Oct. 29, 1963 H. W. SCHICK 3,108,662

BUILDING CONSTRUCTION

Filed Nov. 12, 1958

Fig. 1.

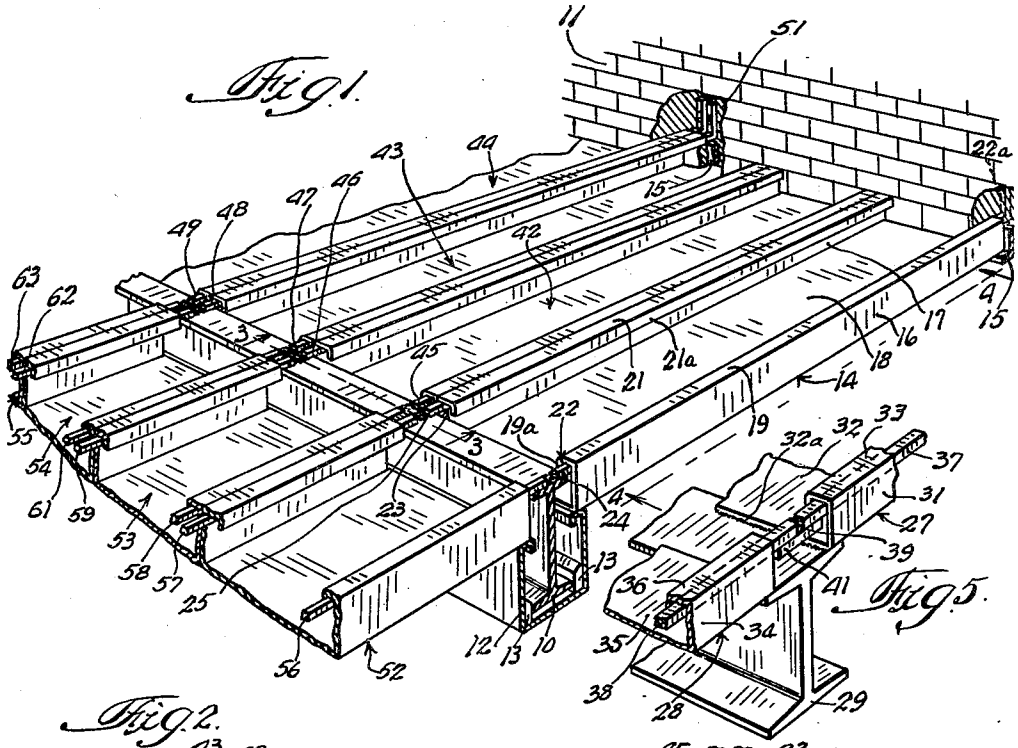


Fig. 5.

Fig. 2.

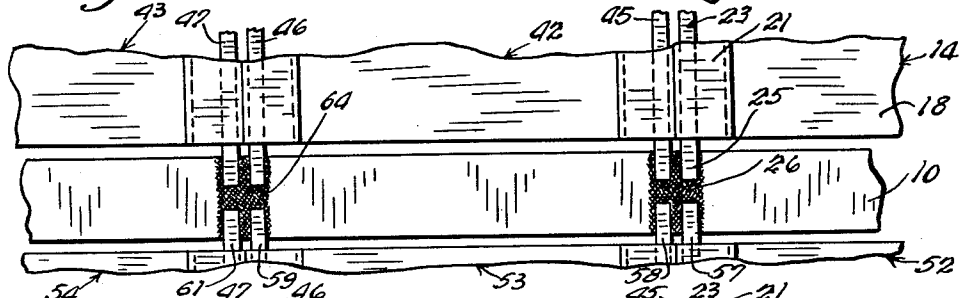


Fig. 3.

