Nov. 13, 1962 J. V. RYLANDER 3,063,103

JOIST FRAMING CONSTRUCTION

Filed Sept. 25, 1958

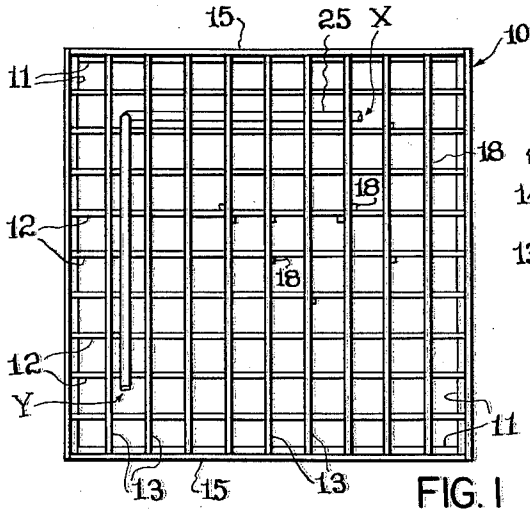


FIG. 1

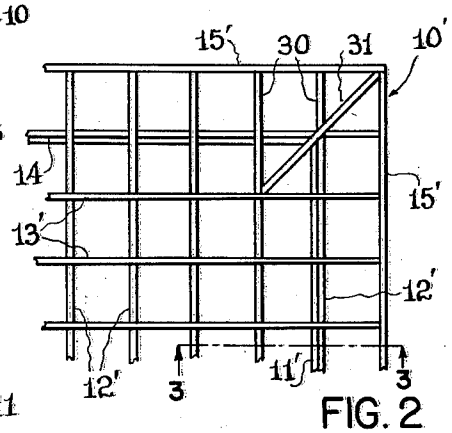


FIG. 2

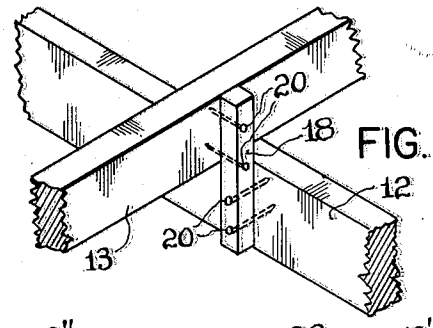


FIG. 5

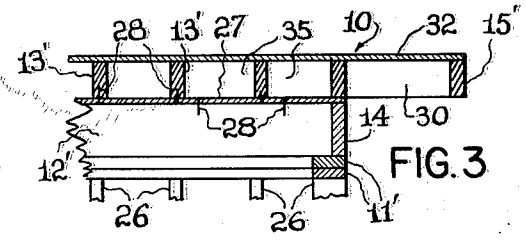


FIG. 3

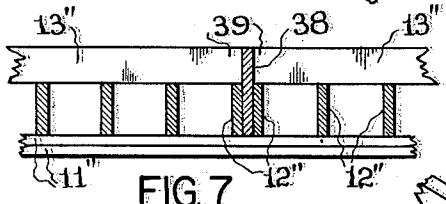


FIG. 7

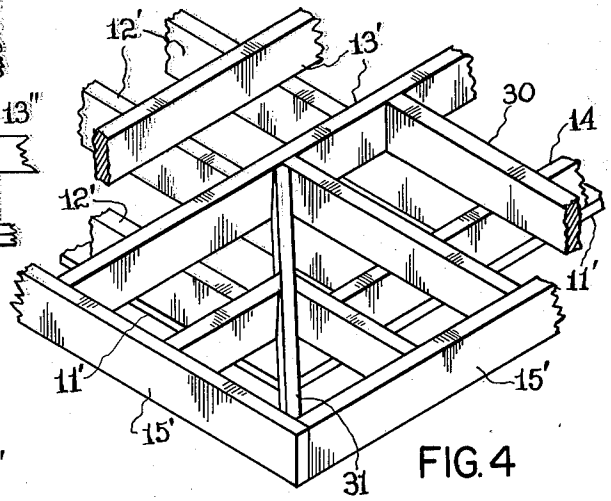


FIG. 4

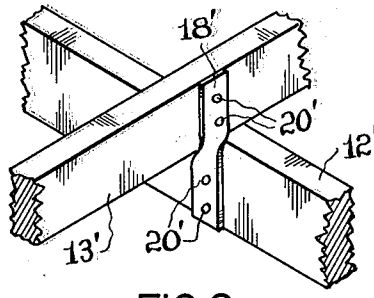


FIG. 6

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JOIST FRAMING CONSTRUCTION

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11 Claims. (Cl. 20—1)

This invention relates to framing structures for buildings and more particularly to an improved mode of joist framing suitable for both floors and roofs and exhibiting various advantageous features over prior framing structures.

It has long been common practice to provide framing for floors and roofs formed from a single layer of joists of a suitable width to carry the load under particular loading conditions. However, there are numerous disadvantages to this prior and substantially universal practice, particularly when using wooden joists. For example, cross-bracing between each pair of joists is required in all cases except possibly where the joist length is very short. Usually a pair of diagonally disposed cross braces is used between each pair and these must be individually cut to size and secured in place. Another disadvantage resides in the fact that the running of ducts and wiring required for electrical installations, plumbing, heating and the like necessitate forming holes through the joists in order to reach points spaced crosswise of two or more joists. Not only is the provision of such holes costly and difficult, particularly after an underlying ceiling or an overlying flooring is in place, but this practice weakens the joist objectionably and presents serious obstacles to the threading of the ducting and wiring through the openings. Furthermore, joist framing as heretofore employed does not lend itself to the provision of either sound or heat insulation between the upper and lower surfaces of the joist structure. Both types of insulation are most desirable and this is particularly true of buildings in warmer climates and all buildings where sound and heat isolation between levels is of importance as it is, for example, in office and dwelling structures.

