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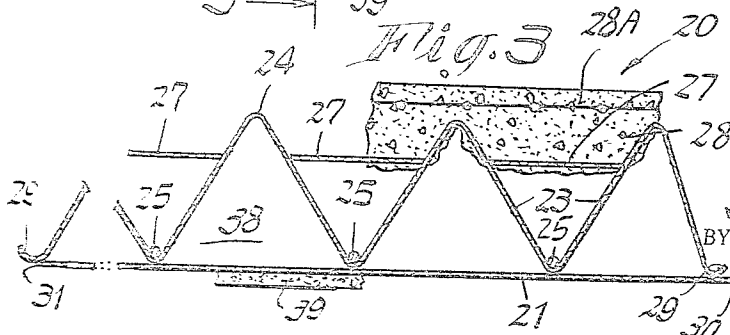
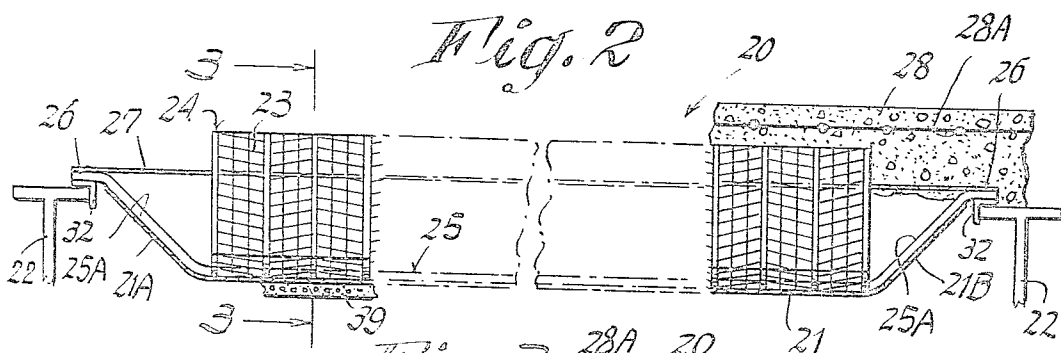
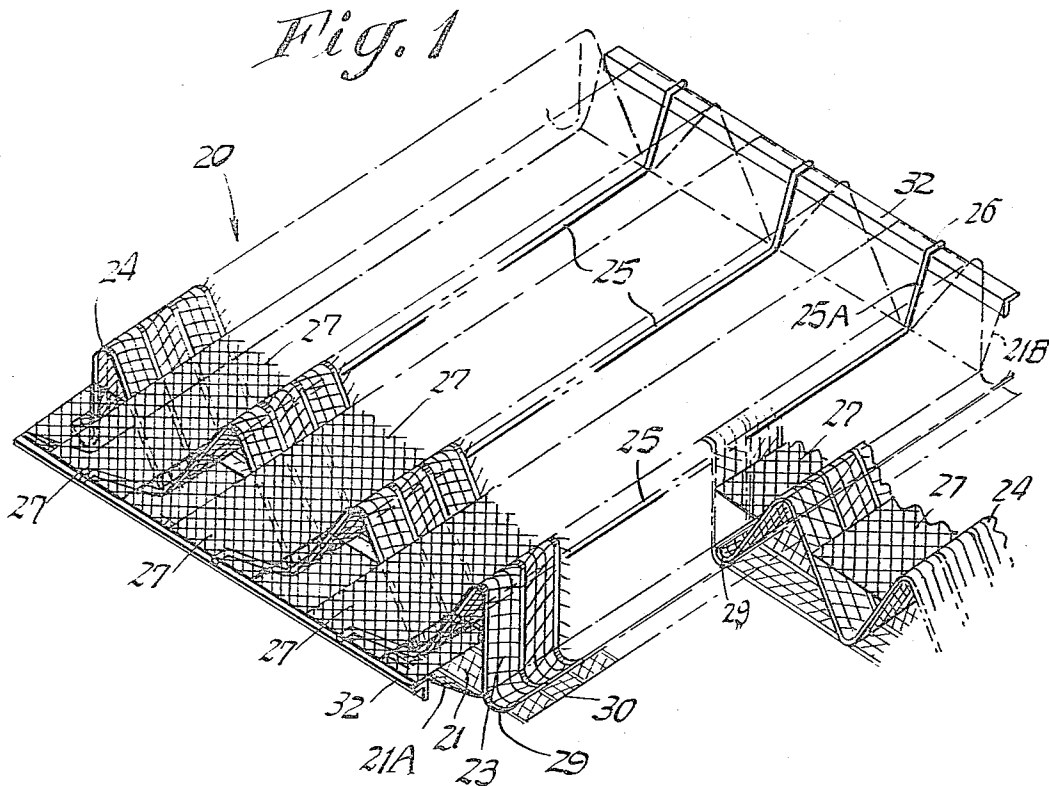
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3,357,147

