

Sept. 3, 1963

W. A. SHELBY, JR
CELLULAR FLOOR CONSTRUCTION

3,102,610

Filed June 30, 1958

2 Sheets-Sheet 1

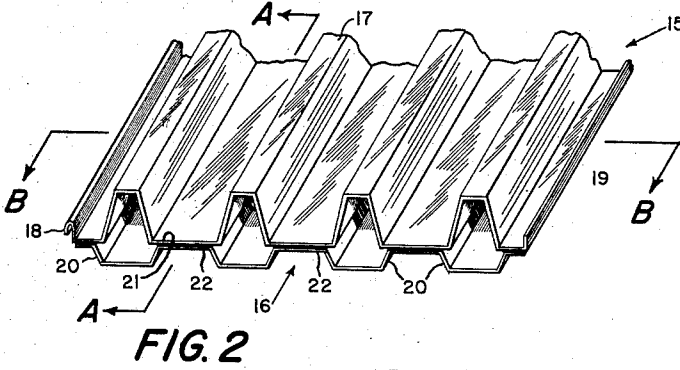


FIG. 2

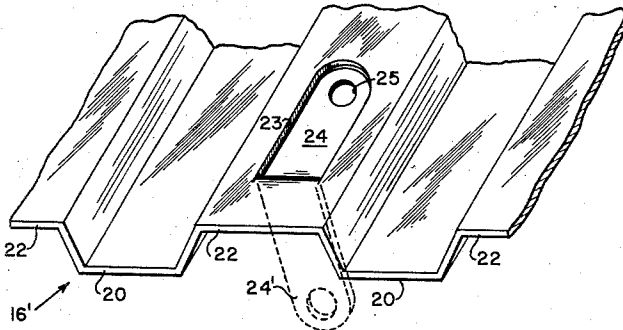


FIG. 3

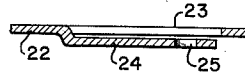


FIG. 4

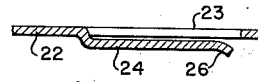


FIG. 5

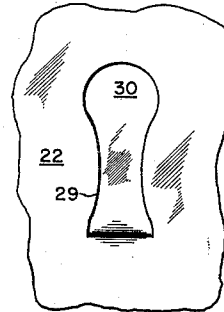


FIG. 7

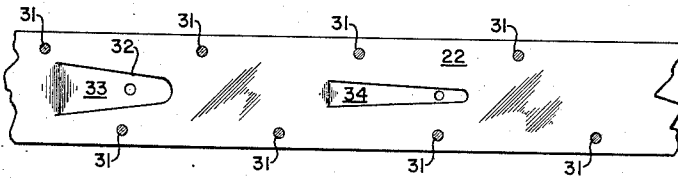


FIG. 8

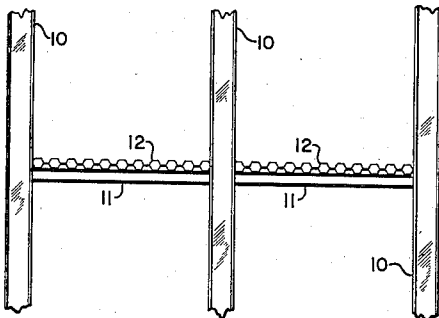


FIG. 1

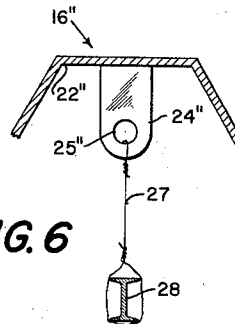


FIG. 6

INVENTOR.

WALLACE A. SHELBY, JR.

