# United States Patent [19]

**Brenner**

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[54] **WALL STUD SYSTEM**


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[52] **U.S. Cl.** .....**52/300,** 52/667, 52/298, 248/188, 287/103 A

[51] **Int. Cl.** .....**E04h 12/22**

[58] **Field of Search**.....52/300, 301, 241, 52/667, 669, 664, 242, 668, 297, 298; 248/158, 165, 188, 407, 412; 287/56, 20, 23, 103 A



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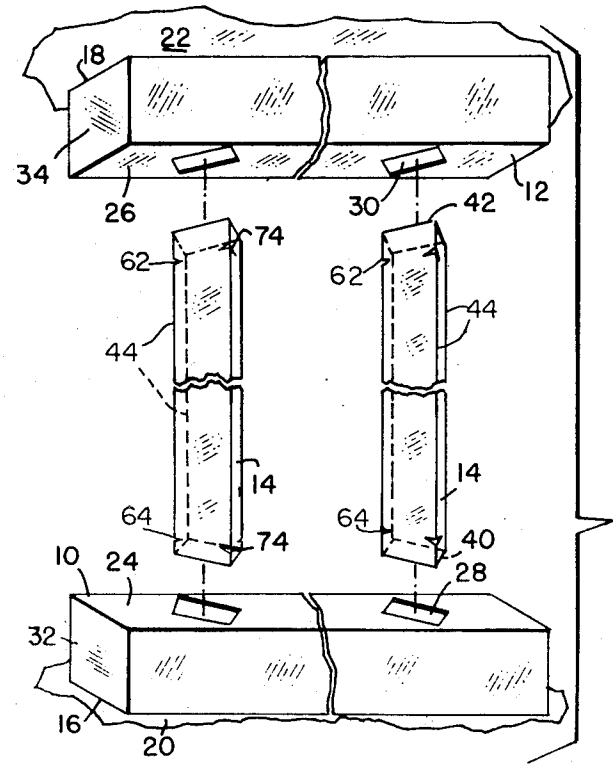
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[57] **ABSTRACT**

A wall stud system comprising a plurality of horizontal floor and ceiling beams arranged in parallel spaced relationship and a plurality of vertical hollow studs extending between the floor and ceiling beams. Each stud is formed to a similar cross-sectional configuration and each floor and ceiling beam is provided with vertically aligned openings to receive the top and bottom of the studs therein. Each aligned opening is positioned in rotative angular relation to the final position of the stud when installed. The studs are provided with wedge-shaped notches at all corners about the periphery of the stud near the tops and bottoms thereof to lock each stud into the beam material after insertion and rotation through the predetermined angle.


