constructed therewith.

A ridge member 18 is provided, which can be supplied in various lengths always equaling a whole multiple of the basic modular unit of measurement, comprising the wall member width, plus a constant comprising the thickness of a wall member, the ridge member 18 having one

5

or more pins 9 projecting therefrom for engaging corresponding pin receiving openings in the top of the smallest gable member 15. The width across the bottom edge of ridge member 18 is equal to twice the overhang 16 plus the thickness of a wall member, and in the illustrated embodiment the pin 9 depending therefrom is centered between the opposite side edges of the bottom thereof.

Roof members proportioned to the basic modular unit of measurement also are provided, which roof members comprise, for a simple gabled structure, reversible generally L-shaped end members 20 and generally Z-shaped intermediate members 21, the members 20 and 21 interfitting in the manner of a jigsaw puzzle to comprise a continuous roof across gable members 15 at the opposite ends of the roof and rafters composed of gable members 15 spanning the structure at points spaced between the opposite ends of the roof. Gable members 15 have pin receiving openings 22 in their opposite ends, at a right angle thereto, with the roof members 20 and 21 having pins 23 projecting therefrom for entering openings 22. Each leg of members 20 and 21 has at least one pin 23, so that each roof will be locked to gable members at points spaced lengthwise of the roof member. The L and Z shapes of members 20 and 21 facilitates fastening thereof to the gable member ends, by allowing each roof member end to overhang the gable ends.

Roof members 20 and 21 are of a width which is a whole multiple of the length of each gable member end, comprising twice that length in the structure illustrated in Fig. 1. Further, each roof member 20 and 21 comprises a whole multiple of a base length equal to the width of a wall member, plus a constant comprising any overhang at the opposite ends of each roof member and the thickness of a wall member, for reasons which now will be obvious. In the illustrated embodiment, a one to one ratio is maintained between the length of each roof member 20 and 21, less the constant, and the basic modular unit, although I contemplate that the provision of some roof members having a two to one ratio and others a three to one ratio, between their length less the constant and the width of the wall members, will be the most practical. Also, for manufacturing economy I believe that the overhang at each end of each roof member should be the same, as illustrated in Fig. 1.

Fig. 5 illustrates that roof members 20 and 21 also can be used in a stepped gable construction, and Fig. 7 shows a staggered or shingle simulating roof structure which follows the same basic configuration illustrated in Fig. 1, but with the top and bottom edge of each roof member 25 forming a modified tongue and groove joint 26 and with the slope of the front wall or face of each roof member 25 being less than the slope of the back wall thereof, to provide a staggered or shingle effect. The ridge piece 18' is correspondingly modified.

Fig. 8 shows another arrangement for accomplishing this, where the staggered or shingled appearance is provided, not by varying the relative slope of the front and back faces of the roof members 25', but by decreasing the roof slope at the opposite ends of the gable members 15' from the bottom edge nearly to the top edge thereof, so that the roof members 25' will lie in a manner illustrated in Fig. 8, with a ridge piece constructed accordingly. Note that, in both Fig. 7 and Fig. 8, the same overall roof slope is provided.

Where the roof members 25 and 25' interlock, as in Figs. 7 and 8, it is necessary only that the lowermost course of roof members on each side of the roof have pins 23 engaging the gable member end openings 22 because the interlocking parts 26 and 26' serve to securely lock the roof members against the gable member ends. With the roof member construction illustrated in Fig. 1, it is believed preferable that every roof member have pins to engage the gable member openings.

Where one gable roof abuts another at a right angle

6

thereto, an additional type of roof member is required, such members being illustrated at 30 in Figs. 3 and 4, the latter comprising a fragmentary bottom plan view thereof. The members 30 are adapted to lie against the gable member ends, with pins entering openings therein in the manner previously described, but they terminate at one end in an inclined end wall which is bevelled on its undersurface, as illustrated at 31, so as to lie against the roof members 20 and/or 21 of the abutting gabled roof. It will be appreciated that the bevel and incline of member 30 comprises a compound angle taking into account the slope of the abutting gabled roof and the slope of the roof comprising members 30.

