

Jan. 26, 1971

B. E. CURRAN

3,557,511

FLOOR STRUCTURE AND BUILDING CONSTRUCTION PANEL THEREFOR

Filed Oct. 9, 1968

5 Sheets-Sheet 1

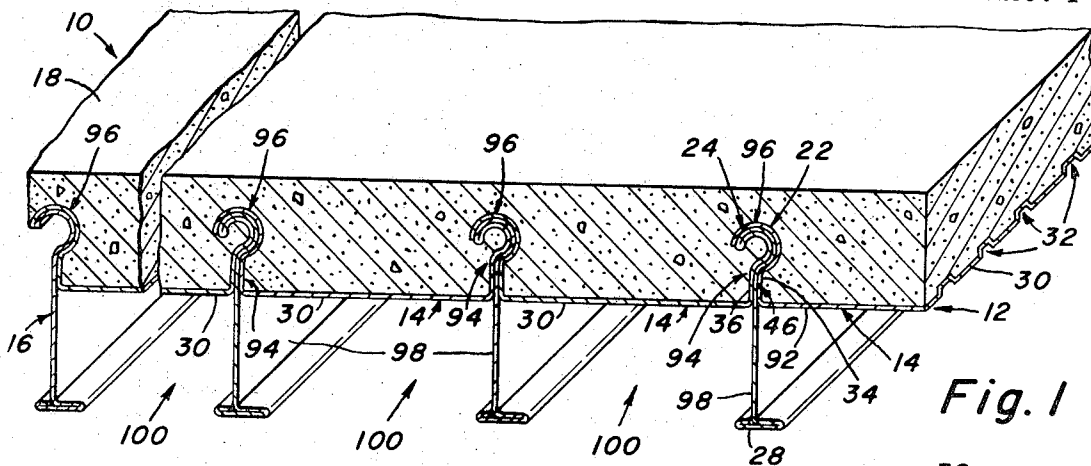


Fig. 1

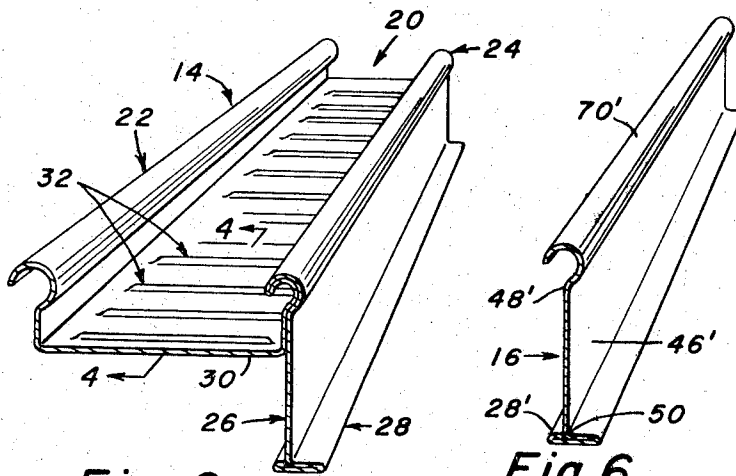


Fig. 2

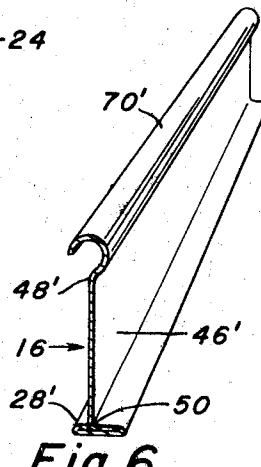


Fig. 6

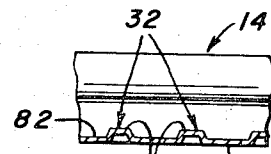


Fig. 4

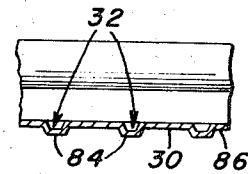


Fig. 5

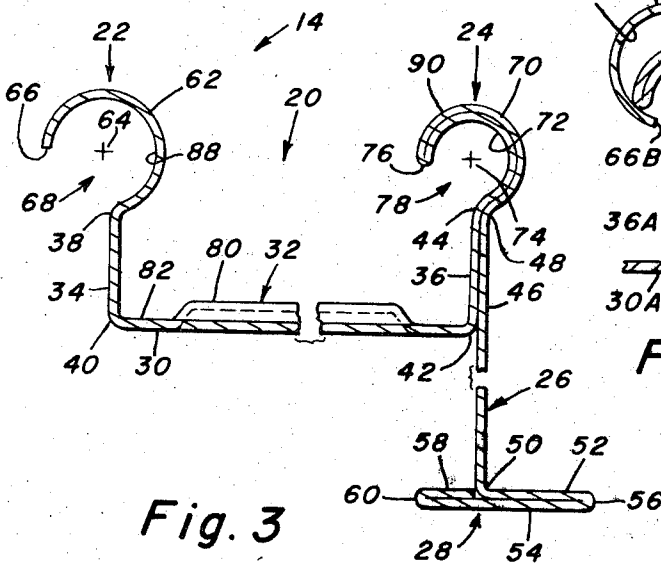


Fig. 3

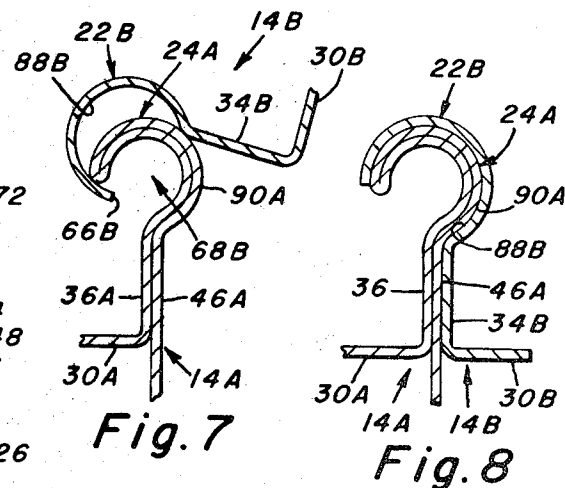


Fig. 7

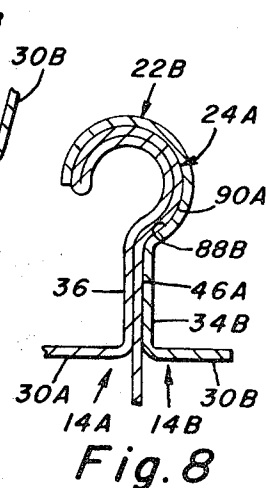


Fig. 8

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5 Sheets-Sheet 2