**5 Claims, 12 Drawing Figures**



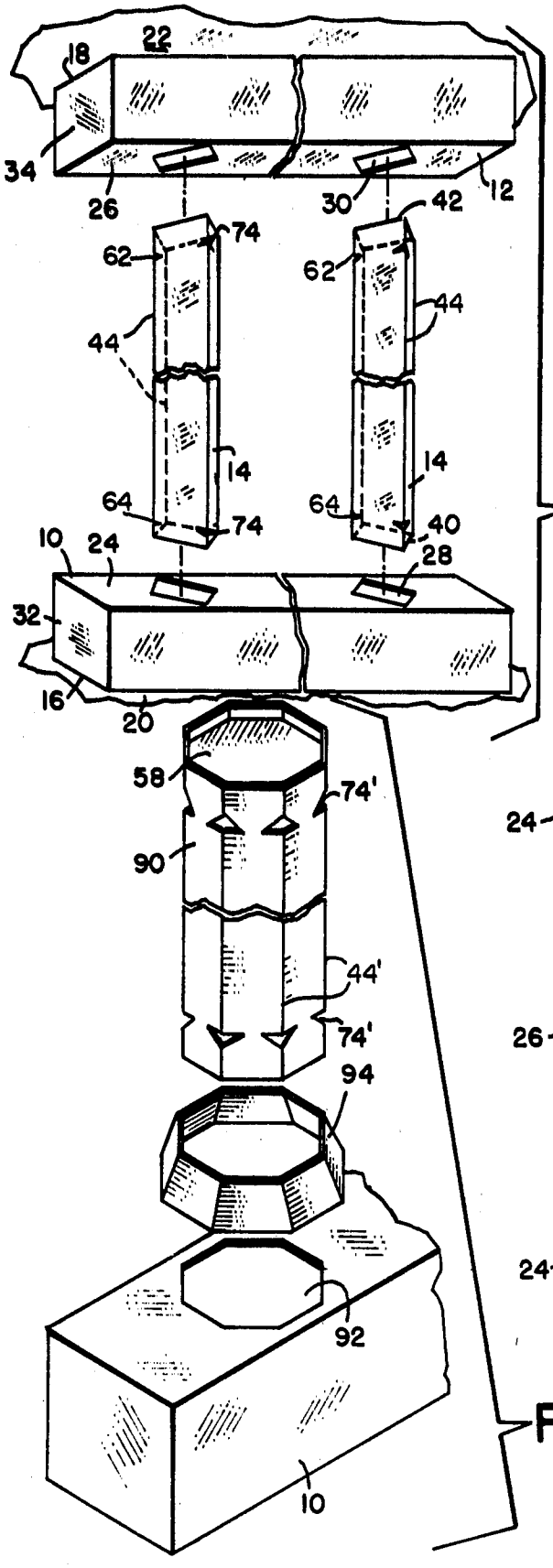



FIG. 1

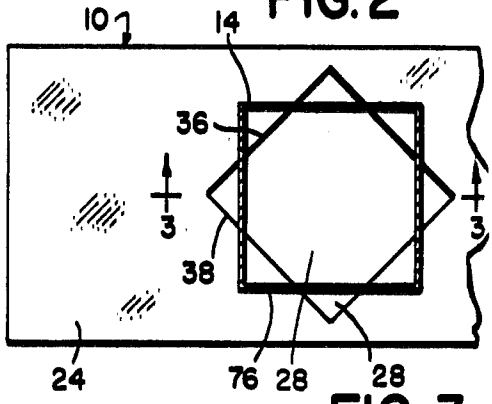



FIG. 2

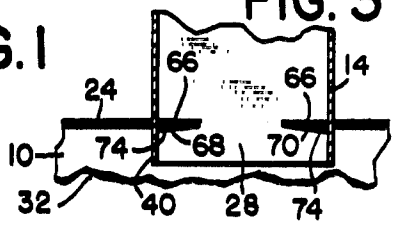



FIG. 3

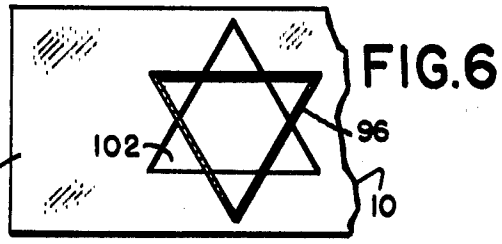



FIG. 6

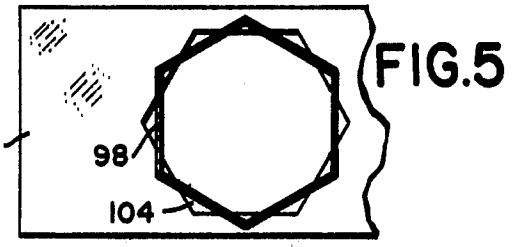



FIG. 5

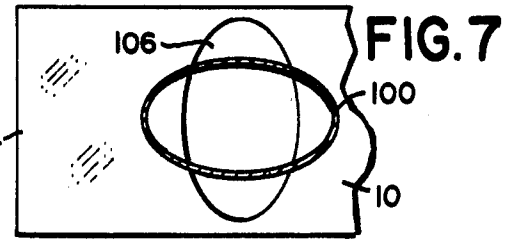



FIG. 7

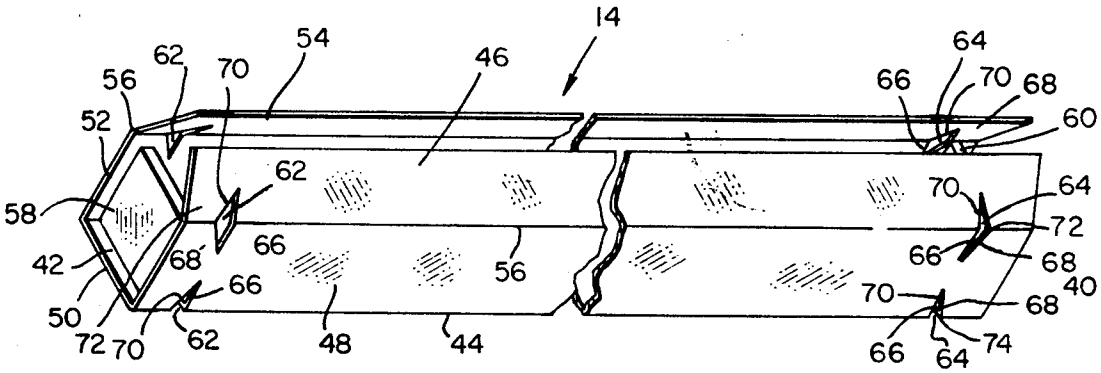
FIG. 4

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FIG. 8



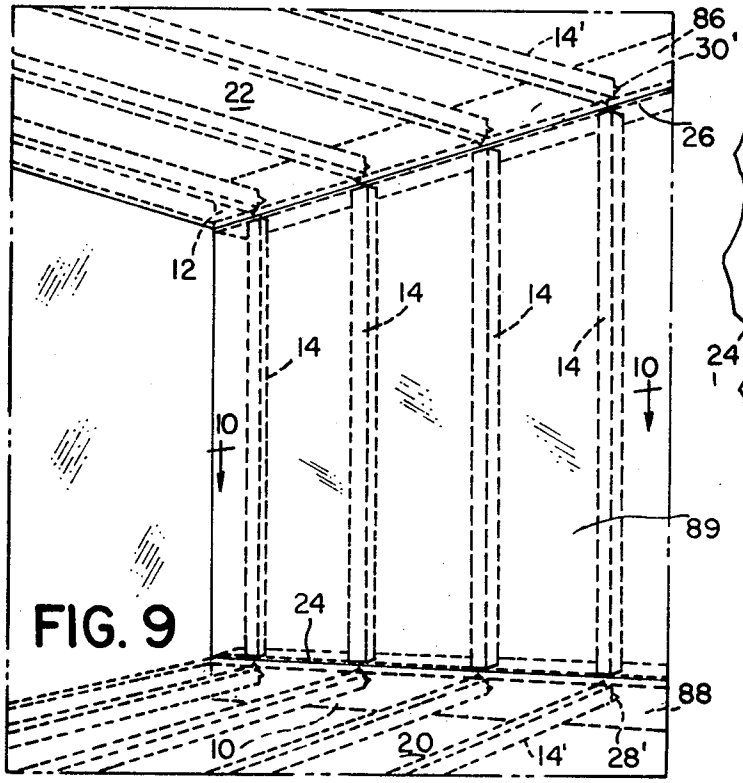




FIG. 9

