

Nov. 17, 1959

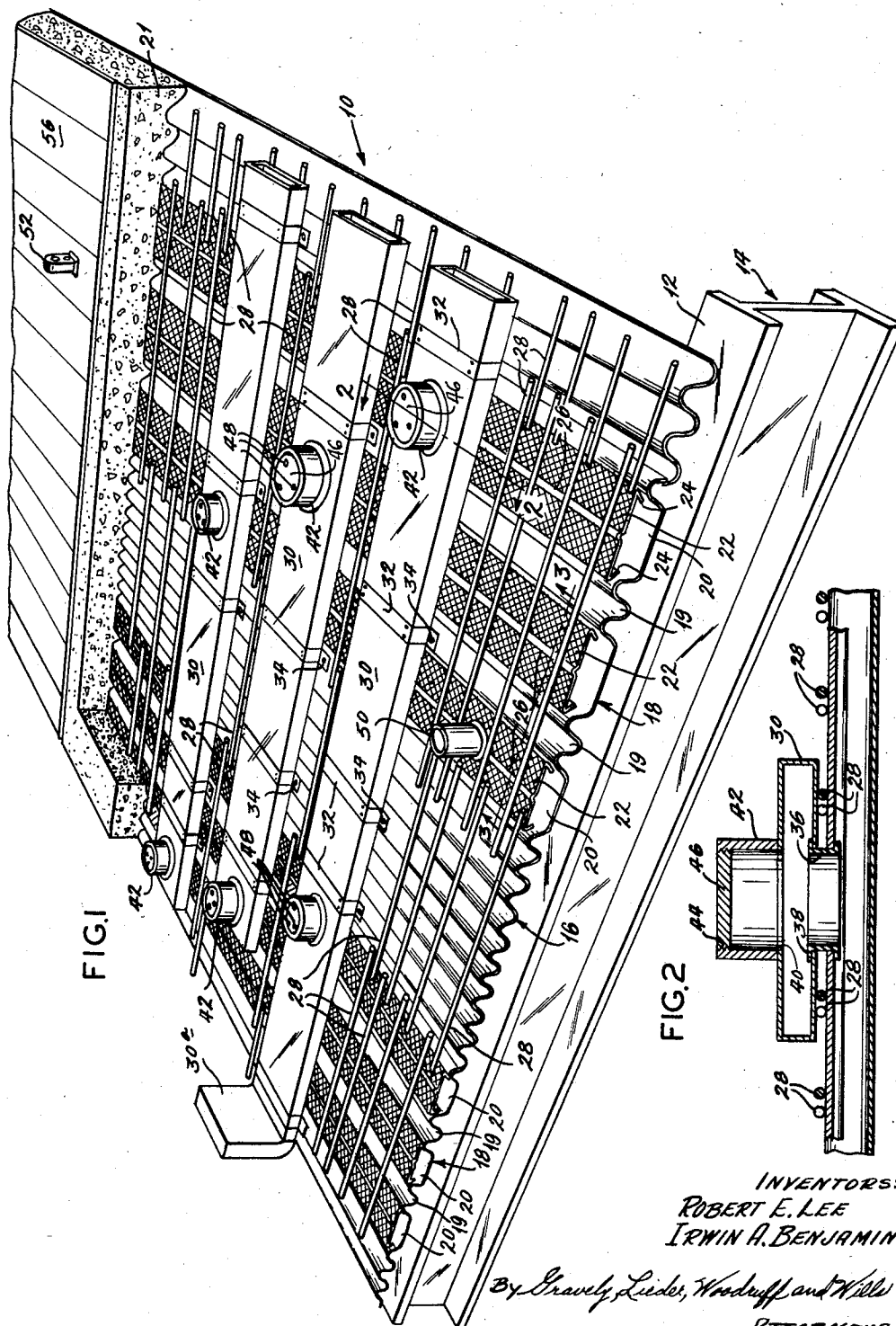
R. E. LEE ET AL

2,912,848

FLOOR STRUCTURE HAVING ELECTRICAL CONDUITS

Filed Dec. 17, 1956

2 Sheets-Sheet 1



Nov. 17, 1959

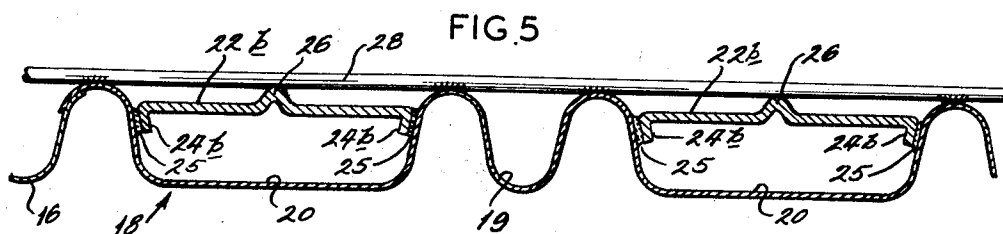
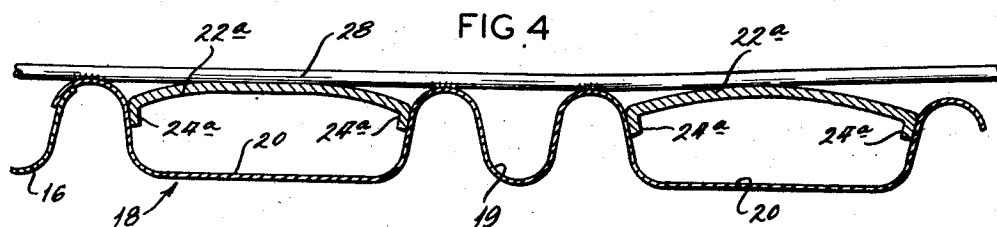
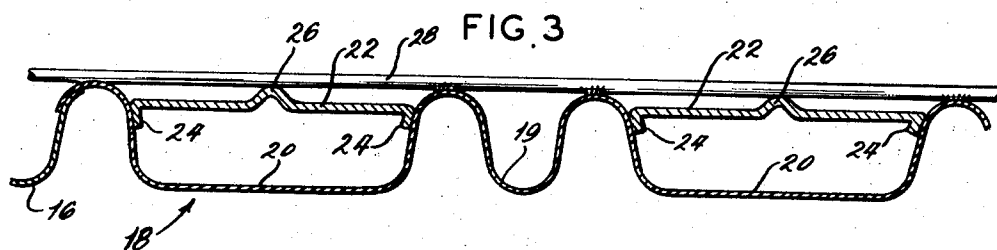
R. E. LEE ET AL

2,912,848

FLOOR STRUCTURE HAVING ELECTRICAL CONDUITS

Filed Dec. 17, 1956

2 Sheets-Sheet 2



INVENTORS:
ROBERT E. LEE
IRWIN A. BENJAMIN

By *Gravely, Lieder, Woodruff and Wille*
ATTORNEYS.

1

2,912,848

FLOOR STRUCTURE HAVING ELECTRICAL CONDUITS

Robert E. Lee, St. Johns, and Irwin A. Benjamin, University City, Mo., assignors to Granite City Steel Company, Granite City, Ill., a corporation of Delaware

Application December 17, 1956, Serial No. 628,606

6 Claims. (Cl. 72-16)

This invention relates in general to floor structures and to composite floor and ceiling structures for buildings. More particularly this invention relates to the aforementioned structures in which novel means are provided for the under floor piping of electrical wiring.

The general idea of providing passages in a floor structure for piping electrical wiring has been known heretofore. However, the known structures have not provided continuous interconnected wire passages extending the length and breadth of the floor structure which passages are constructed so that when a cementitious floor covering is poured, the members forming the passages reinforce the structure and yet provide means for ready access to the wiring system.