BY

Harry B. Keck
ATTORNEY

Sept. 3, 1963

W. A. SHELBY, JR
CELLULAR FLOOR CONSTRUCTION

3,102,610

Filed June 30, 1958

2 Sheets-Sheet 2

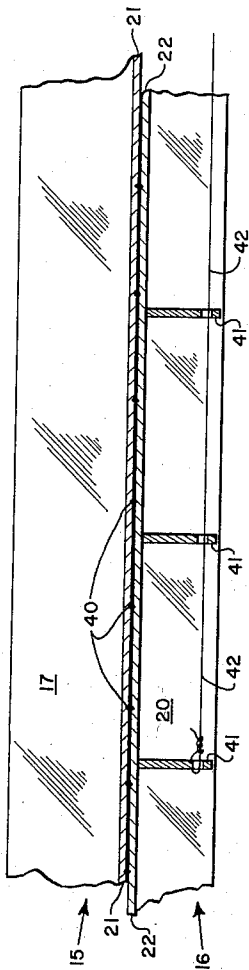


FIG. 9

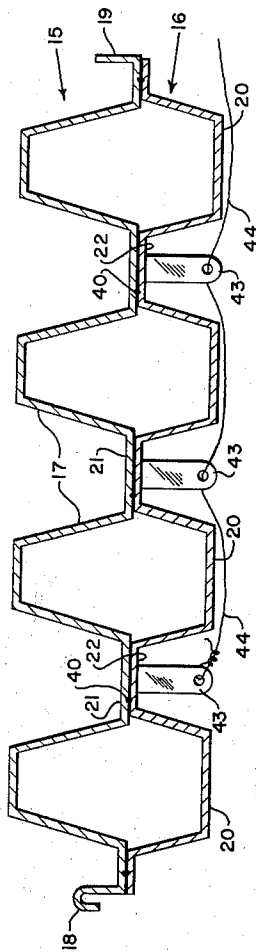


FIG. 10

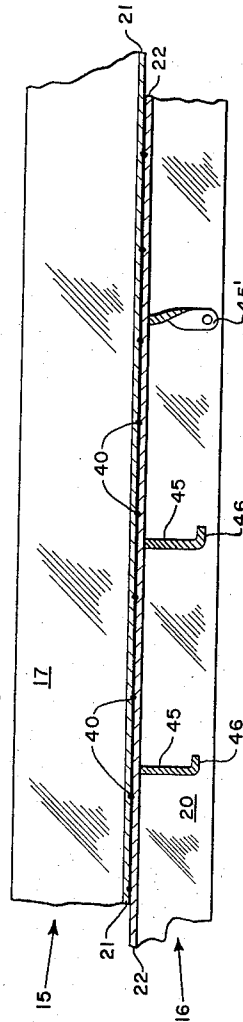


FIG. 11

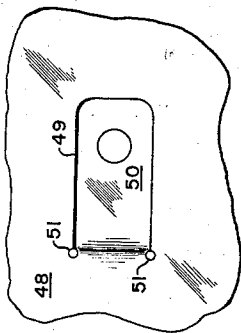


FIG. 12

INVENTOR.
WALLACE A. SHELBY, JR.
BY *Harry B. Keck*
ATTORNEY

1

3,102,610

CELLULAR FLOOR CONSTRUCTION

Wallace A. Shelby, Jr., Pittsburgh, Pa., assignor to H. H. Robertson Company, Pittsburgh, Pa., a corporation of Pennsylvania

Filed June 30, 1958, Ser. No. 745,699

5 Claims. (Cl. 189—34)

The present invention relates to an improved cellular floor construction and, more particularly, to novel means for supporting structures depending from cellular floors.

Cellular floors have gained wide acceptance in the building arts because of the convenience and construction simplicity resulting from their use. They are employed as a support for poured concrete floorings, fireproofing coatings and as permanent conduits for electrical wiring. In addition, subjacent ceilings and ductwork can be suspended from the cellular floors. It is in this last-mentioned application that the present invention has its principal utility.

By present practices the suspension of subjacent ceilings, ductwork and the like must be completed before concrete is poured for a flooring above the cellular floor. The suspension is accomplished by punching or drilling a hole through the cellular floor from the upper surface to the lower surface and fastening a hanging member such as a length of heavy wire through the hole. Frequently difficulty is encountered in positioning the punched holes at precisely the location necessary to provide the desired supporting function. When holes are incorrectly positioned, new holes must be provided in the desired location. The inefficiency of this hit-or-miss technique is apparent. The technique, moreover, cannot be employed after concrete has been poured over the cellular floor.

Some safety hazards exist in the present hole-punching practice. Occasionally a workman's punch has been driven entirely through the cellular frame and has freely fallen to the next lower level endangering working personnel. Occasionally rods or lengths of wire have dropped entirely through punched or drilled holes endangering working personnel. Welding sparks also have been noted as a hazard when holes are provided. Concrete or fine aggregate provided as a flooring or covering will run through holes. Violent hammering of punching tools has in some instances severely distended the positioned cellular floors.