The joist framing provided by the present invention obviates the foregoing and other shortcomings of prior joist framing and provides additional desirable features not heretofore obtainable easily and at low cost. Thus, the joist framing here provided features two or more layers of joists in close superimposed relation, if not in actual supporting contact with one another, and extending generally at right angles to each other. Rigid tie means interconnecting joists of adjacent layers at points of crossover assures rigid interlocking of the two layers and enables the joists to supplement one another in providing an extremely rigid and high-strength joist structure despite the fact that the cross-sectional area of individual joists is considerably smaller than normally employed in a given situation. Owing to these ties and the very marked strengthening thereby achieved, smaller and less expensive joists can be used in each layer of the composite joist structure.

Another feature of the invention is the use of sheet material between adjacent joist layers for the purpose of dividing the structure into isolated layers for sound deadening and heat insulating purposes. These objectives can be enhanced by employing sheet material having either or both heat insulating and sound absorbing qualities. Furthermore, such sheet material can be used in lieu of the vertical tie members to connect the adjacent layers of joists rigidly to one another by the simple expedient of nailing or otherwise fastening the sheet material to each of the adjacent layers of joists.

It will also be recognized that the mode of erecting joists of this invention provides for the circulation of air in separate layers between the upper and lower faces of the structure. This is highly advantageous particularly in tropical and warmer climates.

A further advantage resides in the fact that the upper layer of joists can be extended beyond one or more of the peripheral edges of the lower layer of joists to provide an overhang serving both decorative and functional objectives.

A particularly important advantage of the new framing structure resides in the fact that ducting and wiring can be extended between spaced points by the simple expedient of passing it lengthwise of one layer of joists to a transition point and then lengthwise of and between the joists of an adjacent layer until a desired point is reached. It is therefore unnecessary to form holes or openings of any character through any joist in going from one point to any other point in the entire area being covered. Ducting and wiring can be installed very economically and quickly either during initial erection of the framing or at any time after the structure has been finished and after ceiling and flooring or roofing structure has been secured in place. In the latter event, it is unnecessary to remove the surface covering for the framing except possibly in very localized areas such as at the point of entrance or exit, or where a right angle turn is made at the transition between joist layers.