LIGHTWEIGHT FORAMINOUS FLOOR PANEL AND CAST-IN-PLACE CONCRETE

Filed April 13, 1965

2 Sheets-Sheet 1



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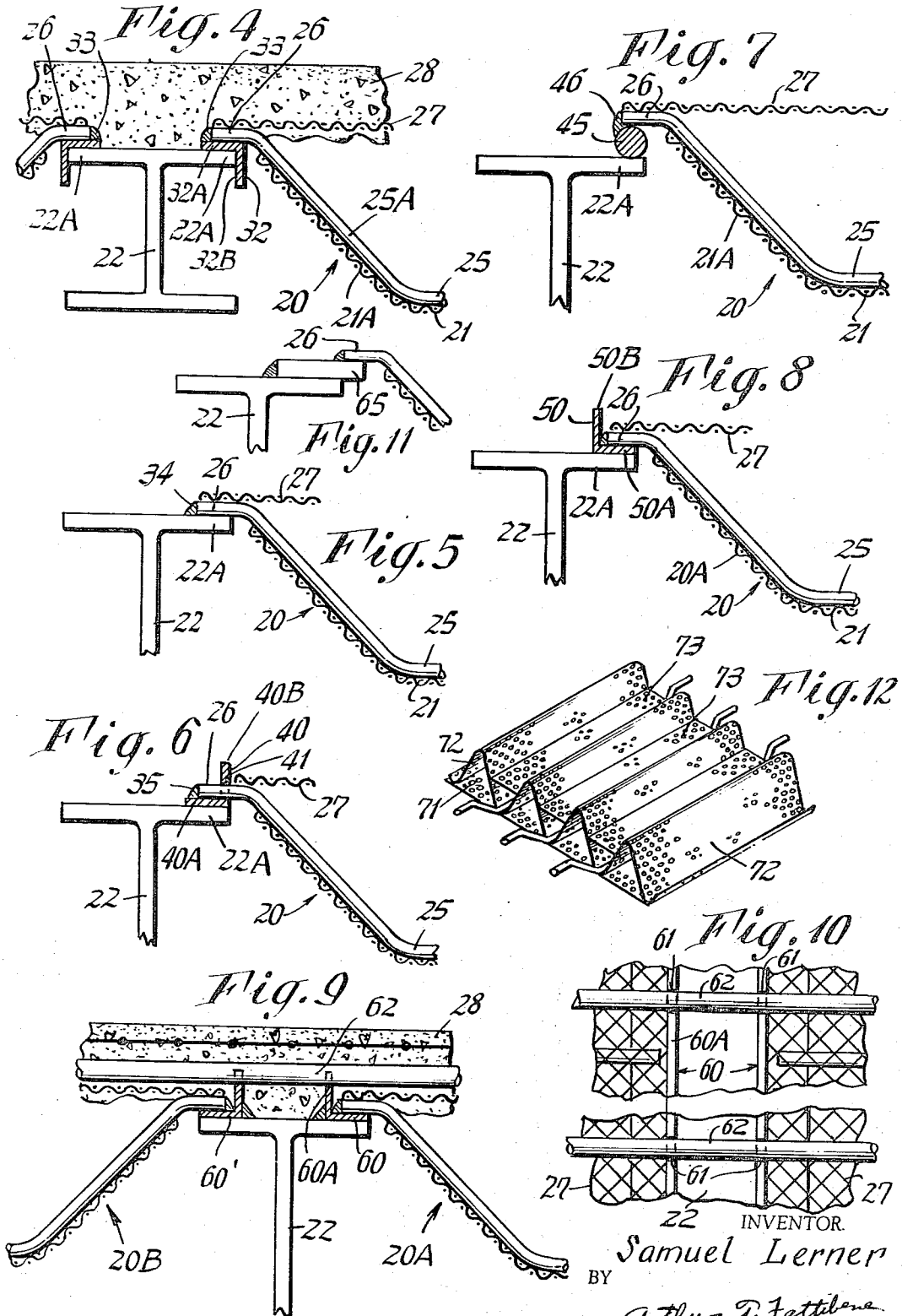
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2 Sheets-Sheet 2



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LIGHTWEIGHT FORAMINOUS FLOOR PANEL AND CAST-IN-PLACE CONCRETE

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ABSTRACT OF THE DISCLOSURE

This invention is directed to a structural floor panel comprising a sheet of undulating foraminous material defining a plurality of alternately spaced peaks and valleys extending longitudinally of the foraminous material. Tension members are secured to the bottom of each valley defined by the undulating foraminous sheet and which tension members extend along the entire length of the valleys. The end portions of the tension members are bent upwardly and incline outwardly of the panel to define end supports for supporting the structural panel from suitable building supports so that a substantial portion of the panel thickness is disposed below the top of the building support structure.