According to the present invention, a plurality of punched-out tabs or tongues are provided in the bottom element of a cellular floor. These tabs or tongues may be bent downwardly as desired after the cellular floor has been positioned in the building to provide supporting means at any desired location. In addition, the tabs or tongues provide a convenient anchoring means to retain coating materials such as fireproofing coating materials which frequently are sprayed onto the lower surfaces of cellular floors.

Thus, the principal object of this invention is to provide convenient suspending means in cellular floors.

A further object is to provide suspending means which do not interfere with the stacking properties of cellular floors, i.e., which permit storage and shipping of such floor frames in a minimum volume.

An additional object is to provide suspending means in cellular floors which can be selected for use regardless of whether concrete flooring has been poured over the upper surface of the cellular floor.

Another object is to provide convenient anchoring means for retaining sprayed coating materials on the lower surface of cellular floors.

These and other objects and advantages of the present invention will become apparent from the following de-

2

tailed description with reference to the accompanying drawings in which:

FIGURE 1 is a fragmentary side elevation view of a typical building frame employing cellular flooring;

FIGURE 2 is a fragmentary perspective illustration of a unit section of cellular flooring;

FIGURE 3 is a fragmentary perspective illustration of a portion of a cellular floor showing the present invention;

FIGURES 4 and 5 are cross-section views of alternative embodiments of this invention;

FIGURE 6 is a fragmentary cross-section view showing the present invention utilized to support depending structure;

FIGURE 7 is a fragmentary plan view of an alternative embodiment of this invention;

FIGURE 8 is a fragmentary plan view of a portion of a cellular floor showing a further embodiment of this invention;

FIGURE 9 is a fragmentary side elevation view of a cellular floor taken along the line A—A of FIGURE 2 showing a further embodiment of the present invention;

FIGURE 10 is a fragmentary cross-section view of a cellular floor taken along the line B—B of FIGURE 2 showing a modified embodiment of this invention;

FIGURE 11 is a fragmentary side elevation view of a cellular floor taken along the line A—A of FIGURE 2 showing a still further embodiment of this invention; and

FIGURE 12 is a fragmentary plan view of an improved alternative embodiment of this invention.

Referring to FIGURE 1, a cut-away section of a typical steel frame building is illustrated showing one manner in which cellular floors may be utilized. As shown in FIGURE 1, a typical building includes vertical girders 10 and horizontal girders 11. Cellular flooring 12 is laid above the horizontal girders 11 and secured thereto, for example, by welding. Concrete may be poured over the upper surface of the cellular floor 12 to provide a flooring surface. Ceiling supporting structure may be suspended beneath the cellular floor 12 to provide a ceiling for the subjacent story. Ductwork and conduits for heating and ventilating, for example, may be suspended from the cellular floor 12 in the space above the ceiling of the subjacent story. Mechanical piping, electrical conduits and electrical fixtures also can be suspended.

A clear illustration of typical cellular floor construction is presented in FIGURE 2. Each cellular floor section includes two elements, identified herein for convenience as an upper element 15 and a correlative lower element 16. The upper element 15 is provided with lengthwise, parallel channels 17. A lapped edge 18 is provided along one side of the upper element 15 and an upwardly bent flange 19 is provided along the other side. By interlocking the flange 19 with a lapped edge (corresponding to the lapped edge 18) of a similar cellular floor section, an entire floor structure may be securely assembled readily with accuracy and conformity.

The lower element 16 is provided with lengthwise, parallel channels 20 which are correlated with the channels 17 of the upper element 15. The channels 17 and 20 provide the "cells" from which the term "cellular floor" is derived. These cells are located permanently in the assembled building and provide a readily accessible means for installing electrical wiring throughout the life of the resulting building.

The cells also may be used as air pasageways. The cells should be imperforate to provide a vapor barrier, especially in roofing applications. Any obstructions or openings in the cells should be avoided.

Between the channels 17 and 20 are flat, horizontal webs 21 (in the upper element 15) and 22 (in the lower element 16). The webs 21 and 22 are contiguous and

are fastened together, preferably by means of spot welds applied at spaced points along the contiguous surfaces of the webs. The fastening, of course, may be achieved by means of rivets, bolts or other means.

