United States Patent

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[54] **STRUCTURAL BEAM FOR SUPPORTING CONCRETE FLOORING**
4 Claims, 9 Drawing Figs.

[52] **U.S. Cl.** 52/333, 52/334, 52/338, 52/687
[51] **Int. Cl.** E04b 5/40
[50] **Field of Search** ..... 52/326, 327, 332—336, 687, 338

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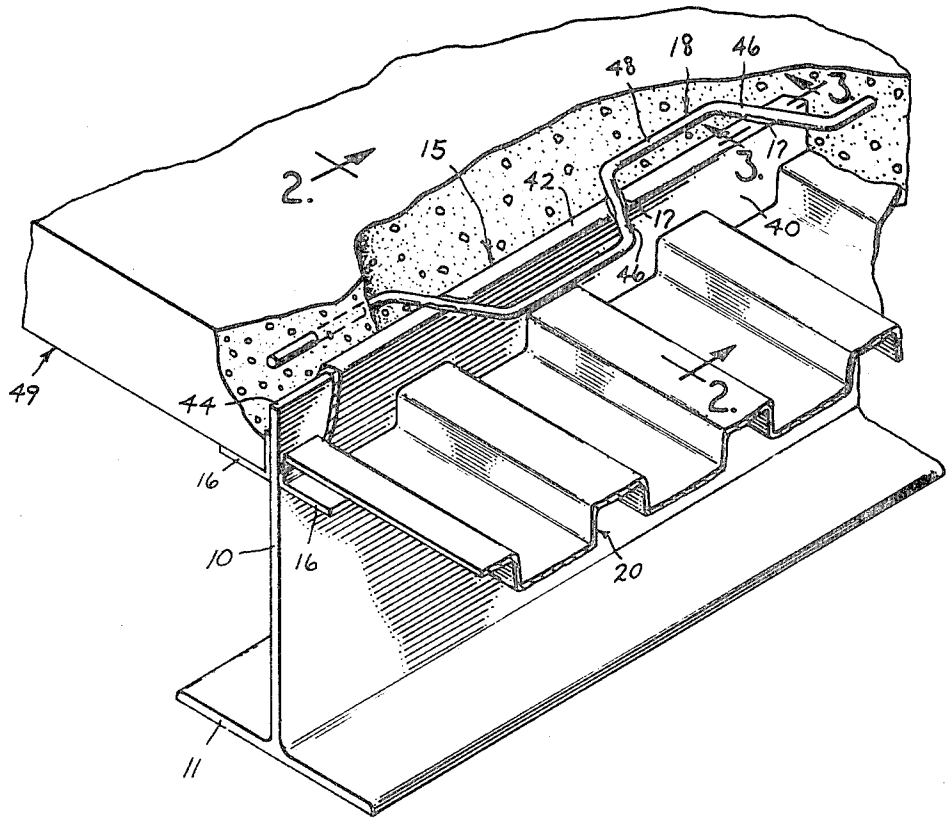
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ABSTRACT: A structural beam for supporting concrete flooring including a base part and an integral web extending upwardly from said base part. An inverted U-shaped cap is mounted over the upper margin of the web. The U-shaped cap has a plurality of longitudinally spaced transverse slots in its upper portion and includes out-turned flanges extending oppositely and laterally from the web. The flanges of the cap are adapted to support deck plates which extend between adjacent parallel beams and over which the concrete flooring is to be poured.



