United States Patent [19]

Krieger

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[54] **STRUCTURAL ELEMENT OF REINFORCED CONCRETE**

[76] Inventor: **Heinrich Krieger**, am Bernbaum 57, Wiesbaden-Sonnenberg, Germany

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[52] **U.S. Cl.** **219/213,** 219/345

[51] **Int. Cl.** **H05b 1/00**

[58] **Field of Search** 219/213, 345

[56] **References Cited**

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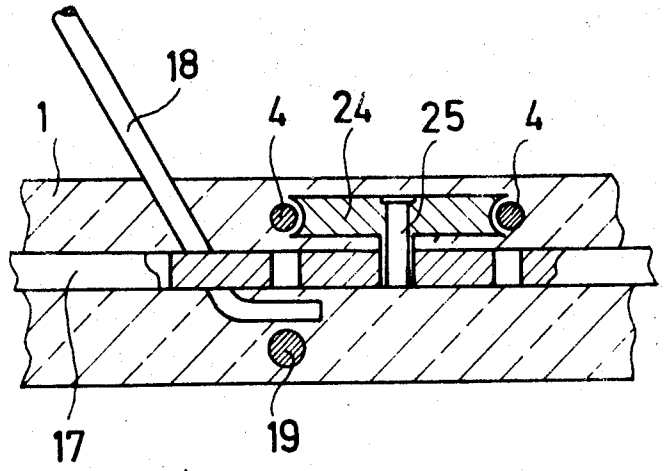
Primary Examiner—C. L. Albritton

Attorney, Agent, or Firm—Kurt Kelman

[57] **ABSTRACT**

A heating cable is embedded in a reinforced concrete slab in serpentine formation, adjacent loops of the cable having bent over portions at opposite edge portions of the slab. Mounting supports are embedded in the slab and hold the cable in the loop formation, and guide members are affixed to respective ones of the mounting supports at the opposite edge portions for guiding the bent-over loop portions and for tensioning the heating conductor.

5 Claims, 6 Drawing Figures



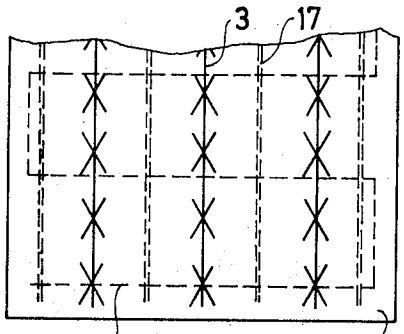


Fig. 1

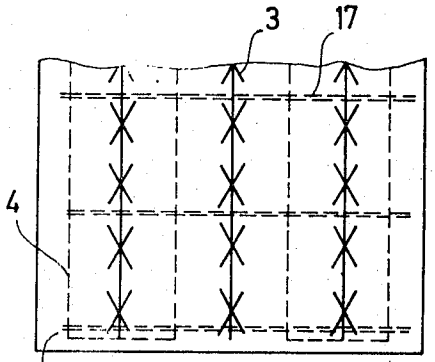


Fig. 2

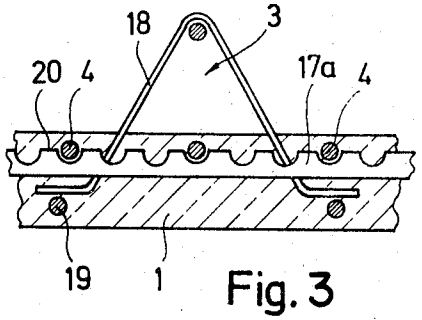


Fig. 3

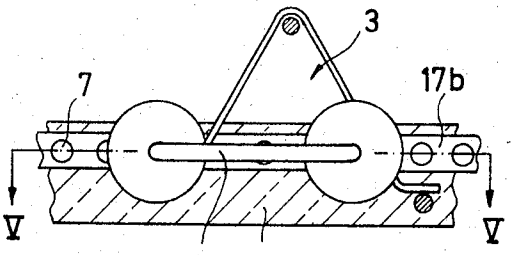


Fig. 4

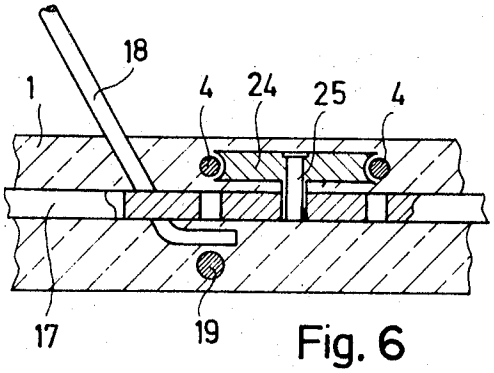


Fig. 6

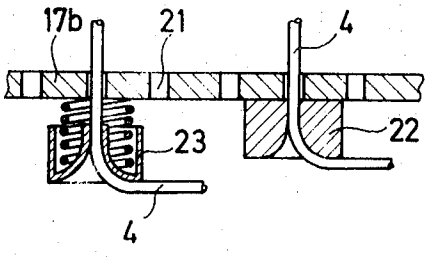


Fig. 5

STRUCTURAL ELEMENT OF REINFORCED CONCRETE

The present invention relates to structural elements of reinforced concrete, and more particularly to ceiling plates containing electrical heating conductors.