It is an object of this invention to provide a floor structure having means therein forming interconnected wiring passages extending the length and breadth thereof and acting to combine with the concrete in the floor structure as reinforcement so as to result in the formation of a reinforced concrete assembly.

Another object is to provide a floor structure having interconnected accessible underfloor wire passages running the length and breadth thereof which makes use of the passage forming members to reinforce the structure and which is simple to erect.

It is an object of this invention to provide in a reinforced concrete floor structure means for housing and stringing electric service lines, and the like, and to arrange such means so that it does not detract from the load bearing characteristics of the floor structure, but becomes a useful part of the whole.

Another object of the invention is to provide a reinforced concrete floor structure in which the reinforcement includes corrugated sheet members, some of which are formed with corrugations that are capped to keep out the concrete during the plastic condition thereof, and which are provided with means for access into the spaces defined by the capped corrugations.

A further object of the invention is to provide a structural floor system for easy electrification in which structural corrugated sheets modified with electric conduit channels are used in cooperating arrangements with corrugated sheets of a regular or unmodified character.

Still another object of this invention is to provide a floor structure completely sealed by a cementitious layer which provides maximum flexibility and accessibility to a hidden under-floor electrical system.

A floor structure constructed according to the present invention comprises a corrugated sheet having temperature wires attached thereto and extending transversely across the sheet corrugations, the sheet spanning and supported on spaced support members, members bridging selected corrugations in the corrugated sheet being sealed to the associated corrugation walls and forming enclosed passages therewith, accessible duct members extending crosswise over the bridging members and the sheet corrugations and communicating with the enclosed passages at selected intersections, and a covering layer

2

of cementitious flooring material poured over the corrugated sheet and around the wires, said wires structurally uniting the cementitious material to the corrugated sheet.

Other objects and advantages of the present invention will become apparent after considering the following detailed specification in conjunction with the accompanying drawings.

In the drawings:

Fig. 1 is a fragmentary perspective view, partly cut away to expose the details of construction, showing an electrified floor structure constructed according to the present invention,

Fig. 2 is a fragmentary cross-sectional view taken along line 2-2 in Fig. 1,

Fig. 3 is a fragmentary cross-sectional view taken along line 3-3 in Fig. 1,

Fig. 4 is a fragmentary cross-sectional view similar to Fig. 3 showing a modified form of the assembly shown therein, and

Fig. 5 is a fragmentary cross-sectional view similar to Fig. 3 showing another modified form of the assembly shown therein.

Referring to the drawings in detail, the number 10 refers generally to a floor structure constructed according to the present invention. The structure 10 is designed to provide interconnected under-floor passages for accommodating the electrical and telephone wiring in a building and to permit easy access to the electrical or telephone wiring without having to tear up or otherwise damage portions of the floor.

The structure 10 is shown supported on the upper flanged portions 12 of the I beams 14 although any other support members capable of carrying the live and dead weight of the floor structure 10 can be used. Only part of a complete floor structure 10 is shown in Fig. 1 to illustrate the invention. For clarity, the portion shown has been cut off in the drawing at the center of the I beam 14 and it is anticipated that other similar portions extend therefrom to succeeding I beams 14.

The floor structure 10 includes overlapping corrugated sheets 16 and 18. The sheets 16 are constructed of high strength sheet steel and have uniform corrugations, and the sheets 18 need not be constructed of high strength steel and have some uniform corrugations 19 and some wide flat-bottom corrugations or channels 20. The sheets 16 and 18 are arranged with their adjacent edge corrugations overlapping and with their ends resting on the I beams 14 as shown in Fig. 1. The ends of the sheets 16 and 18 are preferably welded to the flanges 12 of the I beams 14 to prevent shifting or warping of the sheets and to prevent lateral displacement of the supporting beams 14. Also, if the sheets 16 and 18 are fastened down, leakage of poured flooring material 21 therethrough (which will be described later), is kept at a minimum.

