

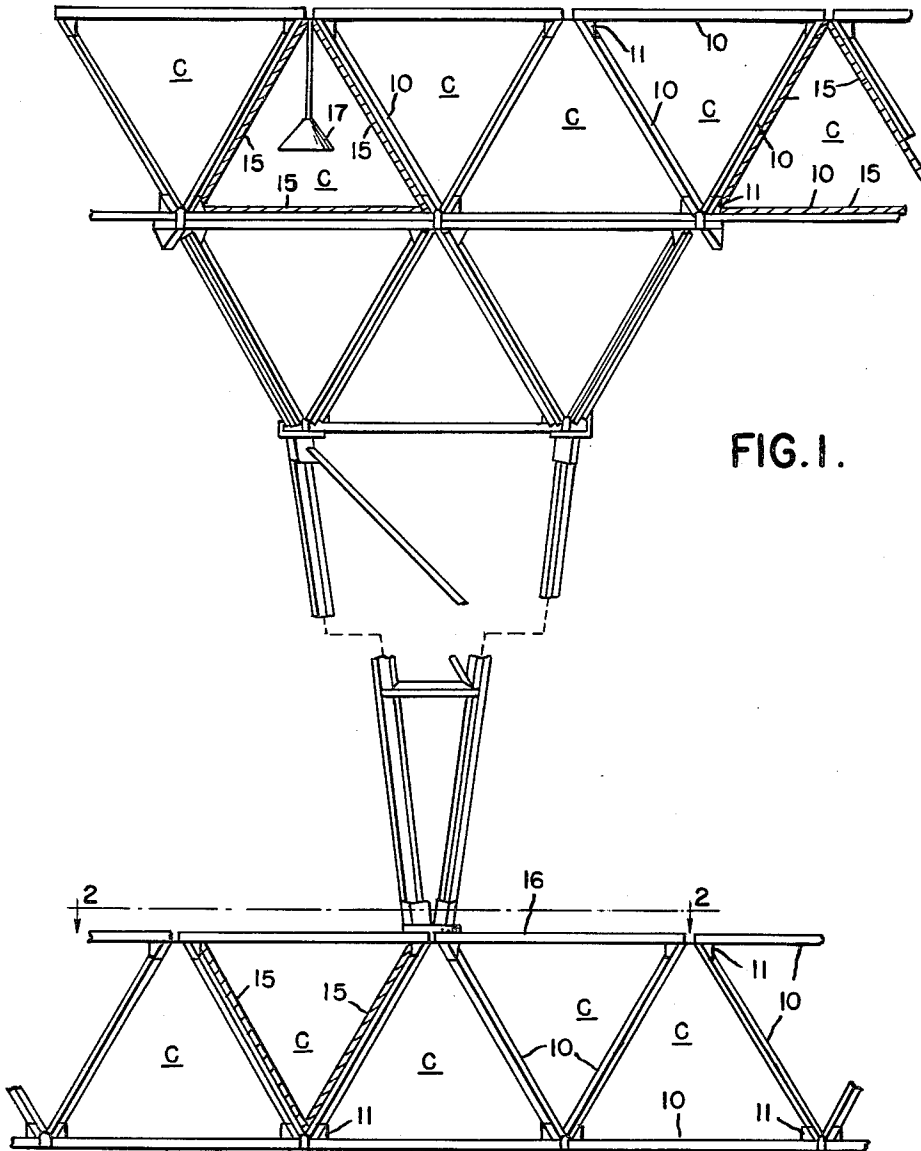
Aug. 14, 1962

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ROOF OR FLOOR SUPPORT

3,049,196

Filed Dec. 8, 1960

2 Sheets-Sheet 1



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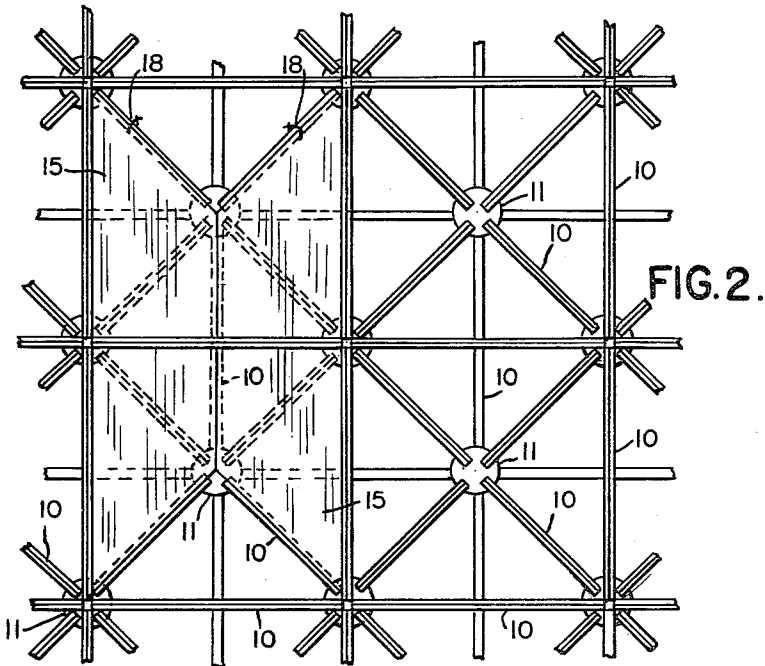


FIG. 3.

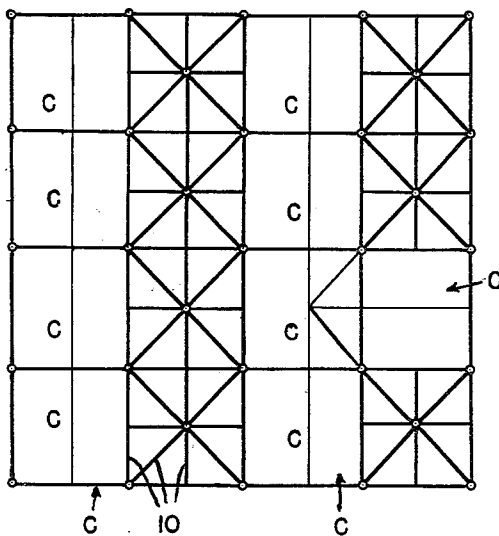
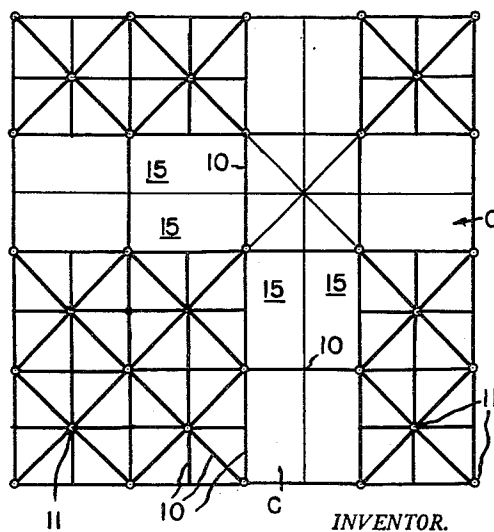


FIG. 4.



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ROOF OR FLOOR SUPPORT

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Filed Dec. 8, 1960, Ser. No. 75,076
7 Claims. (Cl. 189—34)

This application is a continuation-in-part of my abandoned parent application Serial No. 517,247, filed June 22, 1955.

The present invention relates to metallic building structures and the provision in such structures of conduits utilizable for ventilation, heating, diffused illumination, concealment of pipes or other possible uses.

In my application Serial No. 58,874, filed Sept. 20, 1960, which is a continuation-in-part of now abandoned application Serial No. 481,748 filed Jan. 14, 1955, I have described and claimed a system of building construction in which the roof and/or floor supporting structure consists of a plurality of relatively short strut members fixed to junction plates in such fashion as to form a series of four sided pyramids having their apices connected together by other similar metallic channel members and junction plates providing another series of pyramids but inverted. Each of the thus formed pyramids has its slanting edge in common with the adjacent pyramids. The bases of the erect pyramids will be all in one plane forming an upper chord structure and those of the inverted pyramids will be all in another parallel plane forming a lower chord structure, the intervening web structure being the diagonal strut members forming the edges of the several pyramids.