In ceiling plates of this type, electrical heating cables have been manually clamped to the plates and had to be protected by a special concrete layer to avoid damage to the cables in subsequent building operations. This is an exceedingly time-consuming procedure requiring considerable labor. It also subjects the cables to possible damage at the building site.

It is the primary object of this invention to avoid the above disadvantages and to provide structural elements which may be mounted in a minimum of time while keeping the heating conductors protected from weather or adverse working conditions while maintaining them in place according to plan and without in any way being limited to specific heating capacities.

The above and other objects are accomplished in accordance with the invention with mounting supports for a plurality of electrical heating conductors. The mounting supports extend at least partially into, and engage, the concrete of the structural element, and the heating conductors are at least partially covered by the concrete.

With this arrangement, the heating conductors are affixed to the mounting supports at the time of installation and the mounting supports with the heating conductors are then pressed into, or embedded in, the concrete of the structural element before it is set so that the mounting supports will be fixed on the structural element when the concrete has set and the heating conductors will be completely or partially covered by the concrete which thus protects the same. The mounting supports may be concrete bars, net-like or comb-like structures, or carrier rods.

The above and other objects, advantages and features of the present invention will become more apparent from the following detailed description of now preferred embodiments thereof, taken in conjuction with the accompanying drawing wherein

FIGS. 1 and 2 are top views of portions of ceiling slabs with two modifications of heating conductor arrangements;

FIG. 3 is a cross section of a portion of a ceiling slab in the region of a mounting support carrier rod for the heating conductors;

FIG. 4 is a similar cross section in the region of guide members for the heating conductors;

FIG. 5 is a section along line XIV—XIV of FIG. 4; and

FIG. 6 is a cross section similar to that of FIG. 3 and showing another modification with guide rollers for the heating conductor.

Referring now to the drawing and first to FIGS. 1 and 2, a concrete ceiling slab 1 is shown to have anchored in the concrete, lattice girders 3, such reinforced concrete slabs being entirely conventional. Electrical heating conductor cables 4 are embedded in the concrete.

The heating conductor 4 is carried by carrier rods 17 extending parallel to the lattice girders 3 while the major length of the heating conductor extend perpendicularly to the lattice girders. In the slab 1 of FIG. 2, the positions of the heating conductor and carrier rods are reversed, i.e., the major length of the heating conductor extends parallel to the lattice girders while the mounting support rods 17 are perpendicular to the girders 3.

FIG. 3 illustrates a portion of ceiling slab 1 to show the details of the mounting. As shown, the carrier rods 17*a* for the heating conductor 4 have a series of notches 20 dimensioned to accommodate the conductor. The lattice girder 3 has two lower chords 19 connected to the upper chord by diagonally extending braces 18, as is conventional, and the carrier rods 17*a* are affixed to the girder braces in the lower region thereof so that the chords carrying the heating conductors are embedded in the concrete when the lattice girders are anchored thereinto. To avoid upward movement of the heating conductors out of the notches 20 during installation in the concrete, a matching rod with like notches may be placed over rod 17*a* to hold the conductors between the two rods.

As shown in FIGS. 4 and 5, the ends 17*b* of the carrier rods near the edges of the slab 1 have bores 21 to receive the heating conductor cables 4 and pass them perpendicularly through the carrier rod ends, after which they are guided at right angles to run along the edge of the slab, as illustrated in FIGS. 1 and 2. For purposes of guidance, guide members 22 are attached to the carrier rod ends 17*b* and project towards the slab edge, the guide members having arcuate guide channels or bores to maintain a minimum bending radius for the heating conductor. As shown at 23, it is possible to mount at least some of the guide members resiliently. In the illustrated embodiment, a guide member is attached to the carrier rod by means of a helical spring 23 surrounding the heating conductor which is being guided through the arcuate guide channel in the guide member.

FIG. 6 shows a modification wherein the guide members 22 are replaced by guide rollers 24 whose stub axles 25 are received in respective bores in the carrier rods 17c for heating conductors 4.

I claim:

1. A slab of reinforced concrete having opposite edges, comprising a flexible heating conductor embedded in the slab, the heating conductor being formed in a plurality of loops and adjacent ones of the loops having bent-over portions at said opposite edges, concrete reinforcing means at the opposite edges, mounting supports affixed to the reinforcing means, embedded in the slab and holding the heating conductor in said loop formation, and guidemembers affixed to respective ones of the mounting supports at said opposite edges for guiding the bent-over loop portions and for tensioning the heating conductor.

2. The slab of claim 1, wherein said guide members are guide rollers.

3. The slab of claim 1, wherein the mounting supports are carrier bars of elastic material.

4. The slab of claim 1, further comprising spring means interposed between the mounting supports and the guide members for resiliently affixing the guide members thereto.

5. The slab of claim 1 wherein the mounting supports are carrier rods for the heating conductor.

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