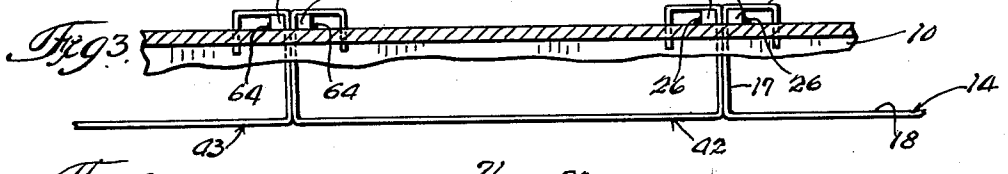
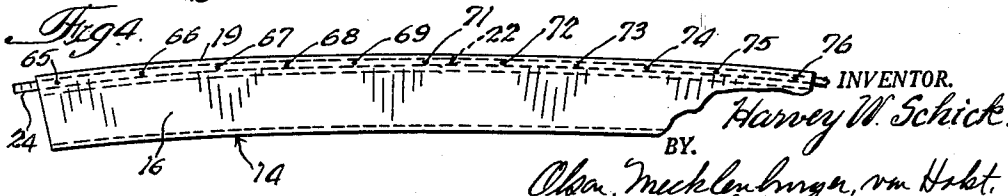


Fig. 4.



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BUILDING CONSTRUCTION

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This invention relates to improvements in a skeletal construction for floors and roofs of buildings, and more particularly it relates to a novel reinforced pan construction for containing a concrete aggregate or the like and to the means for assembling the pan construction.

Heretofore such skeletal structures have frequently been formed of sheets of steel or other material placed over crossbeams in a building, the aggregate being poured on top of the sheets. Variations include different types of interlocking tubes or flat members placed side by side over the crossbeams to form a supporting layer for the aggregate. One improved building deck is a construction such as shown in my United States Patent No. 1,997,950 in which a relatively heavy gauge steel pan with upright sides having flanges along their upper edges is placed on two supporting beams to receive a layer of aggregate fill.

The earlier constructions have necessarily been accompanied by several well-known defects, including mounting difficulties, the need for additional forms to confine the aggregate, and the limited span length which could be accommodated. Even in my earlier construction the weight and cost of steel pans of sufficient gauge to support calculated amounts of aggregate, the weight of the amount of aggregate required to support a designated live load on the floor, and the thickness of a floor resulting from the necessary amount of aggregate combined with sufficiently heavy steel pans or sheets were quite high.

One object of the invention is to provide an improved deck construction in which a given weight load may be supported by a thinner slab than heretofore possible for a given area.

Another object of the invention is to provide a skeletal floor construction which accommodates a minimum amount of concrete aggregate or the like without diminution of weight-supporting strength.

Another object of the invention is to provide an improved pan to support a lightweight level floor.

A further object of the invention is to provide reinforced sections to increase the structural strength of a load-bearing floor section.

A still further object of the invention is to provide an improved skeletal floor construction section having the longitudinal neutral axis of flection raised toward the upper surface of the section.

Yet another object of the invention is to provide a reinforced elongate pan having a lower web portion, substantially upright elongate sides extending upwardly from the web portion, inwardly directed flange portions integral with the upper edges of the upright sides and overlying the web portion, and elongate reinforcing bars secured to each of the inwardly directed flanges along substantially their entire length.

Briefly, the invention is a skeletal deck construction in which transverse, generally horizontal structural members of a building have novel pans placed between them. The pans have side portions extending upwardly from the lower web portion and inwardly directed flanges at the upper edges of the side portions. Reinforcing rods are in engaging association with the entire length of each flange, thus raising the longitudinal neutral axis of flection closer to the upper surface of each pan with a corresponding increase in the section modulus. In the novel pan, a lighter gauge metal may be used for the pan and with the reinforcing rod will have approximately the same weight per square foot but with approximately one hundred fifty percent of the load capacity of the pan alone.

A thinner section with shorter upright sides may therefore be used for a given load and span with corresponding reduction of concrete filling, thus reducing the dead load and permitting more economical design of structural framework.

Other objects and advantages will become apparent from the following description when taken in conjunction with the accompanying drawings.

In the drawings, FIGURE 1 is a perspective view partly broken away of one novel skeletal deck construction incorporating the invention;

FIG. 2 is a fragmentary top plan view of a portion of the girder in FIG. 1 and adjacent pans;

FIG. 3 is a cross sectional view of a portion of FIG. 1 taken along the line 3—3 in FIG. 1;

FIG. 4 is an exaggerated side view of a pan before it is filled with aggregate; and

FIG. 5 is a perspective view partly broken away of an alternative construction illustrating a second embodiment of the invention.