In the aforesaid copending patent application, Ser. No. 58,874, it is pointed out that my approach to this construction system puts emphasis on higher standards of building design and performance, providing more quality at less cost by developing standardization to a high degree. The space frame here involves the use of lightweight, interchangeable parts which may be assembled at low cost by relatively inexperienced workmen to form structures varying greatly in design and capable of being readily disassembled, altered or expanded to meet changing needs. Structures so assembled are completely salvageable.

The roof and floor assemblies naturally have open spaces, which are ideal for carrying the pipes, wires, ducts and equipment needed in buildings. However, to stay within the concept I have developed, simplicity of assembly, low cost, and salvageability must be present.

Another factor that must be considered is that these space frames are enabled to withstand large loads, wind pressure, shocks, vibrations and other stresses encountered, not by being so rigid that stresses are ineffective, but by being relatively flexible and resilient, so that literal temporary bending of the structure as a whole will occur at times. The structure is of course engineered so that it resumes its original form as soon as stresses are relieved. However, it can be seen that other components of the building cannot be rigidly mounted, but must be free to slip slightly, and this poses problems of installing duct-work which the present invention overcomes.

One object of the invention is to achieve the standards of simplified assembly, low cost and salvageability in building structures by providing a space-frame structure capable of containing simplified duct-work.

Another object of the invention is to facilitate the installation and modification of duct assemblies in the present space frame by utilizing triangular tunnels which extend in two directions.

A further object of the invention is to simplify ducting in the present space frame by lining the sides of triangular spaces with substantially self-supporting panels.

Yet another object of the invention is to improve

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building construction by providing a flexible space frame assembly with panels such as will form intersecting duct work flexibly carried by the space frame.

For a more complete understanding of the invention, reference may be had to the accompanying drawings in which like reference characters refer to like parts throughout the several views and in which

FIG. 1 is a view in side elevation with parts in section of a metallic building structure adaptable to the present invention.

FIG. 2 is a top plan view of the structure of the present invention as seen substantially from line 2—2 of FIG. 1 with portions omitted for clarity.

FIG. 3 is a diagrammatic view with some upwardly extending strut members removed for purposes of clarity and showing one possible arrangement of the conduits.

FIG. 4 is another diagrammatic view with some upwardly extending strut members removed for purposes of clarity and showing another possible conduit arrangement.

In the drawings, FIG. 1 shows in elevation a portion of the metallic structure from one side forming a roof at the top and a floor at the bottom separated and indicates possible locations of conduits extending through the roof and floor structures.

As disclosed in said application Serial No. 58,874, in producing the floor or the roof structure, the struts 10, which are all of approximately the same length, are fixed to junction plates 11, each of the plates 11 having eight of the elements 10 fixed by any means such as suitable bolts. Four of the elements 10 will extend upward (or downward) at an angle and the other four will extend radially in the same plane from a common center, connecting to other plates 11. The angularly arranged elements will be fixed at their other ends to other plates 11 disposed in an inverted position relative to the first ones. Repetition of this arrangement results in a structure composed of a series of four sided pyramids, both erect and inverted, with each element 10 forming an edge of two adjacent pyramids, one erect and one inverted. The horizontal struts 10 form upper and lower chord planes and the inclined struts form a spacing web structure.

In the structure so produced, through each row of erect pyramids and through each row of inverted pyramids, there may be seen a triangular space or channel free from any obstructions, which spaces or channels extend both length wise and crosswise of the structure. Looking at FIG. 1, the letters C indicate the channels or spaces extending in one direction. The other channels will extend in a direction at right angles to these as seen in FIGS. 3 and 4.

These channels may be lined with sheets, strips or panels of a suitable material such as asbestos board, plywood, plasterboard, felted material or other sheet material depending somewhat on the subsequent use of the conduit. For steam pipes or for conducting heated air, a heat insulating material is of course, desirable. For sound deadening, a sound absorbing or non-sound reflecting material may be used.

The lining material is indicated at 15 in FIGS. 1 and 2, and in the upper portion of FIG. 1 the three lining members are shown as within the metal space. In the lower portion of the figure, the flooring 16 is indicated as being a possible closure for the conduit. In FIG. 2, this flooring is omitted to show the two panels 15 forming a V-shaped trough.