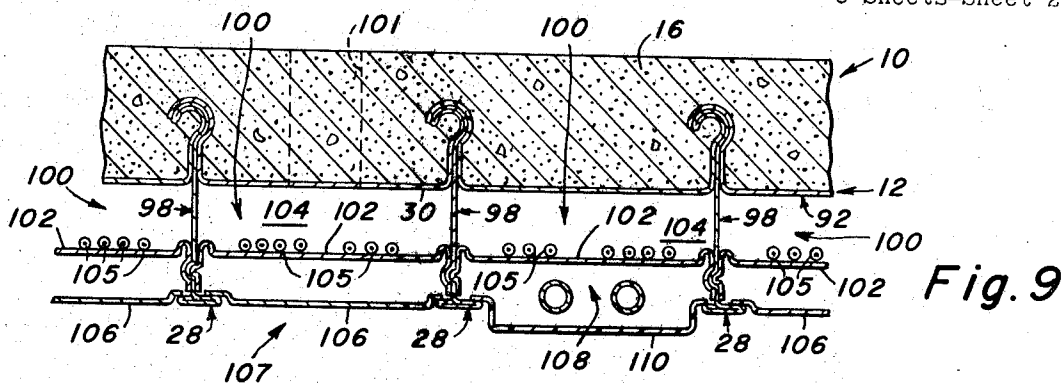


Fig. 9

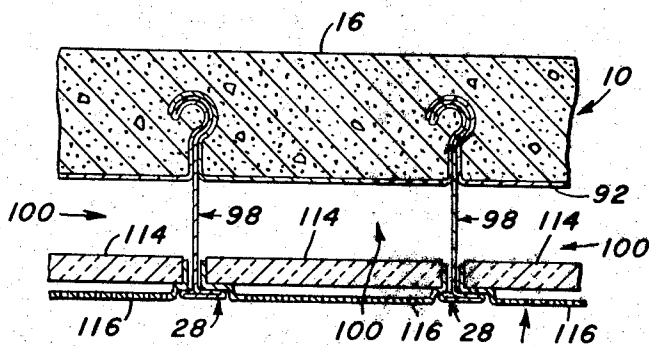


Fig. 10

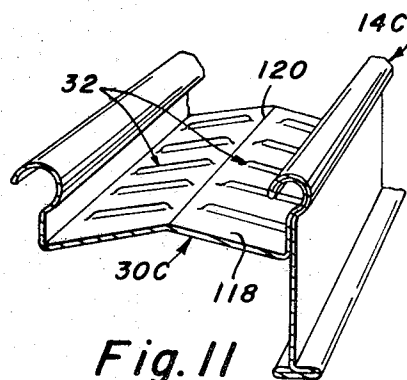


Fig. 11

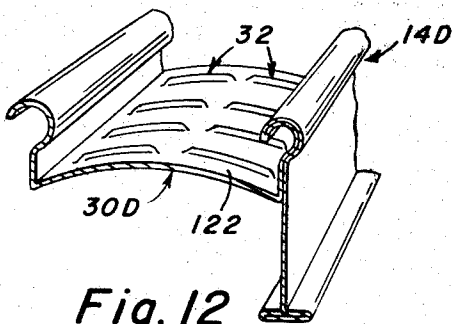


Fig. 12

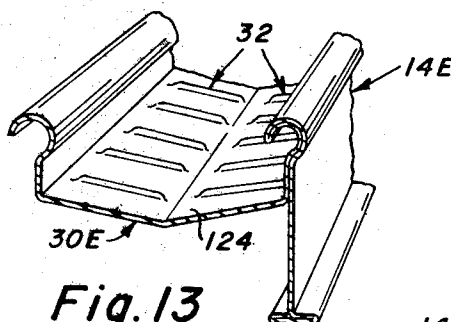


Fig. 13

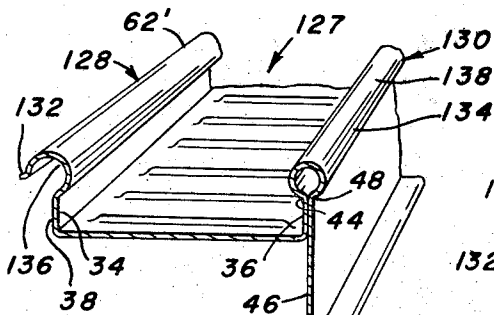


Fig. 15

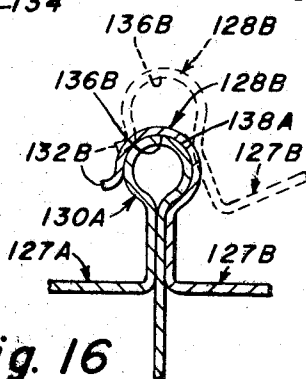


Fig. 16

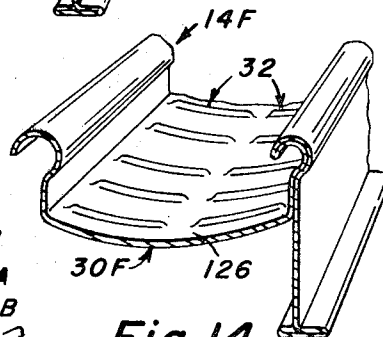


Fig. 14

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5 Sheets-Sheet 3

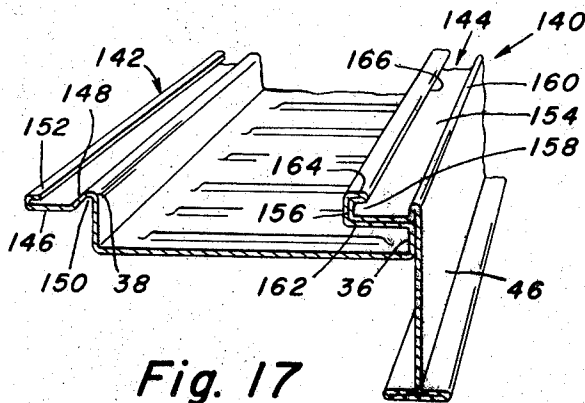


Fig. 17

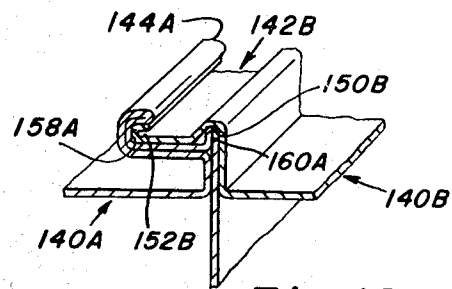


Fig. 18