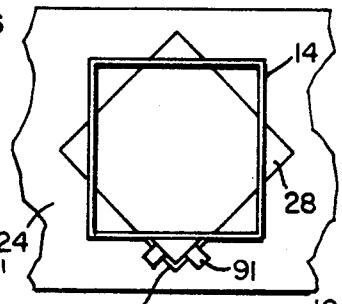



FIG. 12

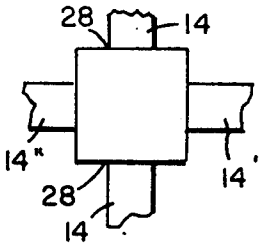



FIG. 11

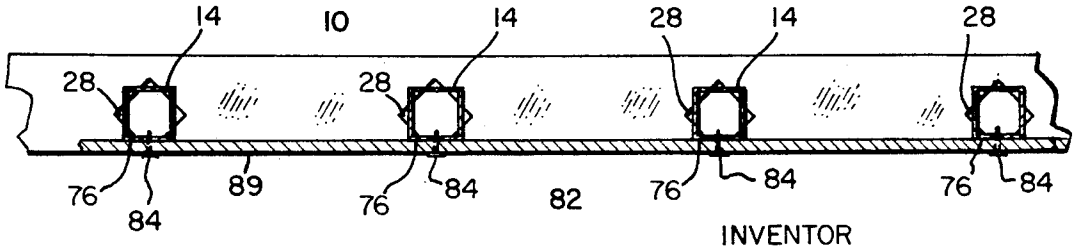



FIG. 10

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# WALL STUD SYSTEM

## BACKGROUND OF THE INVENTION

The present invention relates generally to the field of building construction and more particularly is directed to a novel wall stud system capable of being readily assembled on the job without the need for external fasteners or special tools.