Accordingly, it is a primary object of the present invention to provide an improved joist framing structure having numerous advantages over such structures as heretofore provided.

Another object of the invention is the provision of an improved mode of erecting joist framing rapidly, inexpensively, and of greater ruggedness and load carrying ability making use of multiple layers of joists arranged crosswise of one another.

Another object of the invention is the provision of joist framing having two layers of joists arranged at right angles to one another and rigidly tied together at points of crossover by simple, easily installed tie means.

Another object of the invention is the provision of joist framing formed from a plurality of layers of joists arranged at an angle to one another with the ends of one layer projecting beyond the peripheral edges of another layer to provide an overhang effective as a sun shade and as a weather shield.

Another object of the invention is the provision of joist framing so constructed and arranged that ducting and wiring can be extended between any two or more horizontally separated points without need for forming holes or openings of any kind through any joist.

Another object of the invention is the provision of joist framing comprising two or more layers of joists separated from one another by an intervening layer of sheeting material secured to at least one and preferably both joist layers, such sheeting being effective as structural reinforcing and having either or both heat insulating and acoustical properties.

These and other more specific objects will appear upon reading the following specification and claims and upon considering in connection therewith the attached drawing to which they relate.

Referring now to the drawing in which preferred embodiments of the invention are illustrated:

FIGURE 1 is a top plan view of joist framing according to one preferred embodiment of the invention;

FIGURE 2 is a fragmentary top plan view of an alternate embodiment on an enlarged scale and wherein the upper layer of joists extends beyond the perimeter of the lower layer;

FIGURE 3 is a fragmentary transverse view on an enlarged scale taken along line 3—3 on FIGURE 2 with sheet material between the layers of joists;

FIGURE 4 is a perspective view on an enlarged scale of corner details of the structure shown in FIGURE 2;

FIGURE 5 is a fragmentary perspective vew on an enlarged scale showing one mode of interconnecting adjacent layers of joists at a point of crossover;

FIGURE 6 is a view similar to FIGURE 5 of an alternate tie structure; and

FIGURE 7 is a fragmentary cross-sectional view of alternate joist framing useful where one dimension is greater than commonly available lengths of joists.

Referrng to FIGURE 1, there is shown one preferred embodiment of joist framing according to the present invention. This framing includes the usual plate members **11** bordering the area to be covered with either a floor or a roof and normally consisting of a pair of two by fours or two by sixes, laid flatwise one on top of the other and rigidly secured to the foundation or to the upper ends of studding in accordance with conventional practice. A first layer of joists **12, 12** are erected in spaced parallel relation with their ends resting on and nailed or otherwise rigidly secured to the adjacent portions of face plate **11**. Assuming that a fairly large area measuring 12 feet by 12 feet is to have joist framing erected thereon the lower layer might consist of two by fours or two by sixes, it being understood that normally joists of somewhat greater cross-sectional area and width would be employed for the lower or first layer than for the upper layer. The size selected would depend upon the weight to be supported on the finished framing and would take into consideration the cross-sectional area and additional strength provided by the upper layer of joists.

After the first layer has been erected in the manner described, a second layer of joists **13** is laid croswise and preferably at right angles to the length of underlying joists **12**. Joists **13** likewise are spaced apart and parallel to one another. The adjacent ends of the joists of both the upper and lower layers are preferably rigidly interconnected by tie members, such as member **15**, interconnecting the opposite ends of joists **13**.