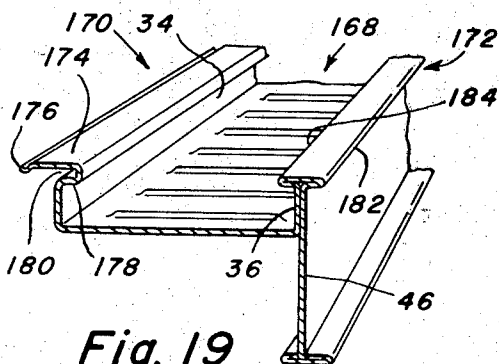


Fig. 19

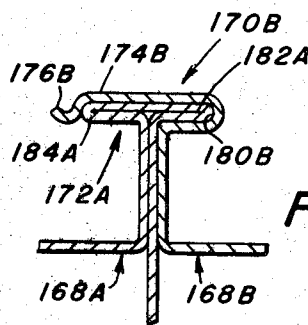


Fig. 20

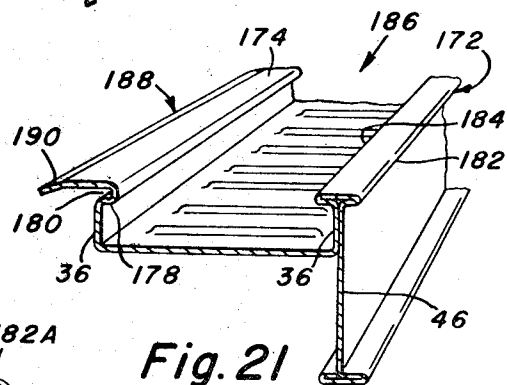


Fig. 21

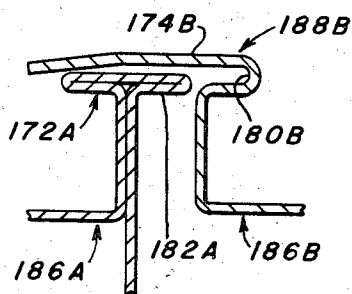


Fig. 22

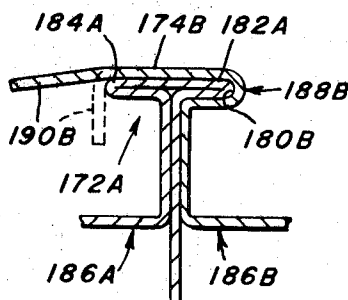


Fig. 23

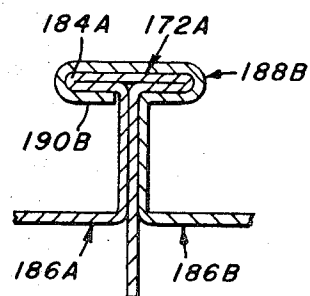


Fig. 24

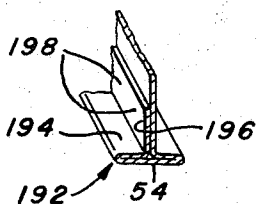


Fig. 25

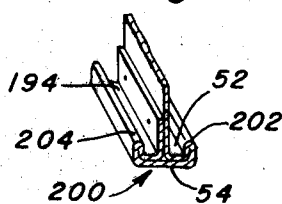


Fig. 26

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FLOOR STRUCTURE AND BUILDING CONSTRUCTION PANEL, THEREFOR

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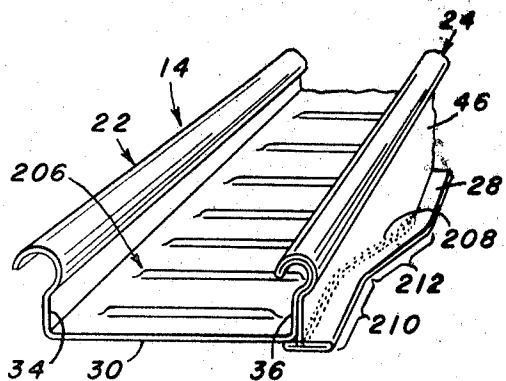