It has been the common practice to fabricate homes and other buildings of relatively light construction with external bearing walls and floor and wall systems interconnected therewith. The floor members were usually fabricated of relatively heavy floor joists of sufficient strength and rigidity to support the finished floor surface. Prior art interior walls were usually constructed of wooden stud members extending from floor to ceiling. Such prior art wooden studs were usually fabricated of 2 by 3 inch or 2 by 4 inch stock which were nailed to floor and ceiling structural members. Wall construction materials comprising either wire lath and plaster or a wall-board of the dry wall type was then nailed to the studs to form the usual finished wall surface. In structures other than lightly constructed buildings such as large commercial and industrial buildings, it has been the usual practice to incorporate only non-combustible material in forming the floor, ceiling and wall frame members. In such non-combustible construction, it has been common practice to provide metal studs comprising sheet metal bent to channel-shaped cross-sectional configuration for the wall framing. Such metal studs were usually employed in systems which included a floor plate and a ceiling plate and means to fasten the metal studs in position. Once assembled, gypsum wall board or metal lath could then be fastened directly to the metal studs, usually by employing sheet metal screws and automatic screw guns.

All of the prior art methods of building construction were quite time-consuming and costly because of the large amount of manual labor employed in both precisely laying out any system and also in the number of man hours required to assemble the system. The vertical studs had to be precisely located and then fastened in position by utilizing either nails or screws. The studs had to be vertically aligned and horizontally spaced, usually sixteen inches on center, all of which required a large amount of skilled labor time. In view of the high costs of skilled construction workers, the former construction methods resulted in greatly increased construction costs.

## SUMMARY OF THE INVENTION

The present invention relates to a wall stud system incorporating non-flammable members and means to precisely align and automatically lock the members in position without the need for extended time-consuming measurements in the field or external fastening devices.

The system includes a floor beam and a ceiling beam of hollow, generally rectangular configuration fabricated of sheet metal bent to the desired dimensions. One side of each of the floor and ceiling beams is punched or otherwise treated to provide a plurality of shaped openings at equally spaced locations along the length of the beam. The openings are shaped to conform to the shape of cooperating stud members and are positioned in angular rotation from the final position of the studs. In the case of studs of square cross sectional configurations, the rotative angular disposition is 45°.



A plurality of identical, elongated, hollow studs extend between the floor and ceiling beams and are fabricated of dimensions suitable to fit within the openings in the beams. Wedge-shaped notches are provided in the studs near each end thereof at all bent corners for locking purposes within the beam openings.

The studs position within the beam openings at an angular relationship from the final position and respectively insert downwardly into the floor beams and upwardly into the ceiling beam. With the studs assembled within the beam openings, the said wedge shaped notches are aligned with the plane of the beam openings and then the studs are angularly rotated with respect to the beams. In this manner, the wedge-shaped notches tighten up upon the beam wall construction at the openings and lock the studs into final position. When it is desired to utilize the wall stud systems in conjunction with finished wall materials such as lath or dry wall sheets, the studs are designed to present one face thereof parallel to the surface of the lath or dry wall to thereby provide a straight surface for connecting the wall construction materials in the usual manner. Such a system has the advantage of requiring relatively little precision measurements or nailed connections in the field and substantially reduces the overall labor required in building construction. Additionally, the system is self-locking and does not require the use of nails, screws or other fasteners between the beam and stud members.

It is therefore an object of this invention to provide an improved wall stud system of the type set forth.

It is another object of the present invention to provide a novel wall stud system that incorporates interlocking beam and stud members requiring no additional fasteners.

It is another object of the present invention to provide a novel wall stud system employing hollow metallic floor beams and wall studs, the beams being provided with a plurality of spaced openings to precisely space the studs with respect to the beams upon assembly:

It is another object of the present invention to provide a novel wall stud system that incorporates a plurality of two basic shapes, namely horizontal beams and vertical studs, the said studs inserting into the beams and being rotated with respect therewith to lock the studs and beams together.

It is another object of the present invention to provide a novel wall stud system incorporating horizontal beams and vertical studs and integral means to lock the studs within the beams.