In order that the joists of the two layers may supplement one another in carrying the load and be held against buckling or spreading relative to one another, rigid connectors such as cleats **18** are located adjacent the point of crossover between the joists with its opposite ends being secured to the joist as by nails or screws **20** in the manner made clear by FIGURE 5. One or more of these cleats **18** may be employed at the point of cross-over or the cleats may be located at part only of the crossovers. It is pointed out that FIGURE 1 shows only a few cleats at random points in framing structure **10**, but it will be understood that this is merely indicative and that in the usual structure substantially all points of crossover would be thus connected. It is pointed out that strong wire may be wrapped about two or more joints at crossover and tightened as by twisting or otherwise.

After the two joist layers have been erected in the manner described, suitable covering may be applied to the undersurface of the lower layer and to the upper surface of the upper layer, the material used being governed by the intended purpose of the completed structure and whether the framing is being employed as a floor or as a roof. In either case, it will be recognized that piping or ducting can be installed between the opposite faces of the framing without making openings of and kind through either layer of joists. For example, let it be assumed that the user wishes to install a hot air circulating duct **25** with one end terminating at point X and the other end terminating at point Y. One leg of duct **25** is located between a pair of joists **12** and then bends upwardly to the second leg of the duct extending to point Y between a pair of upper joists **13**. An upturned elbow connected at point Y opens through the floor or roof, as the case may be, and the opening provided for this purpose is the only one required in the entire framing structure. It will be understood that plumbing of all kinds, ducting, and wiring conduits may be installed in like manner and in any number between any two points, all without need for openings through any joists.

Referring to FIGURES 2, 3 and 4, there is shown an alternate embodiment, the same or similar parts being designated by the same reference characters employed in the first embodiment and distinguished therefrom by the addition of a prime. Plate members **11'** of this embodiment are shown as secured to the upper end of studding members **26**. The lower layer of joists **12'** are laid in spaced parallel relation with their ends supported on plate members **11'**. The opposite ends of joists **12** are preferably rigidly secured together by a tie member **14** which may be of the same material as joists **12**. After the lower layer of joists has been erected as described a layer of sheet material such as plywood **27** or suitable heat insulating panels are laid in edge-to-edge relation against the upper edges of the joist and secured thereto as by nails **28**. Thereafter, the upper layer of joists **13** are erected crosswise of lower joists **12'**. Sheet material **27** provides a convenient means for rigidly tying the two joist layers together and for this purpose may supplant cleats **18** described in connection with FIGURES 1 and 5. Nails **28** driven upwardly from the underside of sheet **27** into joists **13'** at points between joists **12', 12'** serve to anchor the sheeting to the upper layer of joists.

An important feature of the embodiment illustrated in FIGURES 2 to 4, resides in the use of one layer of joists, and preferably the upper layer, to provide a cantilever type overhang extending beyond the peripheral edges of the other joist layer. For example, the opposite ends of joists **13** may extend as much as two, three or more feet beyond the perimeter edges of the lower layer. If it is desired that this extension continue beyond all sides of the building, supplemental members **30** of the same size and material as joists **13** are provided to the requisite length and these are nailed in place in the positions illustrated in FIGURES 2 and 4. Diagonal members **31** extend at an angle of 45 degrees to joists **13'** at the corners of the framing.

Sheeting or roof boards **32** may be secured to the upper edges of joists **13'** as is shown in FIGURE 3 and cooperate with sheeting **27** between the two layers of joists to form air channels or passageways **35**, it being understood that the opposite ends of these channels are open to the atmosphere on the underside of the overhang. If desired, members **14** connecting the opposite ends of joists **12'** may be provided with openings to the atmosphere if the circulation of air between these joists is desirable to provide additional cooling effectiveness.

Referring to FIGURE 6, there is shown an alternate mode of tying the two layers of joists together at points of crossover. For this purpose there is provided a metal straps **18'**, one end being bent to lie flush against a lower joist **12'** and the upper end being twisted at 90 degrees thereto to lie flush against the side of upper joist **13'**. Nails or screws **20'** are used to secure these ends to the joists. If desired, screws could be inserted through bores formed in one joist in alignment with the area of crossover so that the screw could be turned into the other joist.