Fig. 27

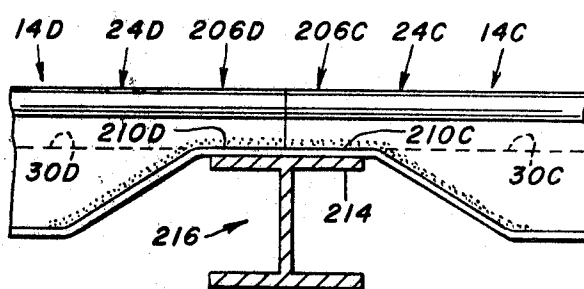


Fig. 28

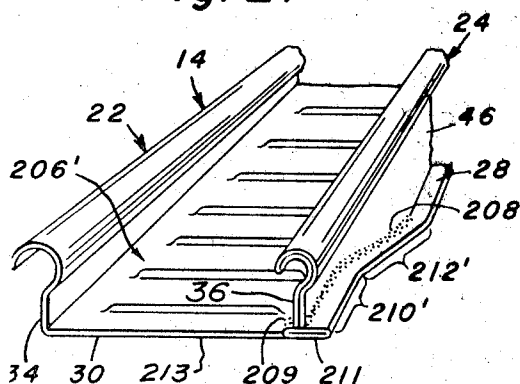


Fig. 29

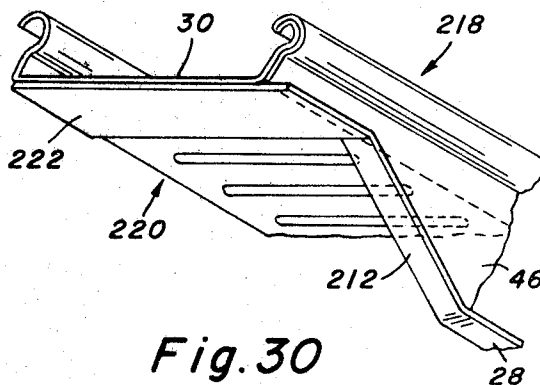


Fig. 30

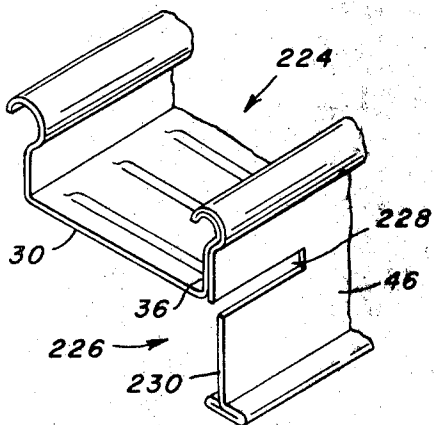


Fig. 31

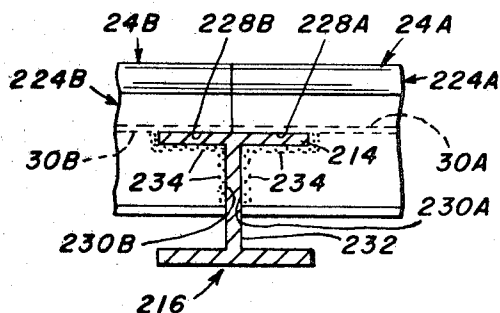


Fig. 32

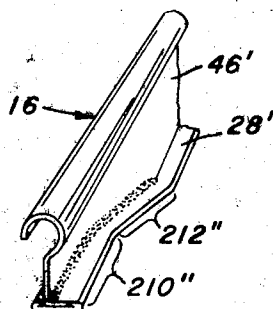


Fig. 33

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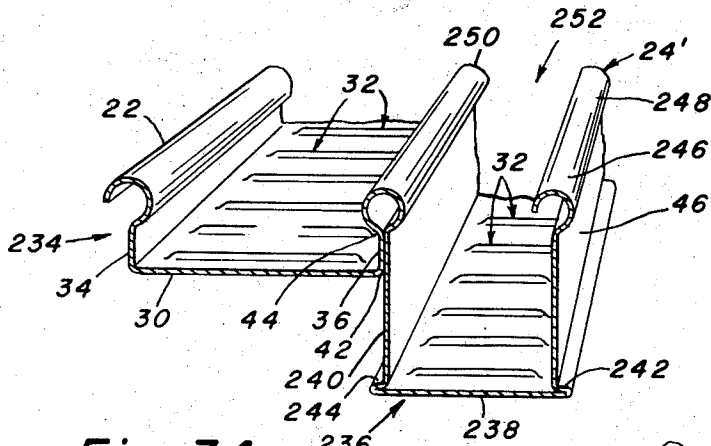


Fig. 34

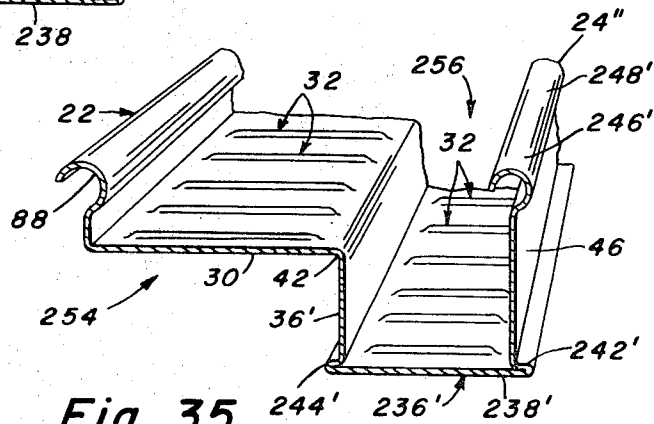


Fig. 35

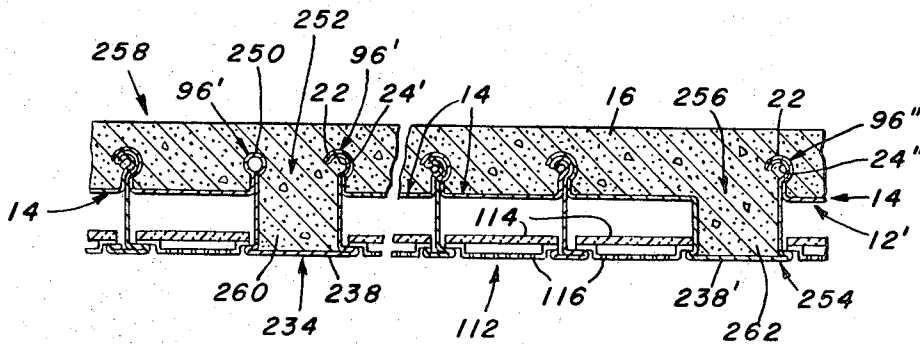


Fig. 36

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FLOOR STRUCTURE AND BUILDING CONSTRUCTION PANEL THEREFOR

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Int. Cl. E04b 5/36; E04c 2/08, 2/50

U.S. Cl. 52—588

6 Claims

ABSTRACT OF THE DISCLOSURE

An improved floor structure assembled from concrete and building construction panels of unique design. The panels are assembled in side-by-side interengaged relation. The upside of the assembled panels presents a plurality of troughs having deformations and keying elements associated therewith. The overlying concrete is united with the panels as a composite floor structure capable of developing improved load-carrying capacities. The underside of the assembled panels presents a plurality of channels which may be adapted to provide any one of a variety of finished ceiling arrangements.

BACKGROUND OF THE INVENTION

(1) Field of the invention

This invention relates to a building construction panel, and more particularly to an improved floor structure resulting from the use of the building construction panel.

(2) Description of the prior art

In the construction of many multi-story buildings, the floors are assembled from corrugated sheet metal decking which is rigidified by a covering concrete layer. Such a floor construction is described in U.S. Pats. 1,855,082; 2,259,674. The concrete component of such floor construction is considered as a parasitic mass making no contribution whatsoever to the load-carrying capability of the building floor. The corrugated metal decking sustains the entire load including the weight of the concrete.

There are other floor constructions utilizing corrugated sheet metal decking merely as a form for supporting a poured-in-place reinforced concrete slab which serves a building floor. See, for example, U.S. Pats. 1,073,540; 1,073,542. Such concrete slabs combine the hardened concrete with metal tension reinforcement rods or wires.

More recently various proposals have been advanced for utilizing the load-carrying capability of concrete components in combination with the load-carrying capability of the sheet metal decking elements. The two materials are combined and the resulting floor has been identified as a composite floor. Typical composite floor construction has been described in Canada Pats. 704,839; 704,840; 704,841 and 704,842.

Still another type of panel is described in the prior art. See U.S. Pats. Re. 25,364; 3,049,198; 3,347,010. This panel is used principally in roof structures. In general, these panels include a generally horizontal plate portion, a web portion depending from one side of the plate portion, and a generally horizontal flange at the lower end of the flange portion, serving as a base. These panels are installed in side-by-side relation with the base of each panel resting on supporting structure and with that edge of the plate portion remote from the web portion overlapping and secured to the adjacent panel in the region of the web portion of the adjacent panel. Each of these panels is characterized by being unstable, that is, incapable of standing alone in the position it assumes when installed in a roof structure. Moreover, these panels are considered

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unstable until such time as they are secured, as by welding, to an adjacent previously installed panel. When installed in a roof structure, the underside of the panels is capable of supporting various elements adapted to form ceiling structures.

These prior art unstable elements find principal use in roof structures.

SUMMARY OF THE INVENTION

The principal object of this invention is to provide an improved floor structure resulting from the use of building construction panels of unique design.

Another object of this invention is to provide a building construction panel having an improved strength-to-weight ratio.

A further object of this invention is to provide an improved load-bearing metal subfloor whose upside presents a plurality of generally U-shaped troughs adapted to receive a covering layer of concrete, and whose underside presents a plurality of channels which themselves may be presented as a finished ceiling or which may support extrinsic elements to provide any one of a variety of finished ceiling arrangements.