It is another object of the present invention to provide a novel wall stud system including upper and lower beam supports and decorative bar members joining the supports, the bar members rotatively locking onto the lower beam support.

Another object of the present invention is to provide a novel wall stud system that is rugged in construction, inexpensive in manufacture, and trouble-free when in use.

Other objects and a fuller understanding of the invention will be had by referring to the following description and claims of a preferred embodiment thereof, taken into conjunction with the accompanying drawings, wherein like reference characters refer to similar parts throughout the several views and in which:

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an exploded perspective view showing the basic construction elements of the present invention.

FIG. 2 is an enlarged, fragmentary top plan view showing a vertical stud of square configuration locked upon a horizontal base member.

FIG. 3 is a cross-sectional view taken along Line 3—3 of FIG. 2, looking into the direction of the arrows.

FIG. 4 is an enlarged, exploded, perspective view showing a modified, decorative stud and beam configuration.

FIG. 5 is a top plan view similar to FIG. 2 illustrating a modified stud configuration.

FIG. 6 is a top plan view similar to FIG. 2, showing another modified stud configuration.

FIG. 7 is a top plan view similar to FIG. 2, showing another modified stud configuration.

FIG. 8 is a partially assembled, perspective view showing a stud blank in the process of being formed into the final configuration.

FIG. 9 is a partial perspective view showing a portion of the wall stud system in use.

FIG. 10 is a cross-sectional view taken along Line 10—10 of FIG. 9, looking in a direction of the arrows.

FIG. 11 is a fragmentary elevational view showing a modified beam and stud configuration.

FIG. 12 is an enlarged, fragmentary, top plan view similar to FIG. 2 and showing a strengthening clip.

## DESCRIPTION OF THE PREFERRED EMBODIMENT OF THE INVENTION

Although specific terms are used in the following description for the sake of clarity, these terms are intended to refer only to the particular structure of my invention selected for illustration in the drawings and are not intended to define or limit the scope of the invention.

Referring now to the drawings, I show in FIG. 1 the functional components of my invention including a generally rectangular, elongate, floor beam means 10 and a similar, generally rectangular, elongate, ceiling beam means 12 which is preferably installed in the same vertical plane as the floor beam 10 to provide plumb vertical walls in conjunction with the studding as hereinafter more fully set forth. A plurality of vertical, elongate, hollow studs 14 extend between the floor and ceiling beams 10, 12 for wall construction purposes or decorative treatment as hereinafter more fully set forth.

Each floor and ceiling beam 10, 12 is preferably rectangularly formed to elongate hollow configuration and may be fabricated of thin, strong sheet material of the necessary rigidity for the use. I prefer to use sheet cold, rolled steel of one-sixteenth of an inch in thickness. If desired, the material may be galvanized to prevent oxidation after installation. It will be appreciated that other materials such as hard plastics and non-ferrous metals and sheet steel of other thicknesses may be employed in accordance with the teachings of this invention for use with specific applications. Each beam 10, 12 includes a base side 16, 18 for firmly positioning against the respective floor 20 or ceiling 22 of the building under construction. The beams 10, 12 may be secured to the building construction 20, 22 in a suitable, well known manner such as by gluing, nailing or other method. Optionally, the floor and ceiling beams 10, 12, may be more strongly fabricated to be utilized as bearing members in accordance with well-known construction techniques to thereby become supports for other building construction members as hereinafter more fully set forth.

The inwardly facing side 24, 26 of each beam 10, 12 is punched or otherwise treated to provide a plurality of spaced stud receiving holes 28, 30 for receiving and securing the vertical studs 14 therein. Preferably, the respective holes 28, 30 are horizontally spaced at 16 inches on center to conform to usual construction industry installation procedures. However, greater hole spacing or lesser hole spacing may be provided and still come within the scope and meaning of this invention.