By inclining the end portions of the tension members to define the end supports for the panel the end portions thus act in shear so as to increase the strength and/or loading characteristics of the panel.

Strips of foraminous material are supported in the respective valleys intermediate the height thereof and preferably above the neutral axis of the panel or floor system defined by the undulating sheet. A layer of concrete is poured over the strips of foraminous material whereby the foraminous nature of the material forms a natural bond for the concrete and the form defined by the foraminous material thus becomes an integral part of the floor panel which cooperates with the concrete to support a load. A base forming sheet of foraminous material may be connected to or suspended from the undulating sheet of foraminous material.

This invention relates in general to a structural floor system and more particularly to a prefabricated foraminous metal panel with cast in-place concrete, resulting in a complete floor system.

In the construction of a building utilizing a concrete floor system, it was heretofore necessary to erect a form on which to support the concrete while it sets, and steel reinforcing bars had to be used to take the tension. The erection of such forms and the placement of reinforcing steel in the field required a considerable amount of material and hard labor, all of which reflected in increasing overall cost of the building. After the concrete has been poured and set, the forms then had to be removed, again at a considerable amount of cost and labor.

Because concrete can be efficiently loaded in compression only the design of a given concrete floor constructed with conventional forms for a given loading condition resulted in an inefficient use of a substantial portion of the concrete in the floor system. This was because the forms did not form any part of the structural floor system and therefore, the portion of the concrete disposed below the neutral axis of the concrete floor was placed in tension when loaded. For this reason, such concrete floor systems had to be formed of a considerable thickness and reinforcing steel added to insure the load bearing capabilities of such floors. For this reason, the dead weight of such floors was oftentimes considerable, thereby requiring the need for much heavier contributory supporting structures and the use of tension members. As a result, the cost of

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such floor systems and buildings in general was increased accordingly,

Also, it has been heretofore customary to support the concrete floor on the top of a supporting beam or joint. Generally such supporting beam and joint comprise an I-beam or channel, which depending upon the load to be supported thereon, may be of considerable depth. Consequently, in the finished structure the supporting beams and joints for a floor system projected below the subjacent ceiling. As a result the projecting beams had to be covered or finished. This type of detailing greatly added to the cost of a finished structure. Further the projecting support beam of the floor system made it impossible to construct a ceiling effect having a large uninterrupted expanse which is most desirable. Further the projecting support structure subjacent the known floor constructions interfered with the circulating of the heating and/or cooling air currents, and thereby adversely affected the heating and cooling of rooms subjacent the prior known concrete floor system.

Further, the supporting of concrete flooring on the top of the supporting steel, beams or joint increase the overall height of the building. In very tall multiple story buildings the sum of the floor thickness for each story accounts for a substantial portion of the overall building height. For example, in a building having twenty-five stores and a floor thickness of 6 to 8 inches, the height attributed to the sum of the floor thickness would equal approximately 13 to 18 feet.

It is therefore an object of this invention to provide an improved concrete floor system in which the concrete thereof is more effectively utilized.

Another object of this invention is to provide an improved prefabricated floor system or panel in which the maximum load bearing characteristics for a given designed floor system are attained with a minimum of concrete.

It is another object to provide a composite concrete panel constructed of relatively light weight material that becomes an integral part of the floor system upon the setting of the concrete supported thereby.

Another object is to provide a prefabricated panel constructed and arranged to support the concrete portion of the floor system thereon in a manner so that the concrete is subjected to compression loading only.

Still another object is to provide in a concrete floor system an improved panel constructed so that it becomes an integral part of the floor system and which takes the loading of the system in tension.

Another object is to provide a prefabricated floor system in which a minimum of concrete is required for maximum strength for a given floor design.

Another object is to provide an improved floor system which is entirely fireproof.

Another object of the invention is to provide novel end constructions for supporting the floor system or panel of this invention between suitable supporting structure either as a simply supported structure or as a continuous structure.

It is another object to provide novel end constructions for supporting the floor system or panels from the supporting structure or beam in a manner such that a substantial portion of the floor thickness is below the tip of the supporting structure.

Another object is to provide means for supporting a floor system or panel between supporting steel or beams in a manner such that the top of the floor system or panel is substantially flush or nearly so to the top of the supporting steel or beam.