Still another object of this invention is to provide a building construction panel capable of producing a full depth concrete rib for increasing the load-carrying capacity of the finished metal-concrete floor structure.

A further object of this invention is to provide a building construction panel having deformations and laterally disposed connecting members or keying elements adapted to tie the covering layer of concrete to the building construction panel thereby enabling the concrete and the panels to act compositely to develop improved load-carrying capacities.

The present invention provides an improved floor structure which includes a metal subfloor assembled from a plurality of building construction panels of unique design and an overlying layer of concrete.

Although the present metal subfloor is assembled from a plurality of building construction panels, it is a convenient concept in describing the metal subfloor to state that the subfloor includes a substantially continuous pan or deck portion having a plurality of upwardly extending ribs and a plurality of downwardly extending ribs. The upwardly extending ribs cooperate with the deck portion to define plural troughs. Deformations in the deck portion and keying elements associated with the upwardly extending ribs secure an overlying layer of concrete to the metal subfloor in shear transferring relation therewith. The downwardly extending ribs terminate in bases adapted to engage the building framework which supports the improved floor structure. The downwardly extending ribs and the substantially continuous deck portion define plural channels. The channels may be painted or otherwise decorated to provide a ribbed ceiling structure. Alternatively, the channels may support elements designed to provide any one of a variety of ceiling arrangements.

The present building construction panel can be characterized as an unstable element, that is, an element which is incapable of standing alone in the position which it assumes when assembled in the metal subfloor assembly of this invention.

The building construction panel of this invention is formed from a single sheet of metal and includes first and second generally vertical webs which are laterally spaced from each other. A central pan extends from the lower edge of the first generally vertical web toward the second generally vertical web and terminates in a longitudinal pan edge. First and second complementary connecting members are provided, one along the upper edge of each of the first and second generally vertical webs. A

base is provided at the lower edge of the second generally vertical web below the level of the central pan. A third generally vertical web connects the central pan to the second generally vertical web. The present building construction panel is adapted to be engaged side-by-side with other units of the same building construction panel with the said first connecting member interfitting the second connecting member of a previously installed building construction panel and with the second connecting member interfitting the first connecting member of a subsequently installed building construction panel.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an isometric view of a floor structure incorporating a plurality of building construction panels of this invention;

FIG. 2 is a perspective view of the building construction panel employed in the floor structure of FIG. 1;

FIG. 3 is an end view on an enlarged scale of the building construction panel of FIG. 2;

FIG. 4 is a fragmentary cross-sectional view taken along the line 4—4 of FIG. 2, illustrating embossments in a central pan of the present building construction panel;

FIG. 5 is a view similar to FIG. 4, illustrating indentations in the central pan of the present building construction panels;

FIG. 6 is a perspective view of a starting section employed in the floor structure of FIG. 1;

FIG. 7 is a fragmentary cross-sectional view illustrating the initial interfitted relation of first and second connecting members of adjacent ones of the panels of FIG. 2;

FIG. 8 is a fragmentary cross-sectional view illustrating the first and second connecting members in the position they assume when fully connected together;

FIG. 9 is a cross-sectional view taken transversely through a floor structure including building construction panels of this invention, illustrating the formation of a ceiling structure incorporating electrical raceways and a lighting unit;

FIG. 10 is a cross-sectional view, similar to FIG. 9, illustrating the formation of an acoustical ceiling assembly;

FIGS. 11 to 14 are perspective views of building construction panels of this invention, illustrating alternative configurations of a central pan;

FIGS. 15, 17, 19 and 21 are perspective views of building construction panels of this invention, illustrating alternative embodiments of the first and second connecting members;

FIG. 16 is a fragmentary cross-sectional view illustrating the first and second connecting members of adjacent ones of the panels of FIG. 15, in the positions they assume when fully connected;

FIG. 18 is a fragmentary cross-sectional view illustrating the first and second connecting members of adjacent ones of the panels of FIG. 17, in the positions they assume when fully connected;

FIG. 20 is a fragmentary cross-sectional view illustrating the first and second connecting members of adjacent ones of the panels of FIG. 19, in the positions they assume when fully connected;

FIGS. 22, 23 and 24 are fragmentary cross-sectional views illustrating the interconnection of the first and second connecting members of adjacent ones of the panels of FIG. 21;

FIGS. 25 and 26 are fragmentary isometric views illustrating alternative embodiments of a base provided in the building construction panel of this invention;

FIG. 27 is a fragmentary perspective view illustrating the preferred end configuration of the present building construction panel;

FIG. 28 is a fragmentary side view of two of the panels of FIG. 27 supported on a horizontal beam;

FIGS. 29, 30 and 31 are fragmentary isometric views

illustrating alternative embodiments of the end configuration of the present building construction panel;

FIG. 32 is a fragmentary side view of the panel of FIG. 31 supported on a horizontal beam;

FIG. 33 is a fragmentary perspective view illustrating the end configuration of the starter section of FIG. 6;

FIGS. 34 and 35 are perspective end views of further alternative embodiments of the building construction panel of this invention, presenting deep troughs adapted to provide full depth concrete ribs; and

FIG. 36 is a cross-sectional view taken transversely through a floor structure incorporating building construction panels of FIGS. 2, 34 and 35.

DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

Referring to FIG. 1, there is illustrated an improved floor structure 10 of this invention. The floor structure 10 comprises a metal subfloor 12 assembled from a plurality of building construction panels 14 disposed in side-by-side interengaged relation, a starter section 16 and a covering layer of concrete 18.

The building construction panel of this invention is formed from a single metal sheet, such as steel, aluminized steel, galvanized steel and the like.

Referring to FIG. 2, it is a convenient concept when describing the building construction panel 14 to state that it includes a generally U-shaped trough 20 presenting complementary first and second connecting members 22, 24 on opposite sides thereof; and a supporting leg 26 depending from the second connecting member 24 and terminating in a base 28 adapted to support the panel 14. The trough 20 includes a central pan or deck portion 30 provided with a plurality of generally parallel deformations 32.

Referring to FIG. 3, the trough 20 includes first and third generally vertical webs 34, 36 positioned along opposite sides and extending upwardly from the pan 30. The first generally vertical web 34 includes an upper edge 38 adjoining the first connecting member 22 and a lower edge 40 adjoining the central pan 30. The pan 30 extends horizontally away from the lower edge 40 and terminates in a longitudinal pan edge 42 adjoining the third generally vertical web 36. The third generally vertical web 36 includes an upper edge 44 adjoining the second connecting member 24.

The supporting leg 26 comprises a second generally vertical web 46 having an upper edge 48 adjoining the second connecting member 24 and a lower edge 50 adjoining the base 28.