It will be apparent that when these panels 15 are inserted, they are self-supporting, the panels being prevented from falling inwardly by the presence of the adjacent panels and the framework, due to the triangular relationship of the struts 10. Yet, as the structure flexes, the duct work will slip relative to the struts. If desired,

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the panels may be held in place against excessive longitudinal slippage by any means such as by wiring 18 as shown in FIG. 2.

In the ceiling or roof structure, if the lighting means, shown conventionally at 17, is mounted above the ceiling plane, a suitable light transmitting and, preferably, diffusing panel may be used as the bottom of the conduit in the ceiling plane.

In FIGS. 3 and 4 there are shown diagrammatically two of the many possible arrangements of the conduits.

In FIG. 3 two parallel channels or conduits C are shown with one of them provided with a branch conduit C at right angles.

In FIG. 4 two intersecting channels C are indicated.

Although I have described only a few embodiments of my invention, it will be apparent to one skilled in the art to which the invention pertains that various changes and modifications may be made therein without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. In a building structure a portion consisting of rectangular pyramid forms, erect and inverted, produced by fixing identical metallic strut members to junction plates located at the apices of the pyramid forms, said erect pyramid forms each having slanting edges in common with the four adjacent inverted forms, each of said metallic strut members forming an edge of two adjacent pyramid forms, said pyramid forms having their rectangular bases in two parallel planes, panels of sheet material secured to the inner sides of said strut members within a row of said pyramid forms and extending through a plurality thereof whereby to form a conduit, the planes of the panels forming said conduit intersecting at acute dihedral angles whereby said panels coact to restrain each other from being displaced inwardly with respect to the conduit through said building structure portion.

2. In a building structure a roof support portion consisting of rectangular pyramid forms, erect and inverted, produced by fixing identical metallic strut members to junction plates located at the apices of the pyramid forms, said erect pyramid forms having slanting edges in common with the four adjacent inverted forms, each of said metallic strut members forming an edge of two adjacent pyramid forms, said pyramid forms having their rectangular bases in two parallel planes, panels of sheet material secured to the inner sides of said strut members within a row of said pyramid forms and extending through a plurality thereof whereby to form a conduit, the planes of the panels forming said conduit intersecting at acute dihedral angles whereby said panels coact to restrain each other from being displaced inwardly with respect to the conduit through said building structure portion.

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3. In a building structure a roof support portion consisting of rectangular pyramid forms, erect and inverted, produced by fixing identical metallic strut members to junction plates located at the apices of the pyramid forms, said erect pyramid forms having slanting edges in common with the four adjacent inverted forms, each of said metallic strut members forming an edge for two adjacent pyramid forms, said pyramid forms having their rectangular bases in two parallel planes, panels of sheet material secured to the inner sides of the angularly arranged members within a row of said pyramid forms to form a trough, and ceiling panels closing the thus formed trough to provide a conduit, the planes of the panels forming said conduit intersecting at acute dihedral angles whereby said panels coact to restrain each other from being displaced inwardly with respect to the conduit.

4. In a space frame structure comprising a lower chord frame, an upper chord frame spaced from and parallel therewith, and a web structure spacing and connecting said frames, each frame comprising a plurality of lateral and longitudinal rows of struts connected to form a substantially rectangular open-work grid structure, the intersections in one frame being laterally and longitudinally offset from the intersections in the other frame, said web structure comprising struts connecting only the intersections in one frame with the intersections of the rows in the other frame to provide unobstructed triangular tunnels in said space frame structure in two directions intermediate and parallel to said frames, and panels lining the inside of at least one of said tunnels to form an enclosed triangular conduit, the planes of the panels forming said conduit intersecting at acute dihedral angles whereby said panels coact to restrain each other from being displaced inwardly with respect to the conduit.

5. The space frame structure as defined in claim 4 and in which said web struts are of substantially equal length and substantially equal in length to the distance between adjacent intersections of a frame.

6. The space frame structure as defined in claim 4 and in which adjacent triangular tunnels are parallel and inverted with respect to each other.

7. The space frame structure as defined in claim 4 and in which said panels are separable and removable from said tunnel.

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