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SHEET 1 OF 2

Fig. 1

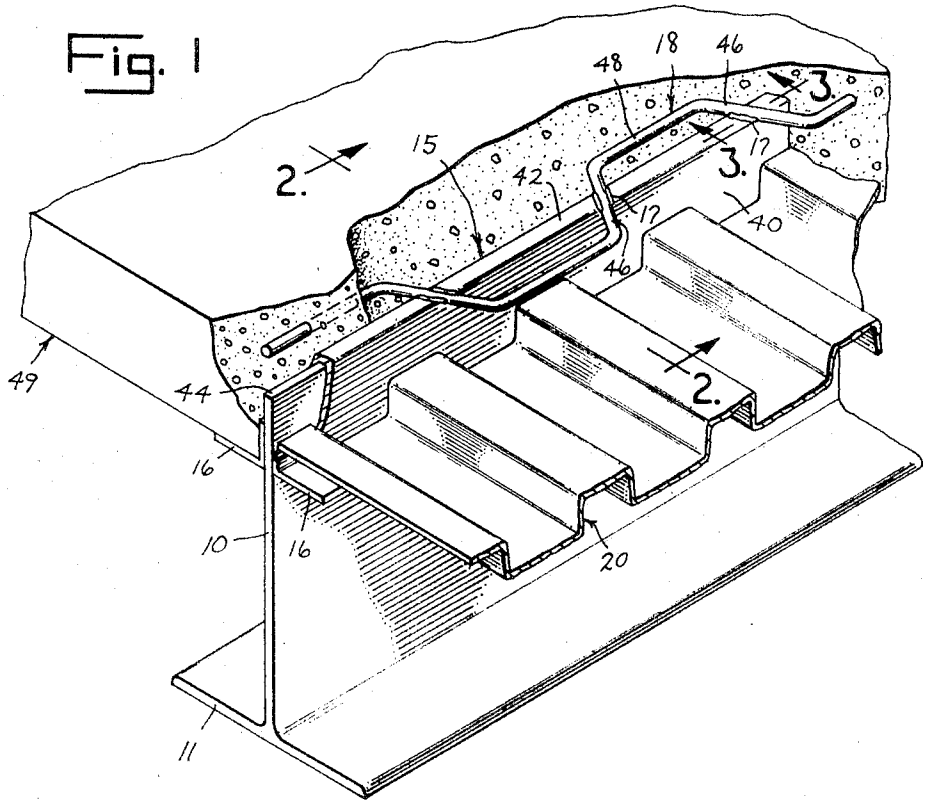


Fig. 2

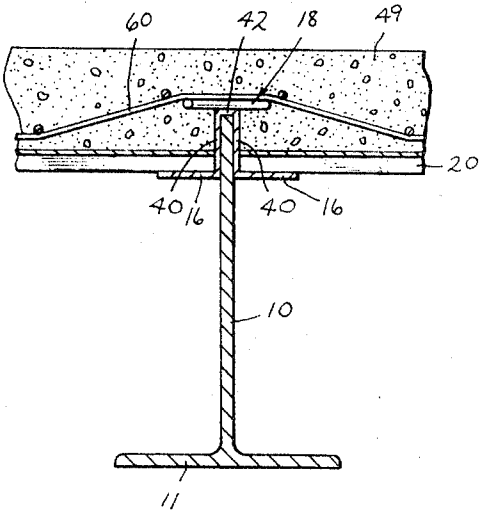
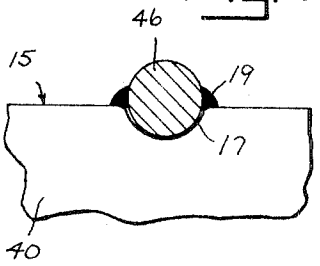