Referring to the drawings, in FIG. 1 structural girder 10 is an elongate supporting member for a floor of a building and is spaced apart from and substantially parallel to one wall 11 of the building. U-shaped steel sheet 12 encloses the lower portion of girder 10 so that no portion of the girder is exposed in the finished building. Bars 13 space plate 12 the desired distance from the lower portion of girder 10 and may extend for substantially the entire length of girder 10 to form a secure attachment for plate 12. Such construction allows room for enclosing electrical conduits, pipes, or other necessary conduits within concealed areas throughout the building. In addition or in place of such conduits the area enclosed by plate 12 and bars 13 may be filled with any appropriate insulation or fireproofing material.

Pan 14 extends between girder 10 and wall 11 and is suspended therefrom. An L-shaped steel channel 15 is preferably set in the wall 11 during construction on which the floor pans rest. Two opposite sides 16 and 17 of pan 14 are disposed upright from the web portion 18. Flanges 19 and 21 extend inwardly along the upper edges of sides 16 and 17, respectively. Short lips 19*a* and 21*a* are formed downwardly from the free edges of flanges 19 and 21 to further insure against possible buckling or other distortion of the flanges.

A rod 22 engages the entire length of flange 19, and a similar rod 23 engages the entire length of flange 21. In the particular construction of FIG. 1, one end portion of rod 22 is formed upwardly to provide anchor portion 22*a* which is anchored in wall 11. The other end portion 24 extends substantially beyond the pan 14 and overlies and is secured to girder 10. Similarly, one end portion of rod 23 is anchored in wall 11 and the other end portion 25 overlies and is secured to girder 10.

As shown in FIG. 2, end portion 25 of rod 23 may be affixed to girder 10 by surrounding weld 26 or any similar method.

In FIG. 3 the rod 23 is engaged within flange 21 which is spaced apart from web portion 18 of pan 14 by side 17. Welds 26 affix rod 23 to girder 10.

In FIG. 4 the rod 22 engages the entire length of flange 19 and extends therebeyond, and a camber of the rod is exaggerated for easy visualization. One important structural feature of this invention is the camber imparted to the pans during manufacture. The pans 14 are placed under a substantial inverse load while the rods 21 and 22 are welded into place. When the rods and pan cool and the load is removed, the pan straightens somewhat but retains a predetermined camber which greatly enhances the load-bearing ability of the completed structure.

FIG. 5 shows an alternate construction in which pans 27 and 28 rest on girder 29. Side 31 is angularly dis-

posed to the web portion 32 of pan 27 with a flange 33 along the edge of side 31 spaced from web portion 32. Similarly side 34 is angularly disposed to web 35 of a similar pan 28 and flange 36 is spaced from web 35 by side 34. Rod 37 engages flange 33 and rod 38 engages flange 36. Rods 37 and 38 are preferably in close spaced relationship and secured to each other by a weld fillet 39. The joint may be strengthened by a short bar 41 welded to each of the bars 37 and 38 or by any convenient means. The pan 32 is secured to the girder 29 by a weld 32*a* or other convenient means.

This alternate embodiment is somewhat more space-consuming in that the entire girder extends beneath the pans. However, it is also substantially stronger in that it provides, in effect, continuous upper and lower tension and compression members. It is estimated that a twenty percent improvement in the section modulus is thus obtained.

Referring again to FIG. 1, pan 14 is installed between girder 10 and wall 11 and a plurality of pans are installed adjacently, such as pans 42, 43 and 44. Rods 22 and 23 support pan 14 between girder 10 and wall 11. A plurality of similar rods support adjacent pans, such as rods 45, 46, for pan 42 and rods 47, 48 for pan 43. One end of each of these rods is anchored in the wall 11, such as shown by the section of wall 11 which is broken away at 51 in FIG. 1. Pans 14, 42, 43 and 44 may be filled with various types of concrete aggregate to form a floor. Conventionally the aggregate extends to approximately one inch above the tops of the pans.