In the embodiment illustrated in FIG. 1, the holes 28, 30 are formed to a square configuration and communicate with the respective hollow interiors 32, 34 of the beams 10, 12 for stud receiving and securing purposes. As best seen in FIG. 2 the sides 36, 38 of the opening 28 align at an angular relation of 45° to the longitudinal axis of the beam 10. The hole 30 is similarly angularly aligned with the longitudinal axis of the ceiling beam 12. It is the intent of this invention to install the respective floor and ceiling beams 10, 12 in vertical, spaced relationship so that the holes 30 vertically register above the holes 28 and with the sides of the holes 28, 30 in respective vertical alignment to readily receive the studs 14 during the system fabrication procedure. Upon installation, as best seen in FIG. 3, the bottom 40 of the stud 14 inserts through the opening 28 and positions within the hollow interior 32 of the beam 10 in tight engagement with the inwardly facing side 24. Similarly, although not specifically illustrated, the stud top 42 inserts through the ceiling beam opening 30 and positions within the hollow interior 34 of the ceiling beam 12 upon installation and engagment.

As best seen in FIGS. 1 and 8, each stud means 14 is preferably fabricated from a single sheet of material and is bent to a plurality of identical longitudinal folds 44 to define a plurality of vertical panels 46, 48, 50 and 52. A tab 54 extends from the end panel 52 from the fold line 56 and serves to enclose the stud 14 by fastening upon the panel 46 in well-known manner such as by spot welding or by sheet metal screws (not shown). In this manner, an elongate, enclosed stud 14 of relatively strong construction can readily be fabricated using well-known techniques and conventional sheet material bending equipment. If desired, the stud can be strengthened by providing a top 58 and a bottom 60 which respectively insert through at the stud top and bottom 42, 40 and secure therein in a well-known manner such as by spot welding. The top and bottom 58, 60 serve to strengthen the stud 14 when so desired and prevent relative movement of the respective panels 46, 48, 50, 52 with respect to each other about the fold lines 44.

Each panel is provided near the top 42 and bottom 40 thereof with generally triangularly shaped openings 62, 64 which are identically punched or otherwise formed through the stud panels and each opening includes a base 66 and a pair of equal, angularly disposed legs 68, 70 which join to form the triangularly shaped openings 62, 64. The bases 66 of the top and bottom openings 62, 64 dispose at right angles to the longitudinal axis of the studs 14 and the legs 68, 70 angularly extend in the direction of the associated beams 10, 12. The respective bases 66 space apart the precise dis-

tance for interaction with the respective inwardly facing sides **26, 24** of the ceiling and floor beams **12, 10.** The legs **68, 70** outwardly extend from the respective bases **66** and intersect at respective apices **72** of each triangular opening **62, 64.** The apices **72** align over the respective fold lines **44** for stud securing purposes so that the wedge-shaped openings **62, 64** are widest at the fold lines **44.** As best seen in FIGS. **1** and **8,** each triangular opening **62, 64** bends about the fold lines **44** to form corner positioned notches having bases **66** at right angles to the longitudinal stud axis and generally wedge-shaped configuration opening toward the respective stud ends **40, 42.**

Each stud **14** is fabricated of a plurality of sidewall panels **46, 48, 50, 52** and is bent to a cross-sectional configuration to correspond with the cross-sectional configuration of the upper and lower beam holes **30, 28.** The stud panels are fabricated slightly smaller than the dimensions of the openings **30, 28** to thereby permit each stud **14** to readily slide down into the floor beam openings **28** and upwardly into the ceiling beam openings **30.**

In order to install the wall stud system in accordance with the present invention, the floor and ceiling beams **10, 12** are first secured to stationary building construction **20, 22** in well-known manner with the respective inwardly facing sides **24, 26** facing towards each other and in vertical registry. The respective openings **28, 30** also are vertically aligned in registry for receipt of the studs **14.** The studs **14** are fabricated as hereinbefore explained and tie into the system by first inserting each respective bottom end **40** into a floor beam opening **28,** a distance sufficient to allow the stud top **42** to position directly beneath the ceiling beam opening **30.** The stud top **42** is then inserted into the opening by vertically raising the stud until the upper notches **74** horizontally align with the ceiling beam inwardly facing side **26.** The spacing between the stud upper and lower notches **74** is precisely controlled so that when the upper stud notch **74** horizontally aligns with the inwardly facing side **26,** the lower stud notch **74** similarly aligns with the inwardly facing side **24** of the bottom beam **10.** See FIG. **3.**