In erecting the structure, the wide flat-bottom corrugations 20 are capped with closure members 22, 22a and 22b (Figs. 1, 3, 4, and 5) which extend longitudinally therealong. The closure members 22 and 22b are flat on top and are provided with upwardly projecting longitudinal beads 26 (Figs. 1, 3 and 5) and the closure members 22a (Fig. 4) are bowed upwardly. All of the closure members 22, 22a and 22b are further provided with downwardly and inwardly flanged edge portions 24, 24a and 24b respectively that make contact with the sides of the associated corrugations 20.

When the closure members 22 and 22b are positioned in the corrugations 20, the flanged edge portions 24 and 24b thereof rest against the sides of the corrugations 20 and the beads 26 project above the tops of the corrugations in sheets 18. Temperature reinforcing wires 28 are

3

then welded or otherwise fastened transversely across the tops of the corrugations on sheets 16 and 18. The main reason for welding the wires 28 to the sheets 16 and 18 is to force the sheets 16 and 18 to coact structurally with the cementitious or poured floor layer 21. In addition, the wires 28 press down on the beads 26 and hold the flanged edge portions 24 and 24b of the closure members 22 and 22b against the sides of the corrugations 20 (Figs. 3 and 5). A good seal between the flanges 24 and 24b and the sides of the capped corrugations 20 prevents leakage of the cementitious material 21 into the corrugations 20. Fig. 5 further shows the use of adhesive means 25 applied between the flanged portions 24b and the sides of the corrugations 20. The adhesive means can also be used with the closure members 22a and can be employed to hold the closure members 22, 22a and 22b in place without any spring loading arrangement such as provided by the wires 28.

The closure members 22a (Fig. 4) operate similarly to closure members 22 and 22b except that the whole top surfaces thereof are bowed upwardly instead of being beaded. Pressure is applied on the closure members 22a when the wires 28 are installed to press the flanged edge portions 24a thereof into sealing engagement with the sides of the corrugations 20. The right end of the wire 28 (Fig. 4) is shown before it is welded to the sheet 18 to illustrate that downward pressure is applied on the closure member 22a by the wires 28 when the wires 28 are welded to the sheets 18. If desired, a seal could also be applied between the flanged portions 24a and the sides of the corrugations 20.

Other forms for the closure members 22, 22a and 22b can also be employed without departing from the spirit and scope of this invention. For example, resilient gaskets can be substituted for the flanged edge portions 24, 24a or 24b, or the flanged portions 24, 24a, or 24b can be turned upwardly instead of downwardly and conformed to the contour of the sides of the corrugations 20, or the closure members 22, 22a or 22b can be welded along their flanged edge portions 24, 24a, or 24b to the sides of the corrugations 20, or still further, tape or other sealing devices can be used along the edges of any of the closure members 22, 22a and 22b to seal them to the adjacent sides of the corrugations 20. The important thing is to make a good seal between the closure members 22, 22a and 22b and the sides of the corrugations 20 so that the liquid or fluid portions of poured floor material 21 cannot seep into the passages formed between the closure members 22, 22a and 22b and the corrugations 20 to obstruct or fill them up.

The wires 28 in addition to being welded to the tops of the sheet corrugations are overlapped end to end (Fig. 1) to provide for tying the cementitious material 21 to the sheets 16 and 18. The lapped ends of the wires 28 serve to provide anchorage and to transmit stresses between the sheets. Still further, the wires 28 prevent buckling and spreading of the corrugations and stiffen or strengthen the sheets 16 and 18.

By the arrangement described, the corrugated steel sheets 16 and 18 support the wet cementitious material 21, and the wires 28 which extend transversely across the tops of the corrugations tie the cementitious material 21 and corrugated sheets 16 and 18 together against separation and against relative slippage therebetween. The steel sheets 16 and 18 also provide the desired primary tensile reinforcement for the cementitious slab, thus dispensing with and saving the cost of separate conventional tensile reinforcement, and the over-lapped side marginal portions of the steel sheets 16 and 18 prevent leakage of the cementitious material 21 to the underside of the sheets.