Fig. 9 illustrates an arrangement comprising a gabled roof as described in Fig. 1, together with an L having a modern flat roof. The flat roof is composed of members 32 of a width and length equal to a whole multiple of the width of wall members 3, thereby providing an overhang 16' equal to one-half the width of a wall member 3 less one-half thickness thereof, and a member 32' which comprises a joining roof member having one edge 34 beveled to the slope of the abutting gabled roof. The member 32' has a width one and one-half times the width of wall members 3. Roof members 32 and 32' carry pins 9 which enter the holes 17 in the upper edge of the wall and corner members 3 and 11, pins 9 being spaced from the edge of members 32 and 32' in the manner previously defined so as to maintain a direct proportion to the basic modular unit of measurement.

A construction kit of my invention also can be used to construct multiple story structures, and for this purpose I provide reinforcing girt members 35 of the same width and thickness as wall members 3, and corner members 11, having pins 9 depending therefrom to enter holes 17 in the upper edge of the lower course of wall members and holes 17 in the upper edge thereof to receive pins 9 depending from superposed wall members 3. The girt members 35 are interposed between the superposed wall and corner members, and have a wedge-shaped tongue 5' at one end and a correspondingly wedge-shaped tongue receiving groove 6' at their opposite end, so that when engaged they interlock in a manner avoiding relative lateral movement therebetween and reinforcing the multiple story wall structure.

Accordingly, it is seen that my invention fully accomplishes its intended objects, providing a modular construction kit composed of members which are easily manipulated by children to build a wide variety of sturdy structures. It will be appreciated that the foregoing detailed description is given by way of illustration only, without thought of limitation.

Having fully disclosed and completely described my invention, and its mode of operation, what I claim as new is:

1. A modular construction kit adapted to provide superposed courses of wall and corner members comprising, a base, a number of wall and corner members, each of said members having a tongue projecting from one side edge thereof and means defining a tongue receiving groove in the opposite side edge thereof, each of said wall members also having a pin projecting from one end thereof, said wall and corner members being a whole multiple of the same base width between the opposite side edges thereof and the pins of said wall and corner members being correspondingly positioned between the opposite side edges thereof, and means defining a number of pin receiving holes in said base spaced apart a distance equal to twice the distance between the center of said pins and the adjacent side edge of the member associated therewith, wherein said wall and corner members have pin receiving openings in the other ends thereof correspondingly spaced between the opposite side edges thereof, together with reinforcing girt elements of a width equal to the width of said wall and corner members adapted to be interposed between superposed ones thereof, each

of said reinforcing girt elements having a pin projecting from the bottom edge thereof positioned to enter the hole in the other end of the member therebelow and means defining a hole in the top edge thereof positioned to receive the pin projecting from the member thereabove, each of said reinforcing girt elements also having a wedge shaped tongue projecting from one side edge thereof and a correspondingly wedge shaped tongue receiving groove in the opposite side edge thereof.

2. A modular construction kit comprising, a base, a number of wall and corner members of uniform thickness each having a tongue projecting from one side edge thereof and means defining a tongue receiving groove in the opposite side edge thereof, each of said wall and corner members also having a pin projecting from one end thereof, said wall and corner members being a whole multiple of the same base width between the opposite side edges thereof and the pins of said wall and corner members being correspondingly positioned between the opposite side edges thereof, means defining a number of pin receiving openings in said base spaced apart a distance equal to twice the distance between the center of said pins and the adjacent side edge of the member associated therewith, together with a number of gable members of different lengths adapted to be superposed on said wall and corner members with progressively shorter gable members being superposed on each other, each of said gable members being of the same height and of a length which, less a constant comprising any overhang and the thickness of a corner member, comprises a whole multiple of a base length comprising the base width of said members or a factor of two thereof, together with pins projecting from one of the top and bottom edges of said gable members and pin receiving openings in the other thereof, the other ends of said wall and corner members being formed to mate with the bottom edges of said gable members, and said gable member pins and openings being aligned with the spacing therebetween comprising a whole multiple of the spacing between the mating formation at the other ends of said wall and corner members.