It will be appreciated that the upper and lower openings **30, 28** are angularly disposed at 45° from the longitudinal axis of the respective beams **12, 10.** See FIG. **2.** Accordingly, the studs **14** must also angularly position with regard to the longitudinal axis of the beams **10, 12** when first inserted into the openings **28, 30.** With the studs **14** so angularly positioned, each stud in turn is rotated with respect to the beams through an angle of 45°. The upper and lower notches **74** rotate through the material of the respective inwardly facing sides **24, 26** and the wedge-shaped configuration serves to lock the studs **14** against the inwardly facing sides **24, 26.** (FIGS. **2** and **3**). By angularly turning the studs **14** through 45°, the respective stud panels **46, 48, 50, 52** will then rotate into an alignment with the longitudinal axes of the beams **10, 12** that is either parallel thereto with respect to two of said panels or perpendicular thereto with respect to the remaining two panels to provide one flush, parallel surface **76** in alignment with the longitudinal axis of the beams **10, 12** for receipt of the usual wall construction material such as rock lath, metal lath, or gypsum wall board. It will be appreciated that after the studs are rotated with respect to the upper and lower openings **30, 28,** they will be securely locked into position and cannot be removed from the beams **10, 12** until first rotated back through the same 45° to thereby again allow relative vertical movement in the openings **30, 28.**

Referring now to FIGS. **9** and **10,** I show one method of installation wherein the ceiling beam **12** spaces above the floor beam **10.** A plurality of square cross-sectional studs **14** rotatively lock in verticaly aligned, spaced relationship in the manner hereinbefore described to form a wall construction in conjunction with usual gypsum wallboard **82.** A plurality of sheet metal screws **84** or other commonly employed fasteners turn through the wallboard **82** into the parallel stud surfaces **76** to thereby securely affix the wall-board to the studs **14.**

The room sides **88, 86** of the floor and ceiling beams **10, 12** are similarly provided with a plurality of square openings **28', 30'** which rotatively position at an angle of 45° with the longitudinal axes of beams **10, 12.** Ceiling studs **14'** and floor studs **14''** extend horizontally between adjacent floor beams **10** (only one illustrated) and adjacent ceiling beams **12** (only one illustrated) in the same manner as hereinbefore described for the wall studs **14.** Ceiling wallboard **22** affixes to the ceiling studs **14'** and conventional flooring members **20** affix to the floor studs **14'** in the usual manner to form a finished appearance. The upper and lower edges **80, 82** of the wallboard abut respectively the ceiling construction **22** and flooring **20** to form corner junctions in well-known manner. In one method of construction, if desired, the respective upper and lower openings **30, 28** may be carefully positioned and the dimensions of the studs **14** may be controlled and fabricated to locate the parallel surfaces **76** of the stud **14** a distance back from the room surfaces **86, 88** of the beams **12, 10,** a distance corresponding to the thickness of the wall board **82.** Thus, if ⅝ inch thickness wallboard is used, the parallel surfaces **76** of the studs **14** should recess a distance of three-eights of an inch back from the room sides **86, 88** of the beams **12, 10.** Similarly, if ½ inch thickness wallboard is utilized, the recess distance should be adjusted to one-half of an inch in depth see FIG. **10.**

Referring now to FIG. **4,** a modified type of stud construction is set forth wherein a decorative stud **90** is illustrated having eight sides. It is contemplated that decorative studs may be utilized for room dividers, stair banisters, railings and other similar constructions where it is desired to employ a decorative effect. Such decorative studs should be fabricated of finished highly polished materials such as chrome coated steel or other finishes such as brushed brass to present a finished appearance without covering or other decoration. In the manner hereinbefore described, the floor and ceiling beams **10, 12** are fabricated to elongate, hollow form having shaped openings **92** of configuration to receive the decorative studs **90** therein in locking engagement. Each stud includes a plurality of upper and lower corner, wedge-shaped notches **74'** at each longitudinal fold **44'** as hereinbefore set forth, for interaction with the shaped openings **92** for locking purposes. It will be appreciated that as a decorative stud **90** is angularly turned with respect to the upper and lower beams **10, 12,** a portion of the shaped openings **92** will be exposed by reason of the angular locking movement of the stud **90** with respect to the opening **92.** If desired, a decorative ferrule **94** may be fabricated and slipped over the stud **90** prior to assembly of the parts. After the stud **90**

is received within the opening 92, the decorative ferrule 94 can be positioned against the beam 10 or 12 to thereby form a decorative junction without any portion of the opening 92 being exposed. In the case of ceiling ferrules, set screws (not shown) may be employed in well-known manner to hold the ferrule against the underside of the ceiling beam 12.