Both the size and spacing of the wires 28 may vary even in the same structure. The dimensions and spacings of the wires 28 should be chosen to provide for the loads required to make the concrete and the steel coact as a uni-

4

fied structure. Inasmuch as these stresses are greatest near the supports, the wires 28 normally will be spaced closer together near the ends of the sheets 16 and 18.

The use of corrugated steel sheets 16 and 18 as tensile reinforcement for the cementitious material 21 eliminates the thickness and volume of the cementitious material ordinarily required below conventional metal reinforcement.

Usually the closure members 22, 22a or 22b and the rods 28 are installed on the sheets 16 and 18 in a manufacturing process. Then after the sheets 16 and 18 are installed in a building, header ducts 30 are mounted crosswise of the corrugations therein. The header ducts 30 are shown having rectangular cross sections (Fig. 2) and are fastened to the sheets 16 and 18 by bands 32 and screws, or by welding material 34. The end of one of the ducts 30 has an up-turned portion 30a which carries wiring from the floor into a panel box.

At selected intersections between the header ducts 30 and the passages formed by the closure members 22 and the corrugations 20, openings 36 are made which provide communication therebetween. The openings 36 illustrated in Fig. 2, are provided with annular flanged members 38 which hold the associated ducts 30 and the closure members 22 together and in alignment.

Access openings 40 (Fig. 2) are provided through the upper surfaces of the ducts 30 above the openings 36 and junction boxes 42 are mounted thereon. The junction boxes 42 are provided with threads 44 and cooperating access covers 46 which have suitable wrench holes 48. Openings may be made in the closure members 22, 22a and 22b wherever it is desired to have a surface outlet tube 50 for an outlet receptacle or telephone jack 52.

The cementitious flooring material 21, such as concrete, is poured over the assembled structure. The cementitious material 21 unites the sheets 16 and 18 with the wires 28 to complete the floor structure. The wires 28 being attached to the tops of the sheet corrugations and being surrounded by cementitious material 21 provide structural action between the sheets 16 and 18 and material 21 as previously described. Furthermore, by providing the corrugations 19 between the capped corrugations 20, it is possible to retain structural strength which is reduced in the area of the channels 20.

The cementitious layer 21 is made level with or slightly above the upper ends of the junction boxes 42 and the outlet tubes 50, and if desired, a wear covering layer 56 of wood, tile, etc., can be installed to complete the structure.

It is now apparent that there has been provided a floor structure of simple construction, which is simple to erect, and yet which provides a network of accessible passages and ducts making for complete flexibility of a building's electrical wiring system. Many changes, alterations, and modifications of the structure 10 shown and described in this specification will be readily apparent to those skilled in the art. All such changes, alterations, and modifications which do not depart from the spirit and scope of the present invention are deemed covered by this invention, which is limited only by the claims which follow.

What we claim is:

1. In a building floor structure supported between building supports by a corrugated panel having spaced ridges and valleys with integral connecting portions extending therebetween, means capping a corrugation in said panel to form with the adjacent sides of the corrugation a passage therewith for electrical conduits, said capping means including an elongated closure member having marginal portions which engage the connecting panel portions adjacent a panel valley and a portion interconnecting said marginal portions, and reinforcing wires extending transversely across said panel and said closure member, said reinforcing wires being fixedly secured to the corrugation ridges and exerting downward pressure on the closure member against

5

the connecting portions of the panel, said interconnecting portion of the closure member extending above the corrugation ridges before the reinforcing wires are fixedly secured to the corrugation ridges.

2. In a building floor structure supported on building supports by a corrugated panel having opposed surfaces formed by spaced ridges and valleys with integral sloping portions extending therebetween, means capping a corrugation in said panel to form a passage therewith for electrical conduits, said capping means including an elongated closure member having marginal portions with sealing means attached thereto for engaging the sloping panel portions and said closure member also having an upwardly bowed portion interconnecting the marginal portions thereof, and reinforcing wires extending transversely across said panel and said closure member, said reinforcing wires being fixedly attached to the corrugation ridges and exerting downward pressure on the interconnecting bowed portion of the closure member whereby the marginal sealing means thereon are pressed into sealable engagement with the panel.