In FIGURE 7, there is shown still another joist framing according to the present invention and particularly useful where one dimension of the area being covered is greater than the length of the joist used for the upper layer. Let it be assumed, for example, that an area 12 feet by 24 feet is to be covered. In this event the 12 foot joists **12''** are laid crosswise of the shorter dimension of the area, their ends being supported on plate members **11''**. Crosswise of the mid-plane of this span there is erected an extra wide joist **38**, this joist being sandwiched between and rigidly secured by nails, screws or the like to a pair of joists **12''**. Thereafter, the upper layer of joists **13''** are erected in the same manner described above. A pair of 12 foot joists **13''** are required

to span the length of the 24 foot area, such a pair being in alignment and with their adjacent ends abutting the opposite faces of wide joist **38**. Ends **39** are nailed or otherwise secured to joist **38** and vertical ties similar to **18** and **18'**, illustrated in FIGURES 5 and 6 may be used at points of crossover of the upper and lower joists to secure these together. Although sound and heat insulating sheeting corresponding to sheet **27** in FIGURE 3 is not shown in FIGURE 7, it will be understood that such sheeting may be and preferably is used for the purposes described above. It will also be appreciated that sheet **27** and vertical ties **18**, **18'** may be used interchangeably in the several modifications for the purpose of interconnecting the two layers of joists.

While the particular composite joist framing and mode of erecting the same herein shown and disclosed in detail is fully capable of attaining the objects and providing the advantages hereinbefore stated, it is to be understood that it is merely illustrative of the presently preferred embodiments of the invention and that no limitations are intended to the details of construction or design herein shown other than as defined in the appended claims.

I claim:

1. Generally horizontally disposed joist framing for use in building structures, said joist framing comprising a plurality of superimposed layers of joists each layer of which includes a plurality of joists with the joists in one layer arranged substantially at right angles to the joists in the other layer, means for rigidly supporting the opposite ends of both layers of joists, the space between adjacent joists in each layer being unoccupied and available for the running of conduits, electric wiring and the like, and means for securing joists of said layers together at substantially all points of crossover to provide a rigidly interconnected multi-layered joist framing.

2. Joist framing as defined in claim 1 characterized in that the joists comprising one layer are of a different width vertically than the corresponding width of the joists in an adjacent one of said layers.

3. Joist framing as defined in claim 1 characterized in that said means for securing said joists together includes sheet material between adjacent layers of said joists, and means rigidly securing said sheet material to said layers.

4. Joist framing as defined in claim 1 characterized in the provision of members including said joists bounding the perimeter of each layer and serving to interconnect the adjacent ends of the joists in a given one of said layers rigidly together.

5. Joist framing as defined in claim 1 characterized in that the joists comprising the lower layer are of greater vertical width than the joists comprising an overlying layer.

6. Joist framing as defined in claim 1 characterized in that the area enclosed by one of said layers of joists is appreciably greater than the area enclosed by another to provide a cantilever type overhang.

7. Joist framing as defined in claim 6 characterized in that the joists forming an upper one of said layers has one end edge projecting beyond the corresponding end edge of a lower one of said layers and adapted to project beyond the building side wall to provide a protective overhang as respects sun-light and the weather.

8. Joist framing as defined in claim 1 characterized in that an upper one of said layers of joists projects substantially outwardly beyond at least a plurality of the perimeter edges of an underlying layer of joists to provide an overhang, said upper layer of joists including the overhang portions thereof being supported cantilever-fashion by said underlying layer.

9. Joist framing as defined in claim 8 characterized in the inclusion of heat and sound insulating material between adjacent layers of said joists and serving as an intervening and separating layer between said layers of joists.

10. Joist framing as defined in claim 8 characterized in the provision of sheet material between adjacent layers of said joists and forming a substantially continuous barrier between said layers throughout the contiguous areas thereof.

11. Joist framing as defined in claim 1 characterized in the provision of generally vertically disposed tie means positioned at points of crossover between joists of adjacent layers and effective to tie the same rigidly together at said points of crossover.

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