The foregoing objects and other features and advantages are attained by a prefabricated floor panel having cast in-place concrete comprising a form that includes a

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base forming sheet of foraminous material supported or suspended from a undulating sheet of foraminous material to define a series of longitudinally extending corrugations having alternating peaks and valleys. Tension members are secured to the bottom of each corrugation or valley defined by the undulating foraminous sheet. The tension members extend along the entire length of the corrugations with the end portions thereof being upwardly bent.

In accordance with this invention, the upwardly bent end portions of the tension members define the means to which various novel end supports may be secured for supporting the form between the beams or joints of a suitable supporting structure. If desired, the end portions of the foraminous base sheet may also be upwardly turned to complement the upwardly bent end portions of the tension members.

Strips of foraminous material are supported in the respective corrugations or valleys intermediate the height thereof above the neutral axis of the panel or floor system. Accordingly, with the panel so constructed, a layer of concrete is poured over the strips of foraminous material, the foraminous nature of the material providing a natural bond for the concrete. Accordingly, the form becomes an integral part of the floor panel which cooperates with the concrete to support a load.

In accordance with this invention novel end supports are provided to suspend the floor panel or system between adjacent supporting beams or joints so that a substantial portion of the floor thickness is disposed below the top of the supporting beams or joints.

A feature of this invention resides in provision of a concrete floor system which includes an improved light weight form or panel that can be readily handled, and which is constructed so as to become an integral part of the floor system upon the setting of the concrete thereon.

Another feature resides in the provision of a form for a concrete floor system that is constructed and arranged to reduce to a minimum the amount of concrete required to take the compression loading of the floor system.

Another feature resides in the provision wherein the portion of the floor system or panels defines a series of hollow passages in which the piping or electrical conduits of a building may be housed.

Another feature resides in the provision of variously constructed novel end support arrangements for supporting the ends of the floor system or panel on the supporting structure of a building, so that the depth of the overall floor system is almost entirely included between building supports reducing height of buildings effecting great economy in building cost, heating and air conditioning, loading, structural steel, windows, wall, etc.

Other features and advantages will become more readily apparent when considered in view of the specification and drawings in which:

FIGURE 1 illustrates a perspective view of a structural floor panel or form of this invention in which the layer of concrete is not shown.

FIGURE 2 is a side elevation of the improved floor panel of FIGURE 1 supported between a pair of building support structures by one of the novel end connections to reduce building costs.

FIGURE 3 is a sectional view taken along line 3—3 of FIGURE 2, having parts broken away.

FIGURE 4 is an enlarged detailed view of one of the novel end support means of the panel of FIGURES 1 through 3.

FIGURE 5 is a modified form of a novel end support for the floor system or panel of the present invention.

FIGURE 6 is another modified form of a novel end support construction.

FIGURE 7 is still another modified form of a novel end support construction.

FIGURE 8 is still another modified form of a novel end support construction.

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FIGURE 9 illustrates still another modified form of the novel end construction which permits the panels to act as a continuous structure by providing means at either end connected to hold positive reinforcing steel over building supports.

FIGURE 10 is a plan view of the end support construction of FIGURE 9 with the layer of concrete not shown.

FIGURE 11 is another novel form of end connection.

FIGURE 12 illustrates a perspective view of a modified form of the floor panel in accordance with this invention using preformed steel sheets in lieu of open lath or expanded metal.

Referring to the drawings, there is shown in FIGURES 1 through 3 the improved structural floor panel 20 of the instant invention. As shown, the form or panel 20 comprises a rectangular base sheet 21 of foraminous material, e.g. open wire lath, expanded metal, perforated plate and the like. Accordingly, the base sheet 21 is sized to extend between a pair of supporting columns, beams, or joist of a building frame 22. As shown, the respective opposed marginal end portions of the foraminous base sheet 21 are upwardly turned as indicated at 21A and 21B.

An undulating sheet 23 of foraminous material, as above mentioned, is connected to the foraminous base sheet 21. In the illustrated form, the undulating sheet 23 is provided with a series of corrugations or V-shape peaks and valleys to define a plurality of longitudinally extending valleys or channels. Means in the form of wire strings, clips or the like suitably secures or ties the undulating sheet 23 to the base sheet 21. As best seen in FIGURES 2 and 3, the height of the peaks 24 defined by the undulating sheet 23 extend above or beyond the upturned end portions 21A, 21B of the base sheet 21.

In accordance with this invention, a tension member or rod 25 extends longitudinally across the length of the base sheet. As shown, the tension members 25 are located at the bottom of their respective valleys and they each extend the length of the panel. The opposed end portions 25A of the respective tension members are upwardly turned with the tip ends 26 thereof horizontally bent. If desired, the end portions 21A, 21B of the base foraminous sheet 21 may be turned to complement the upturned end portions 25A of the respective tension members 25.