The supporting leg 26 and the base 28 have a generally T-shaped configuration. The base 28 includes an upper flange 52 adjoining the lower edge 50, a bottom flange 54 connected to the upper flange 52 at a fold 56, and a terminal flange 58 connected to the bottom flange 54 at a fold 60.

The first connecting member 22 may comprise an open channel 62 of generally cylindrical configuration, having a longitudinal axis 64. The open channel 62 adjoins the first generally vertical web 34 at the upper edge 38, extends therefrom for an arc distance of greater than 180° and terminates in a leading edge 66. The leading edge is spaced from the upper edge 38 to provide a lengthwise opening 68. The open channel 62 is of a single metal thickness.

The second connecting member 24 comprises second and third open channels 70, 72 of generally cylindrical configuration, having a common longitudinal axis 74. The second open channel 70 adjoins the second generally vertical web 46 at the upper edge 48. The third open channel 72 adjoins the third generally vertical web 36 at the upper edge 44. The second and third open channels 70, 72 are connected together at a fold or leading edge 76. The second and third channels 70, 72 extend from the upper edges 48, 44, respectively, for an arc distance of greater

than 180°. The leading edge 76 is spaced from the upper edge 44 to provide a second lengthwise opening 78.

In the preferred embodiment, as shown in FIGS. 3 and 4, the deformations 32 comprise embossments 80 extending above an upper face 82 of the central pan 30. Alternatively, as shown in FIG. 5, the deformations 32 may comprise indentations 84 extending below a lower face 86 of the central pan 30.

A plurality of the panels 14 can be erected in side-by-side interengaged relation to form the metal sheath 12 (FIG. 1). The first and second connecting members 22, 24 (FIG. 3) comprise complementary elements presenting coengageable inner and outer surfaces 88, 90, respectively. That is to say, the inner surface 88 of the first connecting member 22 of one panel is adapted to be engaged over the outer surface 90 of the second connecting member 24 of an adjacent panel.

The starter section 16 is the first member of the metal sheath 12 to be installed. The starter section 16 includes a generally vertical web 46' having an upper edge 48' adjoining an open channel 70' and a lower edge 50' adjoining a base 28'. The starter section 16 corresponds with the supporting leg 26 of the panel 14 (FIG. 2).

The assembly of adjacent panels 14A, 14B will now be described with reference to FIGS. 7 and 8. Referring first to FIG. 7, a fragment of the panel 14A is shown oriented in the position it assumes in the metal sheath 12 (FIG. 1). The panel 14B is titled so that second connecting member 24A is received through the lengthwise opening 68B of the first connecting member 22B. The panel 14B is then rotated in a clockwise direction to bring the coengageable surfaces 88B, 90A into surface engagement and to place the first generally vertical web 34B in confronting relation with the second generally vertical flange 46A, as shown in FIG. 8.

When the panels 14A, 14B are in the relative positions shown in FIG. 8, it will be seen that the central pans 30A, 30B are in a common plane. In addition, it will be seen that the coengageable surfaces 88B, 90A, are engaged over an arc length which is greater than 180° thereby providing a relatively waterproof, positive mechanical connection between the panels 14A, 14B.

Referring again to FIG. 1, it is a convenient concept in describing the metal sheath 12, to state that the metal sheath 12 presents a substantially continuous deck portion 92 having spaced-apart upwardly extending ribs 94 provided with keying elements 96 along their upper ends, and downwardly extending ribs 98. The substantially continuous deck portion 92 corresponds with the central pans 30 of the plural panels 14. The upwardly extending ribs 94 corresponds with the first and third generally vertical webs 34, 36 and that portion of the second generally vertical web 46 above the central pan 30. The keying elements 96 correspond with the first and second connecting members 22, 24 of the adjacent panels 14. The downwardly extending ribs 98 correspond with that portion of the second generally vertical web 46 extending below the central pan 30 and the base 28.

The keying elements 96 and the deformations 32 secure the layer of concrete 18 to the metal subfloor 12 in shear transferring relation. As a result, the concrete 18 and the metal subfloor 12 coact enabling the floor structure 10 to develop increased load-carrying capabilities.

The downwardly extending ribs 98 cooperate with the substantially continuous deck portion 92 to provide a plurality of downwardly opening channels 100. The downwardly opening channels 100 may themselves be painted or otherwise decorated to provide a ceiling arrangement having a rib like exposed surface, such as illustrated in FIG. 1. Alternatively, as shown in FIG. 9, a continuous insert pan or strap 102 may be inserted into one or more of the channels 100 to provide passageways 104 for electrical conductors 105.

Access may be gained from above the floor 10 to any of the passageways 104 by openings, schematically il-

lustrated at 101, extending through the concrete 16 and the central pan 30 of a panel 14. Decorative insert pans 106 may be supported by the bases 28 to provide a flush ceiling 107. To illuminate the subjacent floor area, lighting fixtures 108 (only one shown) may be provided in selected ones of the channels 100 together with a translucent insert pan 110 supported by the adjacent bases 28. As a further alternative arrangement, as shown in FIG. 10, an acoustical ceiling 112 may be formed by providing each of the channels 100 with an acoustical insulation pad 114 and a perforated insert pan 116, both of which are supported by the adjacent bases 28.

Alternative embodiments of the present building construction panel are illustrated in FIGS. 11 to 14, inclusive. Corresponding numerals will be employed to identify corresponding parts heretofore described.

FIGS. 11 and 12 illustrate building construction panels 14C, 14D, respectively, having central pans 30C, 30D, respectively of upwardly convex configuration. In FIG. 11, the central pan 30C has a generally inverted V-shaped upper surface 118 including a ridge 120. A plurality of the deformations 32 is provided in the central pan 30C on opposite sides of the ridge 120. In FIG. 12, the central pan 30D has a convex arcuate upper surface 122. Two rows of the deformations 32 are provided in the central pan 30D.

FIGS. 13 and 14 illustrate building construction panels 14E, 14F, respectively, wherein the central pans 30E, 30F, respectively, have upwardly concave configurations. In FIG. 13, the central pan 30E has a generally V-shaped upper surface 124 provided with two rows of the deformations 32. In FIG. 14, the central pan 30F has a concave arcuate upper surface 126 provided with two rows of the deformations 32.

Alternative embodiments of the connecting members provided in the present building construction panel are illustrated in FIGS. 15, 16; 17, 18; 19, 20; and 21-24. Corresponding numerals will be employed to identify corresponding parts heretofore described.

FIG. 15 illustrates a building construction panel 127 provided with first and second connecting members 128, 130. The first connecting member 128 comprises an open channel 62' adjoining the first generally vertical web 34 at the upper edge 38 and terminating at its opposite end in an outwardly flared portion 132. The second connecting member 130 comprises a generally tubular channel 134 connected to the upper edges 48, 44 of the second and third generally vertical webs 46, 36, respectively. The first and second connecting members 128, 130 present coengageable inner and outer surfaces 136, 138, respectively.