As illustrated in FIGS. 5, 6 and 7, decorative studs may be formed to any of a number of pleasingly shaped configurations such as, for example, triangular 96 (FIG. 6), hexagonal 98 (FIG. 5), or elliptical 100 (FIG. 7). It will be appreciated that similarly shaped cooperating openings 102, 104, 106, must be formed in the respective inwardly facing sides 24, 26 of the floor or ceiling beams 10, 12 in the manner hereinbefore described to make a workable system. It will be further appreciated that many other variations of shaped studs may be employed in accordance with the teachings of this invention. All of the variously shaped studs secure to the upper and lower beams 12, 10 in the manner hereinbefore described by first inserting into the respective openings 102, 104, 106 and then angularly rotating the studs with respect to the beams to lock the upper and lower notches 44, 44' upon the beam construction. In observing the constructions of FIGS. 4, 5, 6 and 7, it will be further appreciated that the angle of rotation of each stud with regard to its associated beams for locking purposes will vary depending upon the number of sides or configuration of the stud. Also, the studs must be symmetrical in cross-section with equal panels to effect uniform locking upon the beams.

Referring now to FIG. 11, another detail of the present invention is illustrated wherein floor and ceiling beams 108 are fabricated to a hollow elongate configuration having side walls of sufficient thickness and strength to form an integral part of the building structural bearing system. Such wall thicknesses and strength of beam may be readily calculated in accordance with well-known engineering practices to carry specified loads such as floors or ceilings. It is contemplated that wall studs 14 will insert downwardly through openings 28 in the manner hereinbefore described and then rotate with respect to the openings to securely lock the studs 14 to the structural floor beams 108. Similarly other wall studs 14 will insert upwardly into beam openings 28' for modular purposes for fabricating similar rooms on floors below. By properly supporting the beams 108 in accordance with well-known construction techniques, a satisfactory bearing member can thus be provided for receiving and securing floor systems such as floor studs 14'' thereon. Where modular construction below is contemplated, the ceiling studs 14' can be secured to the beam 108 in the manner hereinbefore set forth. Where more than one story construction is designed, the horizontal studs can serve both as floor studs 14'' and ceiling studs 14'. In those instances, where buildings of fireproof construction are contemplated, all of the bearing members (not shown) supporting the strengthened beams 108 must be fabricated of non-combustible materials and the floor itself should also be fabricated of non-combustible materials, all of which is in accordance with well-known fire-resistance construction techniques.

In order to facilitate field erection of modular buildings employing the present wall stud system, it is contemplated studs 14 could be modified to easily frame door and window openings by providing additional angular openings (not shown) in the studs to receive horizontal and vertical framing members (also not shown) which would rotatively lock in accordance with the teachings of the present disclosure.

Additionally, when building live and dead loads render it necessary or desirable, angular clips 89 could be secured to the surface 24 of a beam 10 with integral tabs 91 projecting away from the opening 28 for beam strengthening purposes. If the loads to be supported were sufficiently great, one or more clips 89 could be located at the corners of the opening 28 as necessary to safely carry the load. See FIG. 12.

I claim:

1. In a wall stud system for use in building construction, the combination of
   - A. horizontal beam means of elongate configuration,
     1. said beam means having an inwardly facing side being treated to provide a plurality of spaced openings therethrough; and
   - B. stud means associated with the beam means and being respectively inwardly insertable into the said openings,
     1. said stud means being provided with a plurality of inwardly positioned notches,
        - *a.* the said notches contacting the said inwardly facing side,
        - *b.* the said notches being wedge-shaped in configuration,
     2. said stud means angularly rotating with respect to the beam means to lock the said notches onto the said side at the said openings.

2. The invention of claim 1 wherein the stud means are longitudinally bent to form a plurality of elongate panels which are defined by longitudinal folds and wherein the said notches position about the periphery of the stud means at each said longitudinal fold.

3. The invention of claim 2 wherein the stud means and the openings are triangular in configuration in a horizontal plane.

4. The invention of claim 2 wherein the stud means and the openings are hexagonal in configuration in a horizontal plane.

5. The invention of claim 2 wherein the stud means and the openings are octagonal in configuration in a horizontal plane.

* * * * *