Supported intermediate the valleys defined by the respective undulations of the sheet 23 is a foraminous strip 27 of material that extends longitudinally of the respective valleys. If desired, the strips 27 may be loosely supported, or may be tied in position on the opposed side wall portions of the valley at a position intermediate the height thereof about the neutral axis of the panel. The ends of the strip 27 are laterally extended adjacent the ends of the peaks 24. A layer of concrete 28 is normally supported on the foraminous strips 27 and the foraminous peaks 24 extending thereabove wherein the natural characteristics of the foraminous material provide a mechanical bond for the concrete as it sets in place thereon.

As best seen in FIGURE 3, the layer of concrete 28 is supported on the floor panel described so that the bottom of the concrete layer is located at substantially the level of the foraminous strips 27. Interposed with the layer of concrete 28 there may be embedded a temperature mesh 28A.

To facilitate the joining of adjacent panels in a complete floor system, the opposed longitudinal portion of the undulating foraminous sheet 23 is provided with an outwardly turned lip 29 which is arcuate or trough shape in cross-section. Thus, in assembling floor panels 20 herein described in side-by-side relationship, the contiguous ends adjacent floor panels may be disposed in interengaging

overlapping relation. An interlocking arrangement of adjacent floor panels is attained which prohibits concrete from falling therebetween and out the subadjacent structure during the pouring thereof. As best seen in FIGURE 3, the base sheet 21 is formed so that at one end 30 thereof will overextend the adjacent lip 29, while at the other end 31, the lip 29 overextends the base sheet 21. Thus, when adjacent panels 20 are set in place between supporting structure, a tight interconnecting joint is attained between panels. See FIGURE 1.

A novel end support for the panel 20, described comprises a longitudinally extending angled member 32 having a horizontal leg portion 32A and a vertical leg 32B portion. The arrangement is such that the upper horizontally bent tip end 26 of the respective tension members 25 are adapted to be secured to the outer surface of the horizontal leg 32A of the angle member. Thus, as best seen in FIGURE 4, the tip ends 26 of the respective tension members 25 are suitably secured to the angle member by welding 33 or the like. As seen in FIGURE 4, the leg portions of the angle member 32 are disposed so that the horizontal leg 32A is supported on the edge of a building support such as an I-beam flange 22A or joist. Accordingly, the angle member 32 so supported along the flange of the I beam 22 provides a positive seal to prevent the flow of concrete about the supporting I beam when the concrete is poured onto the structural floor panel and the I beams supporting the same. If desired, the horizontal leg 32A of the angle 32 may be tacked welded to the flange of the beam 22 to hold the same in position during erection.

The end support described functions to support the panel 20 between the supporting building structure so that a substantial portion of the panel thickness is disposed below the top of the support structure. In this manner it will be noted that the amount of supporting beam 22 extending below the panel is substantially minimized, and in many instances the bottom of the panel can be made flush with the bottom of the beam 22. Consequently, the subjacent ceiling can be made free of interruption due to projecting beams. As a result many of the problems presented by projecting means can be totally eliminated. Further by suspending the floor panels between adjacent beams as rendered possible by the novel end supports, the overall height of a multi-storied building can be minimized, all else being equal. This is due to the fact that a substantial portion of the overall floor panel thickness is disposed below the top of the steel. Another feature of the end construction described is that the angle 32 supported as described tends to provide a leveled base for the floor panels. Thus irregularities or unevenness in the flanges of the supporting beam can be disregarded.

FIGURE 5 illustrates another form of novel end support for the floor structure herein described. In this form of the invention, floor structure 20 is supported simply by resting the horizontally bent tip end 26 of the tension member 25 on the flange 22A of the I-beam, whereby the tip ends 26 are secured to the beam by welding 34.

In FIGURE 6 another modified form of novel end support structure is shown. In this form, the end support structure comprises an angled member 40 in which the horizontal leg portion 40A is turned to sit or rest upon the flange 22A of the supporting beam 22. The vertical leg portion 40B is disposed so as to extend upwardly therefrom with the outer surface of the vertical leg disposed adjacent the edge of the flange of the beam. Accordingly, the vertical leg 40B is provided with a plurality of longitudinally spaced apertures 41 which are disposed in alignment with the tip ends 26 of the tension members for receiving the same. The tip ends 26 of the tension member 25 are secured to the surface of the horizontal leg 40A by means of welding 35. As hereinbefore described, the panel may be held in place by tack welding the angle to the beams during erection.