The assembly of adjacent panels 127A, 127B is illustrated in FIG. 16. To install the panel 127B, it is initially disposed in that position shown in dotted outline wherein the first connecting member 128B overlies the second connecting member 138A in saddle-like fashion. Downward pressure applied to the first connecting member 128B, causes the first connecting member 128B to be snapped over the second connecting member 138A into the position shown in full lines.

FIG. 17 illustrates a building construction panel 140 provided with first and second connecting members 142, 144. The first connecting member 142 comprises a first horizontal flange 146, a sloped portion 148 adjoining the first generally vertical web 34 at the upper edge 38 and forming a downwardly opening groove 150; and a hooked end 152 formed along the opposite edge of the first horizontal 146. The second connecting member 144 includes a second horizontal flange 154 terminating in a generally L-shaped flange 156 providing a recess 158. An upstanding bead 160 connects the second horizontal flange 154 to the second generally vertical web 46. The second connecting means 144 additionally includes a third horizontal flange 162 having one edge adjoining the third generally vertical web 36 and terminating along its opposite edge in

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a generally L-shaped flange 164. The L-shaped flanges 156, 164 are connected at a fold 166.

FIG. 18 illustrates the positive mechanical connection provided by the second and first connecting members 144A, 142B of adjacent building construction panels 140A 140B, respectively. When the panels 140A and 140B are connected, the hooked end 152A resides in the recess 158A and resists vertical movement of the panel 140B relative to the panel 140A. The bead 160A resides in the groove 150B and resists lateral movement of the panel 140B relative to the panel 140A.

FIG. 19 illustrates a building construction panel 168 provided with first and second connecting members 170, 172. The first connecting member 170 comprises a horizontal flange 174 having an outwardly flared portion 176 along one edge and a reverse turned portion 178 disposed along its opposite edge. The reverse turned portion 178 adjoins the first generally vertical web 34. A groove 180 is provided between the reverse turned portion 178 and the horizontal flange 174. The second connecting member 172 has a generally T-shaped configuration presenting oppositely extended horizontal ribs 182, 184 adjoining the second and third generally vertical webs 46, 36.

FIG. 20 illustrates the assembly of adjacent panels 168A, 168B. The first and second connecting members 170B, 172A provide a clip type connection between the adjacent panels 168A, 168B. During assembly, the panel 168B is moved laterally toward the previously installed panel 168A. Passage of the outwardly flared portion 176B over the second connecting member 172A causes the horizontal flange 174B to be deflected upwardly. When the horizontal bead 182A is seated in the groove 180B, the outwardly flared portion 176B hooks over the outer edge of the horizontal rib 184A to provide a positive mechanical connection between the adjacent panels 168A, 168B.

FIG. 21 illustrates a building construction panel 186 provided with a first connecting member 188 which is similar to the first connecting member 170 of the building construction panel 168 of FIG. 19. The first connecting member 188 includes a horizontal flange 174 having a reverse turned portion 178 adjoining the first generally vertical web 36. A groove 180 is provided between the horizontal flange 174 and the reverse turned portion 178. A terminal flange 190 is provided along the opposite edge of the horizontal flange 174. The building construction panel 186 also includes a second connecting member 172 which is identical to the second connecting member of the building construction panel 168 of FIG. 19. Accordingly, the second connecting member 172 includes oppositely extended horizontal ribs 182, 184 adjoining the second and third generally vertical webs 46, 36.

FIGS. 22, 23 and 24 illustrate the assembly of adjacent panels 186A, 186B. Initially, as shown in FIG. 22, the horizontal flange 174B is moved above the second connecting member 172A such that the horizontal bead 182A will be received in the groove 180B. When the horizontal bead 182 is seated in the groove 180B and the flange 174B overlies the second connecting member 172A, as shown in FIG. 23, suitable apparatus (not shown) is employed to bend the terminal flange 190B downwardly around the horizontal rib 184A. The completed connection between the adjacent panels 186A, 186B is illustrated in FIG. 24 wherein the terminal flange 190B has been bent downwardly, around and under the horizontal rib 184A.

Alternative embodiments of the base provided in the present building construction panel are illustrated in FIGS. 25 and 26. Corresponding numerals will be employed to identify corresponding parts heretofore described.

In FIG. 25, a base 192 includes a bottom flange 54 provided with a second upper flange 194 terminating in a generally vertical terminal flange 196. The terminal flange 196 may be spot welded as at 198 or otherwise secured to the second generally vertical web 46.

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FIG. 26 illustrates a base 200 wherein the first upper flange 52 and the bottom flange 54 are provided with an upturned edge 202, and the second upper flange 194 and the bottom flange 54 are provided with a second upturned edge 204. The upturned edges 202, 204 provide additional reinforcement for the base 200.

FIG. 27 illustrates the preferred end configuration of the present building construction panel. The preferred end configuration will be described with reference to the building construction panel 14 of FIG. 2. It should be noted that any of the building construction panels described herein may be provided with end configurations such as shown in FIG. 27.

The building construction panel 14 has a panel end 206 wherein the central pan 30 and the first and third generally vertical webs 34, 36 remain in tact. A portion (not shown) of the second generally vertical web 46 below the central pan 30 and above the base 28 is removed. The base 28 is bent to assume the configuration illustrated and is secured to the second generally vertical web 46 by a continuous fillet weld 208 and by a second fillet weld (not shown) applied internally of the panel 14. The arrangement is such that the base 28 is uninterrupted and provides a flat portion or bearing pad 210 and an adjoining sloped portion 212.

As shown in FIG. 28, the panels 14C, 14D can be aligned in end-to-end abutment with the bearing pads 210C, 210D engaged with the horizontal upper flange 214 of a horizontal beam 216. The horizontal beam 216 forms part of the structural framework of a building. It will be noted that the second connecting members 24C, 24D, the first connecting members (not shown) and the central pans 30C, 30D extend continuously across the horizontal beam 216. The panels 14C, 14D may be spot welded or otherwise secured to the horizontal beam 216.

FIG. 29 illustrates a panel 14 having a panel end 206' including a flat portion or bearing pad 210' and an adjoining sloped portion 212'. In this embodiment, portions of the central pan 30 and the third generally vertical web 36 are removed. The flat segment 210' is secured to the central pan 30 and the web 36 by fillet welds 209. The flat segment 210' has a lower face 211 which is flush with the lower face 213 of the central pan 30. When the panel end 206' of the panel 14 of FIG. 29 is placed on a horizontal beam, the central pan 30 and the flat segment 210' will be in overall surface engagement with the top flange of the horizontal beam. Such an arrangement facilitates the welding of shear studs through the central pan 30 directly to the horizontal beam to provide a composite beam construction.