As shown in FIGURE 2, both the upper element 15 and the lower element 16 are provided with lengthwise, parallel channels 17 and 20, respectively. In some building installations, the channels 17 may be identical in cross-section with the channels 20. In other installations, only one of the elements 15 or 16 is provided with parallel channels; the other element may be merely a flat sheet of metal of corresponding dimensions. Cellular floor sections normally are provided in standard widths up to about three feet and in lengths from about four feet to about 25 feet.

By present practices, when it is desired to suspend various structure beneath cellular floors, it is necessary that all supporting elements be positioned before concrete is poured onto the top of the installed cellular floor. This requirement frequently interferes with the rapid and efficient construction of the particular building by requiring that all subjacent structure be assembled or aligned before flooring is installed.

The preferred embodiment of the present invention is illustrated in FIGURE 3 which is a perspective view of a fragment of a lower element 16' of a cellular floor section. Parallel channels 20 and webs 22 are illustrated. A generally U-shaped opening 23 is provided in the web 22, defining a tongue 24. The tongue 24 may be bent downwardly as shown at 24' by broken lines. An aperture 25 preferably is provided in the tongue to receive a depending supporting element such as a support rod or heavy wire. A plurality of U-shaped openings 23 preferably are punched into the web 22 before the lower element 16 is secured to the upper element 15 for assembly of the completed cellular floor section. The punching operation serves to cut out the tongue 24 and also to depress the tongue below the surface of the web 22. This preferred embodiment is shown in FIGURE 4 in cross-section, where corresponding numerals refer to corresponding parts. The aperture 25 also serves to facilitate the downward bending of the tongue 24 since it will admit a pointed implement as a prying device.

A further improvement is illustrated in FIGURE 5 wherein the tip 26 of the tongue 24 is downwardly curved to facilitate admission of a prying implement for tongue bending. The generally U-shaped openings 23 and tongues 24 may be formed by passing each lower element 16 through automatic stamping machines having mating dies of the desired shape at predetermined spaced intervals. The dies also can stamp out apertures 25 in the same operation. While the aperture 25 has been illustrated as circular, it should be apparent that any convenient geometric configuration is suitable.

The utility of the present invention is illustrated in FIGURE 6 which is a cross-section view showing a web 22' of a lower element 16'' having a tongue 24'' in its downwardly bent position. A depending supporting element such as a heavy wire 27 is secured through the aperture 25''. The wire 27 is employed to support an I-beam 28 to which might be attached expanded metal plaster laths for a subjacent plastered ceiling, as an example.

A further embodiment of the invention is illustrated in FIGURE 7 which is a fragmentary plan view of a web 22 wherein a generally U-shaped opening 29 defines a tongue 30 having a reduced width at an intermediate portion. A heavy wire may be readily secured about the intermediate portion of the tongue 30 to support depending structure. In this configuration, no aperture is required in the tongue 30.

A further embodiment of the present invention is illustrated in FIGURE 8. This embodiment specifically avoids the possibility that the stamped tongues might become welded securely during the spot-welding process employed to secure the upper element 15 to the lower element 16.

Normally, the two elements are secured by providing spot-welds alternately along two lines lengthwise of the web 22 on each side of its center axis. Spot welds 31 of this type are shown on the web 22 seen in plan view in FIGURE 8. The generally U-shaped opening 32 is tapered to provide a tapered tongue 33 disposed between the two rows of spot welds 31. By this configuration, the entire tongue 33 is maintained apart from the spot welds 31. Inadvertent welding of the tongue is avoided.

The length of the tongues of this invention may be varied to suit the particular building needs. An elongated tongue element 34 is shown in FIGURE 8 as an example.

As previously mentioned, frequently the undersurface of cellular floors is sprayed with a coating material after installation. By bending various tongues downwardly, regardless of whether they are employed to support depending structure, the bent tongues provide an anchoring surface for such sprayed coatings.