In FIGURE 7, the novel end support comprises a rod

45 which extends transversely along the width of panel 20 of the respective laterally bent tip ends 26 of the respective tension members 25 with the rod 45 suitably secured thereto by welding 46. The rod end support 45 is then supported on the flange 22A of the supporting I-beam 22 by resting the same thereon.

In FIGURE 8 there is illustrated still another modified form of novel end support. In this form of the invention, the end support again comprises an angled member 50 in which the horizontal leg 50A thereof is adapted to sit upon the flange 22A of the supporting I-beam 22 with the vertical leg 50B extending upwardly therefrom. Accordingly, the vertical leg is spaced inwardly from the outer edge of the I-beam flange with the tip ends 26 of the tension members 25 secured to the horizontal leg 50A at the junction of the angle member 50 by welding.

The respective novel end supports as specifically shown and described with reference to FIGURES 4 through 8 are such that the floor panel is supported between adjacent supports as a simple structure. In the event it is desirable to support the floor panel 20, herein described, as a continuous structure, an end support as shown in FIGURES 9 and 10 is utilized. As shown therein the end support for supporting the floor panel as a continuous structure comprises an angled support member 60 similar to that described with reference to FIGURE 8. However, the vertical leg 60A of the support angle 60 is provided with a plurality of longitudinally spaced recesses or grooves 61 which define seats for receiving a field applied reinforcing steel bar 62 as shown in FIGURES 9 and 10. Accordingly, when the ends of adjacent panels 20A, 20B of the type herein described are supported on a common support 22, as shown in FIGURE 9, reinforcing bar 62 is rested in the aligned grooves 61 of the adjacent end support angles 60—60. Accordingly, when the concrete 28 is poured thereover, the tie bar 62 is set in place therein and thus functions as a tie means for connecting the two adjacent floor structures 20A, 20B together so that the load is carried thereby in the nature of a continuous structure.

FIGURE 11 illustrates still another novel construction. In this form a plate 65 is supported on the flange of the supporting beam 22 and the ends 26 of the respective tension members 25 are secured to the plate 65. Accordingly the plate 65 provides a level surface, as it will tend to overcome any irregular surfaces on the flange of the I-beam 22.

FIGURE 12 illustrates a modified form of the invention. In this form of the invention, the floor structure 70 is substantially similar to that described in FIGURE 1 except that the foraminous components which make up the floor system, i.e. the base sheet 71, the undulating sheet 72, and the strips 73 are formed of perforated sheet material, as for example sheet steel. Accordingly, that portion of the sheet material which comes into contact with the concrete is perforated so that the concrete may become bonded thereto. In all other respects the floor panel 70 of FIGURE 11 is similar to that described with reference to FIGURES 1 through 3. Accordingly, the novel end supports for panel of FIGURE 12 may be the same as those herein described, with reference to FIGURES 4 through 11.

From the foregoing, it will be noted that the improved floor panel or structural support systems 20 and 70 described are particularly arranged to minimize the amount of concrete required to support a given load. This is rendered possible because the composite structure described enables the concrete 28 to be disposed well above the neutral axis of the panel whereby it is loaded in compression only, with the load in tension being carried by the tension members extending longitudinally thereof. Consequently, the amount of concrete 28 required is reduced to a minimum because the thickness of the concrete layer can be therefore minimized. As a result, the dead weight of the floor is reduced accordingly, permitting the use of

lighter weight tension members and supporting structure, all of which result in lowering overall building costs.

The novel end connections further effect a reduction in building and maintenance costs in that they result in a saving of building materials, window wall, etc. and in heating and cooling of the finished structure or building.

Also, as evidenced in FIGURES 2 and 3, the undulations defined by sheet disposed below the neutral axis of the floor system or panel define a longitudinally extending channel or passageway 38 which can be utilized to accommodate or conceal the plumbing, piping, electrical conduits, and the like of a building between floor structures. It will be further noted that suitable plaster or other ceiling forming material 39 may be adhered or secured to the bottom of base sheet 21 to provide a ceiling for the subjacent story. While the flooring or panel herein described is preferably formed so that the concrete is poured thereon in the field, it will be apparent that if desired the composite panel may be preformed with the concrete set in place at the point of manufacture, and thereafter be shipped out as a complete finished composite panel for immediate erection in the field.

While the instant invention has been described with reference to particular embodiments thereof, it will be readily understood and appreciated that variations and modifications thereof may be made without departing from the spirit or scope of the instant invention.