FIG. 30 illustrates an alternative end configuration of a building construction panel 218 having a panel end 220. In this embodiment, the sloped portion 212 terminates at the level of the central pan 30. A bearing plate 222 is welded or otherwise secured to the bottom face of the central pan 30 in the position illustrated. The bearing plate 222 is thus positioned to engage the top flange of a horizontal beam.

FIG. 31 illustrates a further alternative end configuration of a building construction panel 224. The panel 224 includes a panel end 226 wherein the second generally vertical web 46 is provided with a longitudinal slot 228 below the level of the central pan 30 and an inset generally vertical edge 230 extending downwardly from the slot 228.

In FIG. 32, two aligned and end-to-end abutted panels 224A, 224B are shown supported on a horizontal beam 216. The beam 216 includes a vertical web 232 and a horizontal upper flange 214. The upper flange 214 is received in the longitudinal slot 228A, 228B. The inset vertical edges 230A, 230B are engaged with the opposite faces of the vertical web 232. Continuous fillet welds 234 secure the panels 224A, 224B to the horizontal beam 216.

It will be noted that the central pans 30A, 30B; the second connecting members 24A, 24B; and the first con-

necting members (not visible) extend continuously across the horizontal beam 216.

FIG. 33 illustrates the end configuration of the starter section 16. The base 28' includes the flat segment or bearing pad 210'' positioned to engage the top flange of a horizontal beam and the adjoining sloped segment 212''.

Further alternative embodiments of the present building construction panel are illustrated in FIGS. 34 and 35. Corresponding numerals will be employed to identify corresponding parts heretofore described.

FIG. 34 illustrates a building construction panel 234 wherein the second generally vertical web 46 is laterally spaced-apart from the longitudinal pan edge 42 of the central pan 30. The panel 234 includes a base 236 comprising a second pan 238 connected to the second generally vertical web 46 and extending therefrom toward and generally parallel with the central pan 30. A fourth general vertical web 240 connects the third generally vertical web 36 to the second pan 238. The base 236 presents oppositely extending flanges 242, 244 adapted to support the aforementioned ceiling components.

The second generally vertical web 46 is provided with a second connecting member 24' comprising an open channel 246 of a single metal thickness and presenting an outer surface 248. A generally tubular rib 250 connects the corresponding upper edges of the third and fourth generally vertical webs 36, 240.

The arrangement is such that the second generally vertical web 46, the second pan 238 and the fourth generally vertical web 240 define a generally U-shaped deep trough 252 adapted to provide a full depth concrete rib, as will be described.

In FIG. 35, there is illustrated a building construction panel 254 wherein the second generally vertical web 46 is laterally spaced-apart from the longitudinal pan edge 42 of the central pan 30. The panel 254 additionally includes a base 236' comprising a second pan 238' extending from the second generally vertical web 46 toward and generally parallel with the central web 30. The base 236' presents oppositely extending flanges 242', 244' adapted to support the aforementioned ceiling components.

In this embodiment, a third generally vertical web 36' extends downwardly from the longitudinal pan edge 42 and is connected to the second pan 238'. The second generally vertical web 46, the second pan 238' and the third generally vertical web 36' define a generally U-shaped trough 256 adapted to provide a full depth concrete rib, as will be described. The second generally vertical web 46 is provided with a second connecting member 24' comprising an open channel 246' having an outer surface 248'. The outer surface 248' is adapted to be engaged with the inner surface 88 of the first connecting member 22 of an adjacent panel.

Referring to FIG. 35, there is illustrated a floor structure 258 comprising a metal subfloor 12' and an overlying layer of concrete 16. For the purpose of illustration, the metal subfloor 12 comprises a plurality of the building construction panels 14, one of the building construction panels 234, and one of the building construction panels 254. A flush-type acoustical ceiling structure 112 is supported on the underside of the metal sheath 12' in the manner described above.

The trough 252 of the panel 234 is filled with concrete and provides a full depth concrete rib 260. The second connecting member 24' is interengaged with the first connecting member 22 of the adjacent building construction panel 14 and comprises one of the aforesaid keying elements 96'. Similarly, the generally tubular rib 250 also comprises a keying element 96'. The keying elements 96' and the deformations 32 (FIG. 34) provided in the second pan 238 secure the concrete rib 200 to the metal subfloor 12'.

The trough 256 of the panel 254 is filled with concrete and provides a full depth concrete rib 262. The second connecting member 24' is interengaged with the first con-

necting member 22 of the adjacent panel 14 and comprise a keying element 96''. The keying element 96'' and the deformations 32 (FIG. 35) provided in the second pan 238' secure the concrete rib 262 to the metal subfloor 12'.

It should be evident that the inclusion of one or more of the panels 234, 254 and the concrete ribs 260, 262 provided thereby will significantly increase the load-carrying capacity of the floor structure 258.

I claim:

1. A flooring panel formed from a single metal sheet comprising:

- a first generally vertical web having upper and lower edges;
- a second generally vertical web laterally spaced from said first generally vertical web and having upper and lower edges above and below the level of the lower edge of said first generally vertical web;
- a central pan extending from the lower edge of said first generally vertical web toward said second generally vertical web and terminating in a longitudinal pan edge disposed intermediate of the upper and lower edges of said second generally vertical web;
- a third generally vertical web having a lower edge adjoining said longitudinal pan edge and an upper edge adjacent to the upper edge of said second generally vertical web;

first and second connecting members of the self-connecting type:

- said first connecting member comprising a generally cylindrical open channel of a single metal thickness, adjoining the upper edge of said first generally vertical web and terminating in a leading edge spaced from the upper edge of said first generally vertical web;
- said second connecting member comprising generally cylindrical outer and inner concentric open channels adjoining respectively the upper edges of said second generally vertical web and said third generally vertical web and being connected at a common leading edge spaced from the upper edges of said second generally vertical web and said third generally vertical web;
- a base of double metal thickness adjoining the lower edge of said second generally vertical web below the level of said central pan; and
- generally parallel deformations in said central pan, said deformations projecting out of the plane of a face of said central pan and extending transversely thereof;

said flooring panel adapted to be engaged side-by-side with others of said flooring panel with said first connecting member interfitting the second connecting member of a previously installed flooring panel and with the said second connecting member interfitting the first connecting member of a subsequently installed flooring panel.

2. The building construction panel of claim 1 wherein said central pan comprises a generally flat sheet portion.

3. The building construction panel of claim 1 wherein said central pan has an upwardly convex configuration.

4. The building construction panel of claim 1 wherein said central pan has an upwardly concave configuration.

5. The building construction panel of claim 1 wherein said deformation comprise embossments extending above the upper face of said central pan.

6. The building construction panel of claim 1 wherein said deformations comprise indentations extending below the lower face of said central pan.

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