3. A modular construction kit as set forth in claim 2, wherein said gable members have pins projecting from the bottom edge thereof, and said mating formations in the other ends of said wall and corner members comprise pin receiving openings.

4. A modular construction kit as set forth in claim 2, wherein the opposite ends of said gable members have the same slope determined by the ratio of the height of said gable members to the base width of said wall and corner members.

5. A modular construction kit comprising, a base, a number of wall and corner members of uniform thickness each having a tongue projecting from one side edge thereof and means defining a tongue receiving groove in the opposite side edge thereof, each of said wall and corner members also having a pin projecting from one end thereof, said wall and corner members being a whole multiple of the same base width between the opposite side edges thereof and the pins of said wall and corner members being correspondingly positioned between the opposite side edges thereof, means defining a number of pin receiving openings in said base spaced apart a distance equal to twice the distance between the center of said pins and the adjacent side edge of the member associated therewith, a number of gable members of different lengths adapted to be superposed on said wall and corner members with progressively shorter gable members being superposed on each other, each of said gable members being of the same height and of a length which, less a constant comprising any overhang and the thickness of a corner member, comprises a whole multiple of a base length comprising the base width of said members or a factor of two thereof, together with pins

projecting from one of the top and bottom edges of said gable members and pin receiving openings in the other thereof, the other ends of said wall and corner members being formed to mate with the bottom edges of said gable members, said gable member pins and openings being aligned with the spacing therebetween comprising a whole multiple of the spacing between the mating formations at the other ends of said wall and corner members, wherein the opposite ends of said gable members have the same slope determined by the ratio of the height of said gable members to the base width of said wall and corner members, together with roof elements adapted to lie against said gable member ends and to extend between laterally spaced courses of gable members, pins projecting from said roof elements, and pin receiving openings in said gable ends positioned to receive said roof element pins, the width of said roof elements being a whole multiple of the length of said gable member ends, and the length of said roof elements less a constant comprising any overhang and the thickness of a gable member being an even multiple of the base width of said wall and corner members.

6. A modular construction kit as set forth in claim 5, wherein said roof elements comprise reversible generally L-shaped end elements and generally Z-shaped intermediate elements adapted to interfit therewith to provide a continuous roof.

7. A kit as set forth in claim 6, wherein said roof elements have pins projecting from each leg thereof spaced apart lengthwise thereof a distance comprising a whole multiple of the spacing between the mating formations at the other ends of said wall and corner members.

8. A modular construction kit as set forth in claim 6, wherein each of said roof elements have the same amount of overhang at the opposite ends thereof.

9. A modular construction kit as set forth in claim 5, together with additional roof elements terminating at one end thereof in an inclined edge bevelled to lie against roof elements of an adjoining gabled roof aligned at substantially a right angle thereto.

10. A modular construction kit as set forth in claim 5, together with a ridge pole member having a bottom edge of a width equal to twice the overhang of said gable members.

11. A modular construction kit as set forth in claim 5, wherein said roof elements are of tapered cross sectional form to provide a shingled roof effect.

12. A modular construction kit as set forth in claim 5, wherein said gable member ends are inclined at an angle from the horizontal less than the roof slope determined by the outer ends of superposed gable members, whereby said roof elements provide a shingled roof effect when lying against said gable ends.

13. A modular construction kit as set forth in claim 5, together with flat roof elements of a width comprising a whole multiple of the base width of said wall and corner members, and a joining flat roof element of a width one and one-half times said base width, said joining flat roof element having one side edge inclined at the slope of the roof provided by said gable members.

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