What is claimed is:

1. A light-weight structural floor panel adapted to be disposed in side-by-side relationship to define a given floor system, the improvement comprising:
 - a sheet of undulating foraminous material,
 - said undulating material defining a plurality of alternately spaced peaks and valleys wherein said peaks and valleys are disposed in parallel,
 - a foraminous strip of material extending longitudinally of each valley,
 - each of said strips being supported between the sides of adjacent peaks intermediate the height thereof,
 - said undulating sheet having opposed longitudinally extending terminal marginal portions for permitting contiguous engagement of adjacent panels when disposed in side-by-side relationship in a given floor system,
 - a tension member disposed at the bottom of each valley,
 - said tension member extending longitudinally the length of its associated valley,
 - said tension member having connected upwardly extending end portions for supporting the ends of said undulating material on a suitable supporting structure so that a substantial portion of the panel thickness is disposed below the top of the supporting structure, said connected upwardly extending end portions of said tension members are outwardly inclined so that said end portions act in shear in supporting said panel between building structures for enhancing the strength and loading characteristics of said panel when placed in operation.
2. The invention as defined in claim 1 and including a layer of concrete cast in-place on said undulating sheet and said strip of material disposed intermediate the height of said alternate undulations to define a composite structural form panel.
3. A light weight structural floor system including a plurality of panels disposed in side-by-side relationship,
 - (a) each of said panels including a base sheet of foraminous material,
 - (b) a sheet of undulating material from which is supported the surface of said base sheet,
 - (c) said undulating material defining a plurality of alternating spaced peaks and valleys wherein said peaks and valleys are disposed in parallel and extend substantially co-extensive with length of said base sheet,

- (d) a foraminous strip of material extending longitudinally of each valley defined by said undulating sheet,
 - (e) each of said strips being supported on the sides of adjacent peaks intermediate the height thereof,
 - (f) said undulating sheet having its opposed longitudinally extending marginal portions terminating in a laterally extending lip to permit overlapping engagement of adjacent panels when disposed in side-by-side relationship in a given floor system,
 - (g) a tension member connected to the bottom of each valley,
 - (h) said tension member extending longitudinally to the entire length of its associated valley,
 - (i) said tension member having an upturned and outwardly inclined end portion whereby said outwardly inclined end portion acts in shear in supporting said panel to increase the strength and loading characteristics of said panel when placed in operation,
 - (m) and, end support means connected to the upturned ends of said tension members.
4. A light weight structural floor panel adapted to be disposed in side-by-side relationship to define a given floor system, the improvement of comprising:
 - (a) a base sheet of foraminous material having upturned end portions,
 - (b) said base sheet being substantially rectangular in shape,
 - (c) a sheet of undulating material which supports the surface of said base sheet,
 - (d) said undulating material defining a plurality of alternately spaced peaks and valleys wherein said peaks and valleys are disposed in parallel and extend substantially the length of said base sheet,
 - (e) said peaks extending upwardly beyond the upturned end portions of said base sheet,
 - (f) a foraminous strip of material extending longitudinally of each valley,
 - (g) each of said strips being supported on the sides of the adjacent peaks intermediate the height thereof,
 - (h) said undulating sheet having in opposed longitudinally extending marginal portions terminating in a laterally turned lip portion to permit overlapping engagement of adjacent panels when disposed in side-by-side relationship in a given floor system,
 - (i) a tension member connected to the bottom of each valley,
 - (j) said tension member extending longitudinally to the entire length of its associated valley, and
 - (k) said tension member having upturned end portions corresponding to the upturned ends of said base sheet,
 - (l) said strip of material having its opposed ends supported on the upturned end portion of said tension members,
 - (m) and, end support means connected to the upturned end portion of said tension members.
 5. The invention as defined in claim 4 wherein said foraminous material comprises metallic lath.
 6. The invention as defined in claim 4 wherein said foraminous material comprises perforated plate.
 7. A light weight composite structural floor panel adapted to be disposed in side-by-side relationship to define a given floor system, said panel comprising:
 - (a) a base sheet of foraminous material having upturned end portions,
 - (b) said base sheet being substantially rectangular in shape,
 - (c) a sheet of undulating foraminous material connected to the surface of said base sheet,
 - (d) said undulating foraminous material defining a plurality of alternately spaced peaks and valleys with said peaks and valleys disposed in parallel and extending substantially the length of said base sheet,

(e) said peaks extending upwardly beyond the upturned end portions of said base sheet,
 (f) a foraminous strip of material extending longitudinally of each valley of said undulated sheet,
 (g) each of said strips being supported on the sides of adjacent peaks intermediate the height thereof at approximately the neutral axis of said composite panel,
 (h) said undulating sheet having its opposed longitudinally extending marginal portions terminating in a laterally turned lip portion to permit overlapping engagement of adjacent panels disposed in side-by-side relationship in a given floor system,
 (i) a tension member extending along the bottom of each valley,
 (j) said tension member extending longitudinally along the entire length of its respective valley,
 (k) and said tension member having upturned end portions corresponding to the upturned ends of said base sheet,
 (l) said strip having its opposed ends supported on the turned up end portions of its corresponding tension member,
 (m) end support means connected to the upturned ends of tension members for supporting said panel onto a supporting structure,
 (n) and, a layer of concrete cast in-place over side strips and peaks disposed therebetween whereby said concrete is supported above the neutral axis of said panel so as to be placed in compression only when loaded.