Fig. 3



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Fig. 4

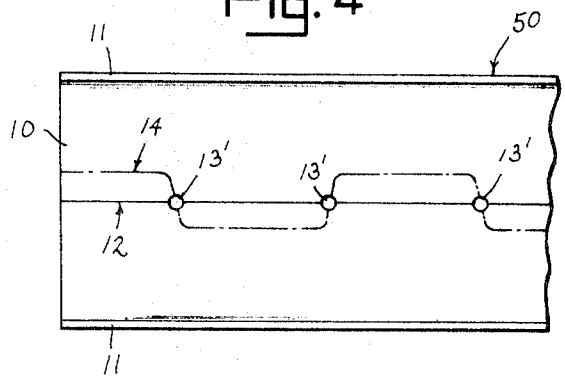


Fig. 5

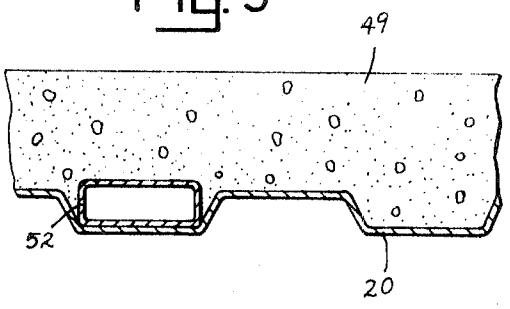


Fig. 6

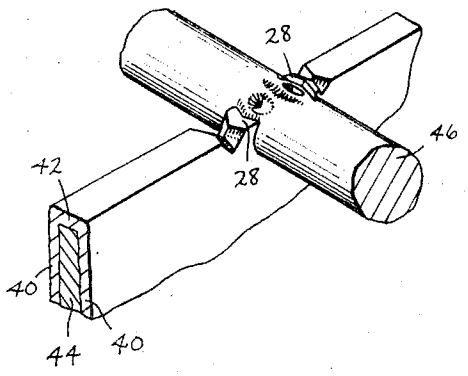


Fig. 7

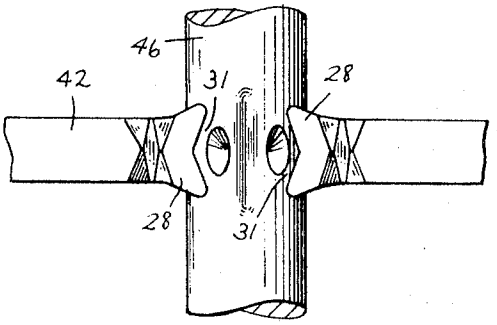


Fig. 8

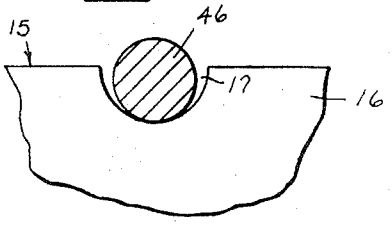
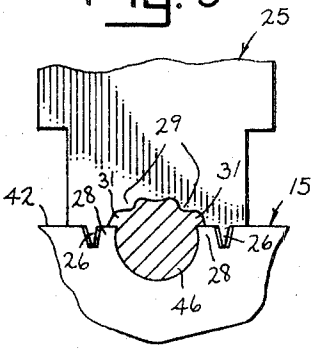


Fig. 9



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STRUCTURAL BEAM FOR SUPPORTING CONCRETE FLOORING

SUMMARY OF THE INVENTION

This invention relates to an improved structural beam for supporting concrete flooring. The beam includes a base part and an integral web extending upwardly from said base part. An inverted U-shaped cap is mounted over the upper margin of said web and extends substantially the length of the beam. Said cap has a plurality of longitudinally spaced transverse slots in its upper portion and includes out-turned flanges extending oppositely and laterally from said web. The flanges of said cap are adapted to carry concrete-supporting deck plates which extend between adjacent parallel beams.

The structural beam of this invention minimizes the weight per unit length of beam and also minimizes the time required to assemble the beam in preparation for the pouring of concrete over the deck plates. Further, this beam consists of component parts which are so correlated that a structurally strong support is provided having maximum weight-bearing strength per pound of beam weight.

Accordingly, it is an object of this invention to provide a structural beam for supporting concrete flooring which is of maximum weight-bearing strength per unit weight of the beam.

It is another object of this invention to provide a structural beam for supporting concrete flooring which can be rapidly assembled and setup with concrete reinforcing means at the construction site in preparation for the pouring of concrete flooring.

It is another object of this invention to provide a structural beam which serves as a composite support member with the concrete flooring and which is of simplified and strong construction.

Other objects of this invention will become apparent upon a reading of the invention's description.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary perspective view of one construction of the structural beam of this invention showing the supported concrete flooring with parts broken away.

FIG. 2 is a cross-sectional view of the structural beam and concrete flooring taken along line 2–2 of FIG. 1.

FIG. 3 is a detailed sectional view taken along line 3–3 of FIG. 1 showing one means of joining component parts of the beam.

FIG. 4 is a fragmentary side elevation of an I-beam illustrating a method of forming the structural beam shown in FIG. 1.

FIG. 5 is a sectional view of the concrete flooring and support deck showing a service conduit positioned therein.

FIG. 6 is a fragmentary detail perspective view showing another means of joining component parts of the beam.

FIG. 7 is a top plan view of the joint shown in FIG. 6.

FIG. 8 is a detail view of the parts forming the joint of FIG. 6 prior to assembly thereof.

FIG. 9 is a detail view illustrating the manner by which the joint of FIG. 6 is formed.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The preferred embodiments illustrated are not intended to be exhaustive or to limit the invention to the precise forms disclosed. They are chosen and described in order to best explain the principles of the invention and their application and practical use to thereby enable others skilled in the art to best utilize the invention.

The structural beam illustrated in FIGS. 1 to 3 includes an upstanding web 10 and an integral horizontal base flange or part 11 at its lower margin. Web 10 preferably has a series of spaced grooves or inset portions (not shown) in its upper margin 44. An inverted U-shaped cap 15 having spaced sidewalls 40 which are interconnected by a bend 42 is mounted upon web 10 with its sidewalls 40 receiving the upper margin of web 10 therebetween and with its bend 42 abutting the upper edge of web 10. The bend 42 and adjacent portions of walls 40 of cap 15 have a series of spaced slots 17 formed therein. Each slot 17 registers with a groove in the upper margin 44 of web 10. Cap 15 includes out-turned substantially horizontal flanges 16 which are each formed at the lower margin sidewalls 40. Flanges 16 of cap 15 preferably extend oppositely and laterally from web 10. Cap 15 is preferably fixedly secured to web 10 as by welding.

A multiple return bent or zigzag-shaped reinforcing rod 18 having spaced transverse runs 46 interconnected by longitudinal runs 48 extends lengthwise of web 10 with its runs 46 received within slots 17 of cap 15 and preferably within the registering grooves in web 10 as best shown in FIG. 1. The longitudinal runs 48 extend in substantially equal laterally spaced relation to and at opposite sides of the cap 15, and the runs 46 extend in a plane at an angle to and preferably perpendicular to the plane of web 10. Rod 18 may be secured to cap 15 by welds 19 illustrated in FIG. 3.