As already stated, in practice it has been found desirable that before both ends of rods 22 are secured an external force is applied beneath the web portion 18 of pan 14, raising the center portion of both pan and rods to produce a camber between the end portions such as exaggeratedly shown in FIG. 4. The extent of such a camber may be calculated according to the materials used so that when the concrete fill is poured into pan 14 the total weight reduces the camber, forming a level finished floor. It has been found that such construction particularly eliminates cracks which appear in the concrete fill over girder 10 after the fill has hardened and a live load is placed on the floor.

If this construction is used with two girders instead of or in addition to use with a girder and a wall, the pans may be supported at both ends as shown on girder 10 in FIG. 1. A plurality of pans such as shown by pans 52, 53, 54 and 55 are arranged adjacent to one side of girder 10 so that rods 56, 57, 58, 59, 61, 62 and 63 are secured to girder 10 with rods 22, 23, 45, 46, 47, 48 and 49 from the other side of girder 10 by welds such as 26 and 64 in FIG. 2.

It has been found in practice that full advantage of the reinforcement bars may be obtained by welding with a four inch weld over girder 10 and one and one-half inch welds with nine inch centers, as indicated for example only in FIG. 4 at 65, 66, 67, 68, 69, 71, 72, 73, 74, 75, and 76, along the portions of the rods engaging the flanges. Where the particular construction of FIG. 1 is used, the extension of the reinforcing bars over the girder eliminates the expense of providing any lugs welded to the under side of the flanges in order to connect a pan to the top of the girder. In one particular embodiment of the invention a pan of 16 gauge steel, 1½ feet wide, is provided with flanges 6 inches deep. The rods are ½ inch square hot rolled steel welded as described above. Such a pan, when properly assembled on supports can be used for spans up to 20 feet. When used in a 20-foot span, the deck is capable of safely supporting a load of 124 pounds per square foot.

As is evident from an inspection of the drawings and the foregoing discussion, the calculated neutral axis of flection is raised toward the flanges when reinforcing bars are engaged with the flanges. This increases the moment of inertia and reduces the amount of deflection in the novel section, and since a thinner section is then required for a given amount of load capacity, the modulus of a section is increased over that of an unreinforced section.

Although the preferred form of the invention is illustrated and described, various changes may be made without departing from its spirit or from the scope of the following claims. What is claimed is:

1. In a skeletal deck construction section, a pan comprising an elongate web portion, opposite lateral portions substantially uprightly disposed from said web portion, flanges spaced apart from the web portion along the edges of the lateral portions, said web portion lateral portions and flanges having a generally uniform thickness, and a reinforcing means disposed adjacent the uppermost extremity of each flange in rigid engaging association with the entire length of said flange, said web portion, lateral portions and flanges having a longitudinal neutral axis of flection and said reinforcing means being disposed remotely from said axis to raise said axis closer to the upper extremity of the flanges.

2. In a skeletal deck construction section, a pan comprising an elongate web portion, opposite lateral portions substantially uprightly disposed from said web portion, flanges spaced apart from the web portion and disposed along the uppermost edges of the upright lateral portions, said web portion, lateral portions and flanges having a generally uniform thickness and having a longitudinal neutral axis of flection, and a reinforcing rod substantially disposed near the uppermost extremity of each upright lateral portion and intermediate said flanges and said axis in rigid engaging association with said pan along the entire length of said flanges to raise said axis closer to the upper extremity of the flanges.

3. In a skeletal deck construction, a pan adapted to receive a filling aggregate comprising an elongate web portion, opposite lateral portions substantially uprightly disposed from said web portion, flanges spaced apart from the web portion and disposed along the uppermost edges of the upright lateral portions, said web portion, lateral portions and flanges having a substantially uniform thickness and having a longitudinal neutral axis of flection, and a reinforcing rod substantially disposed near the uppermost extremity of each upright lateral portion and intermediate said flanges and said axis and over said web portion and said axis in rigid engaging association with said pan along the entire length of said flanges to raise said axis closer to the upper extremity of the flanges.

4. The pan in claim 3, said pan having a camber between opposite end portions of said pan to counteract the normal loading effect when said pan is filled with aggregate and the like.

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