It is possible to improve the anchoring features of this invention by stringing wires or rods between adjacent, depending tongue elements of cellular floors. Referring to FIGURE 9, a sectional view of a cellular floor is presented, taken along the line A—A of FIGURE 2. The cellular floor has an upper element 15 and a lower element 16. The upper element 15 has channels 17 and webs 21. The lower element 16 has channels 20 and webs 22. The webs 21 and 22 are secured by means of spot welds 40. Depending tongue elements 41 according to this invention are provided out of the web 22. A heavy wire 42 is extended between the tongue elements 41. The wire 42 preferably is passed through apertures in the tongue elements 41. Where apertures are not provided in the tongue elements 41, the heavy wire 42 may be secured by wrapping and bending around the tongue elements 41.

FIGURE 10 presents a cross-sectional view of a cellular floor taken along the line B—B of FIGURE 2. Depending tongue elements 43 in FIGURE 10 are strung with a heavy wire 44 extending across the lower channels 20. The latticing provided by stringing wires or rods through depending tongue elements provides a secure anchoring means for any sprayed coating which may be applied to the undersurface of a cellular floor.

A further alternative anchoring technique is illustrated in FIGURE 11, which is a cross-sectional view of a cellular floor taken along the line A—A of FIGURE 2. The upper element 15 is secured to the lower element 16 by means of spot welds 40. Depending tongue elements 45 extending out of the web 22 may be bent to provide a flange portion 46 to increase their anchoring effectiveness. Alternatively, the depending tongue elements may be axially twisted as shown in the tongue element 45' to increase anchoring effectiveness.

Strength tests of tongue elements according to the present invention have demonstrated that they will support tensile loads exceeding the maximum floor load carrying limits of the flooring. Moreover, the tongue elements do not fail under tensile stress, but instead fail in shear. That is, the tongue elements tend to be torn out of the plane of the web along the extensions of the parallel openings which define the tongue. The shear strength of the tongue elements may be increased as shown in FIGURE 12. A web portion 48 has a U-shaped opening 49 defining a tongue element 50. The U-shaped opening 49 is enlarged at each of its ends to provide openings 51 of rounded configuration. The shear stress concentration at the open ends of the U-shaped opening 49 are avoided by distributing the shear stresses around the periphery of the rounded openings 51.

By maintaining the tongues of this invention substantially parallel to the web, until the cellular floor sections are installed in a building, the desirable stacking properties inherent in cellular flooring is retained. The present supporting means, furthermore, does not require holes drilled through webs of both upper and lower elements

5

6

of the cellular floor. Thus, concrete poured over the top of the imperforate cellular floor is completely confined. The safety hazards inherent in holes extending entirely through the flooring are avoided.

According to the provisions of the patent statutes, I have explained the principle, preferred construction, and mode of operation of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. In a sectional cellular floor comprising an upper element and a correlative lower element secured thereto, at least one of said elements having lengthwise, parallel channels forming enclosed cells with the other element, the improvement in said lower element comprising a plurality of generally U-shaped openings each defining a tongue adapted to be bent downwardly, and means carried by said tongue for receiving depending supporting members, said generally U-shaped openings being disposed in a portion of said lower element contiguous with said upper element.

2. The improvement of claim 1 wherein said tongue at its tip is curved downwardly.

3. The improvement of claim 1 wherein said tongue is disposed entirely beneath but substantially parallel to the upper surface of said lower element.

4. The improvement of claim 1 wherein an aperture is

provided through said tongue for receiving depending supporting members.

5. In a sectional cellular floor comprising an upper element and a correlative lower element secured thereto, at least one of said elements having lengthwise, parallel channels forming enclosed cells with the other element, and securing means comprising a plurality of spot welds alternately disposed in two rows between and parallel to said lengthwise, parallel channels for securing contiguous portions of said elements, the improvement in said lower element comprising a plurality of generally U-shaped openings having tapered sides each defining a tapered tongue axially parallel to said rows and disposed substantially entirely between said rows, said tongue being adapted to be bent downwardly, and means carried by said tongue for receiving depending supporting members.

References Cited in the file of this patent

UNITED STATES PATENTS

904,856	Escher	Nov. 24, 1908
920,563	Goho	May 4, 1909
1,073,906	Kahn	Sept. 23, 1913
1,952,449	Marks	Mar. 27, 1934
2,235,883	John	Mar. 25, 1941
2,303,544	Goss	Dec. 1, 1942
2,631,809	Jacobson	Mar. 17, 1953

FOREIGN PATENTS

480,452	Canada	Jan. 22, 1952
---------	--------	---------------