FIG. 6—9 illustrate an alternate swaged construction. Thus, to swage the portions of runs 46 of rod 18 received in slots 17 of cap 15, each slot 17 of cap 15 and registering groove of web 10 is of a dimension to receive therein a run 46 of rod 18 with clearance, as shown in FIG. 8. A swagging tool 25 is positioned to straddle the rod run 46 within each cap slot 17 and forced or hammered against cap 15 and the straddled portion of run 46 of rod 18. Tool 25 has spaced projections 26 which engage and are driven into the bend 42 of cap 15 at each side of slot 17 to form tabs 28 in cap 15 and deflect them to engage and clamp run 46 of rod 18, as shown in FIG. 9. Tool 25 also includes bosses 29 which are located between and inset from the tips of projections 26 and which deform or recess said run to form laterally spaced and oppositely extending ears 31 in rod 18. Each ear 31 of rod 18 preferably overlaps and interlockingly engages a tab 28 in cap 15.

To construct the structural beam of this invention, a commercially available I-beam 50, shown in FIG. 4, having spaced parallel flanges 11 interconnected by a web 10 may be utilized. A series of longitudinally spaced apertures 13′ are preferably formed in web 10. Each aperture 13′ is preferably equally spaced from flanges 11 of the I-beam 50. Apertures 13′ may be formed by any convenient means, such as punching or drilling. I-beam 50 is then split longitudinally and centrally of web 10 by any convenient means, such as a cutting torch or saw to form two T-sections. The split line of beam 50 along web 10 is preferably straight and bisects apertures 13′ therein as shown by solid line 12 in FIG. 4. As an alternative, the split line may be of sinuous or undulating configuration as shown by broken line 14 in FIG. 4. Once the I-beam 50 is split, the cap 15 is mounted over the web 10 of a T-section with its slots 17 in registry with grooves in the web formed from bisected apertures 13′. Cap 15 is then preferably welded to web 10. Return bent reinforcing member 18 is then positioned atop cap 15 with portions of its runs 46 received within slots 17 of the cap. The engaging portions of each cap slot 17 and run 46 of rod 18 are then welded or swaged together, as heretofore described.

The assembled structural beams are positioned parallel to and laterally spaced from each other. A deck plate 20, which may be of corrugated form as shown in FIGS. 1 and 2, is positioned between webs 10 of adjacent beams and is spaced above beam flanges 11 by supporting engagement of its longitudinal margins with flanges 16 of adjacent beams. Concrete 49 is poured over and supported by the plates to a depth sufficient to cover the bend 42 of each cap 15 and the attached reinforcing rod 18 to desired extent. Flanges 16 of each cap 15 and the supporting web 10 are of sufficient strength to support deck plates 20 and the wet concrete 49. If desired, additional reinforcing wire 60 may be laid over the deck plates 20 and support beams prior to pouring of the concrete, such reinforcing being located at any selected elevation and preferably being supported by the beams and the reinforcing rods 18.

Should service ducts be required to house wiring or conduits, tubular members **52** may be laid upon deck plates **20** between adjacent parallel beams, as shown in FIG. **5**. Registering apertures (not shown) are suitably formed in the upper margin of web **10** and sidewalls **40** of cap **15** so as to permit tubular members **52** to extend through the supporting beams. When utilizing I-beams **50** split along a sinuous split line **14** as shown in FIG. **4**, the upper margin of web **10** will contain notches which permit passage therethrough of tubular members **52**, assuming that registering apertures are formed in the cap **15**.

What I claim is:

1. In combination in a floor structure, a plurality of spaced parallel beams each having a vertical elongated web and a laterally projecting base, an elongated member of inverted U-shape in cross section fitting upon the upper margin of said web and having opposite laterally projecting flanges spaced above said base, a longitudinal reinforcing bar of zigzag shape having spaced transverse portions secured to the upper part of said elongated member spaced above said flanges, transverse reinforcing bars supported by and extending between said beams, plates extending between said beams and supported by said flanges, and a monolithic concrete slab supported by said plates and imbedding said longitudinal and transverse reinforcing bars and the upper part of said elongated member.

2. the combination defined in claim **1**, wherein an elongated member and a longitudinal reinforcing bar are fixedly secured to each beam.

3. The combination defined in claim **1**, wherein the upper portions of each elongated member and beam web have longitudinally spaced registering recesses in which transverse portions of said longitudinal reinforcing bar seat and are welded.

4. The combination defined in claim **1**, wherein the upper portions of each elongated member and beam web have longitudinally spaced registering recesses in which transverse portions of said longitudinal reinforcing bar seat, said elongated member and web at opposite sides of said recesses including swaged parts securing said transverse portions of said longitudinal reinforcing bar.