8. The invention as defined in claim 7 wherein the longitudinal edge portion of the base sheet extends beyond the lip portion of said undulating sheet along one side of the panel only.

9. The invention as defined in claim 7 wherein said end support means for each end of said panel comprises:

- (a) an angled structural member having a horizontal leg portion and a vertical leg portion,
- (b) and, means connecting the upturned end portion of said tension members to the outer surface of said horizontal leg portion.

10. The invention as defined in claim 7 wherein said end support means comprises:

- (a) a rod extending transversely of the upturned ends of each of said tension members,
- (b) and, means securing the end of each of said tension members to said rod.

11. The invention as defined in claim 7 wherein said end support means comprises:

- (a) an angled member having a horizontal leg portion adapted to rest on a supporting beam, and vertically extending leg portion,
- (b) said vertical leg portion having a plurality of openings longitudinally spaced along the length thereof,
- (c) said opening being disposed in alignment with the upturned ends of said tensioning members whereby the ends of the latter are extended through said aligned openings,
- (d) and, means securing the ends of said tensioning members extended through said openings to said horizontal leg of said angled member.

12. The invention as defined in claim 7 wherein said end support for each of said panels includes:

- (a) an angled structural member having a horizontal leg and a vertical leg portion,
- (b) and, means for securing the upturned ends of said tension members to the inner surface of said horizontal leg portion.

13. The invention as defined in claim 12 wherein said vertical leg portion is formed in longitudinally spaced notches in the edge thereof, and a tie rod adapted to seat in said notches for tying adjacent panels disposed in end-to-end relation together for continuous beam loading.

14. The invention as defined in claim 7 wherein said end support comprises:

- (a) an elongated plate adapted to be rested on a building support,
- (b) the ends of said tension members being secured to said plate.

15. In a building structure a floor system comprising:

- (a) a pair of spaced apart building support structures,
- (b) a floor panel adapted to be suspended between said support structures,
- (c) said panel including a base sheet of foraminous material and an undulating form of foraminous material connected to the surface of said base sheet,
- (d) a strip of foraminous material supported between adjacent pairs of undulations at approximately the neutral axis thereof,
- (e) tension members extended along the valleys to the respective undulations, said tension members having upturned and outwardly inclined end portions whereby said outwardly inclined end portion of said tension members acts in shear when said panel is supported between said spaced building support structures,
- (f) a layer of concrete on said strips, and
- (g) said upturned end portions being supported by said building supports so that a substantial thickness of said panel is disposed below the top of the support structure.

16. The invention as defined in claim 15 and including an end support means for each end of said panel comprising:

- (a) an angled structural member having a horizontal leg portion and a vertical leg portion,
- (b) and, means connecting the upturned end portion of said tension members to the outer surface of said horizontal leg portion, and said angled member being adapted to be supported on said building supports.

17. The invention as defined in claim 15 including an end support means comprising:

- (a) a rod extending transversely of the upturned ends of each of said tension members,
- (b) and, means securing the end of each of said tension members to said rod.

18. The invention as defined in claim 15 including an end support means comprising:

- (a) an angled member having a horizontal leg portion adapted to rest on a building support, and vertically extending leg portion,
- (b) said vertical leg portion having a plurality of openings longitudinally spaced along the length thereof,
- (c) said opening being disposed in alignment with the upturned ends of said tensioning members whereby the ends of the latter are extended through said aligned openings,
- (d) and, means securing the ends of said tensioning members extended through said openings to said horizontal leg of said angled member.

19. The invention as defined in claim 15 including an end support for said panels comprising:

- (a) an angled structural member having a horizontal leg and a vertical leg portion,
- (b) and, means for securing the upturned ends of said tension members to the inner surface of said horizontal leg portion.

20. The invention as defined in claim 19 wherein said vertical leg portion is formed in longitudinally spaced notches in the edge thereof, and a reinforcing bar adapted to seat in said notches for tying adjacent panels disposed in end-to-end relation together for continuous beam loading.

21. The invention as defined in claim 15 including an end support means comprising an elongated plate adapted to rest on said building support, and said tension members being secured to said plate.

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