3. In a building floor structure supported by a corrugated panel having opposed surfaces formed by spaced ridges and valleys with integral sloping portions extending therebetween, means capping a corrugation valley in said panel to form a passage therewith for electrical conduits, said capping means including an elongated closure member having marginal portions with sealing means attached thereto for engaging the sloping panel portions and having an upwardly extending portion interconnecting the marginal portions that extends above the corrugation ridges, reinforcing wires extending transversely across said panel and said closure member, said reinforcing wires being fixedly attached to the corrugation ridges and exerting downward pressure on the interconnecting portion of the closure member whereby said marginal sealing means are pressed into sealing engagement with the panel, and a layer of cementitious material poured over said panel and structurally uniting with said panel through the reinforcing wires.

4. In a building floor structure supported on spaced building supports by a corrugated panel having opposed surfaces formed by spaced ridges and valleys with integral sloping portions extending therebetween, means capping a corrugation valley in said panel to form a passage therewith for electrical conduits, said capping means including an elongated closure member having marginal portions which engage the sloping panel portions, and an integral interconnecting surface extending between said marginal portions, said last named surface having a longitudinally extending beaded rib thereon which extends above the corrugation ridges, and reinforcing wires extending transversely across said panel and closure member being fixedly attached to the corrugation ridges so as to exert downward pressure on the longitudinally extending bead of the closure member whereby said mar-

6

ginal portions thereof press against the panel to sealably engage said closure member with the adjacent sloping portions of the panel.

5. In a floor structure supported between spaced building supports on corrugated sheets arranged to overlap and bridge between the spaced building supports, said corrugated sheets having surfaces formed by parallel ridges and valleys and sloping connecting surfaces therebetween; means capping a corrugation valley in one of said sheets to form a passageway in the floor structure for electrical conduits, said capping means including a closure member having spaced marginal flanges which engage the sloping surfaces of a corrugation valley and a connecting surface formed integral with said flanges and spanning said corrugation valley, said connecting surface having a portion thereof that extends above the corrugation ridges on the sheet, and a plurality of spaced reinforcing wires extending transversely across the sheet corrugations and said closure member, said wires being fixedly attached to the ridges of the sheet corrugations so as to apply downward pressure on the closure member through engagement with the upwardly extending portion thereof to seal said member to the sheet.

6. In a floor structure supported between spaced building supports on corrugated sheets arranged to overlap and bridge the space between the building supports, said sheets having surface corrugations formed by parallel ridges and valleys and sloping connecting surfaces therebetween; means capping a corrugation valley in one of said sheets to form a passageway in the floor structure for electrical conduit, said capping means including an elongated closure member having spaced marginal flanges which engage the adjacent sloping surfaces of a corrugation valley and having an interconnected closure surface therebetween which spans the corrugation valley and has a portion thereof that extends above the corrugation ridges on the sheet, a plurality of spaced overlapping and transversely extending wires fixedly attached to the ridges of the sheet corrugations, said wires applying downward pressure on the upwardly extending portion of the closure surface to press the closure member against the sheet and seal therebetween, and a layer of cementitious material poured over the sheet structurally uniting with the sheet through the reinforcing wires.

References Cited in the file of this patent

UNITED STATES PATENTS

602,274	Sill	Apr. 12, 1898
1,872,984	Land	Aug. 23, 1932
2,090,483	Mendez	Aug. 17, 1937
2,445,197	Wiesmann	July 13, 1948

FOREIGN PATENTS

2,494	Austria	July 1, 1900
332,331	Great Britain	July 24, 1930
514,195	Canada	June 28, 1955
557,588	Great Britain	Nov. 26, 1943