PATENT SPECIFICATION

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(Under Section 91, sub-sections (2) and (4) of the Patents and Designs Acts, 1907 to 1942, and Section 6 (1) (a) of the Patents &c. (Emergency) Act, 1939, a single Complete Specification was left in respect of this Application and of Application No. 27237/45 and was laid open to inspection on Oct. 17, 1945).

COMPLETE SPECIFICATION

Structure of Reinforced Concrete

I, ELFRED JOHANNES SMEDEGAARD, of 26, Reventlowsgade, Copenhagen Denmark, a citizen of the United States of America, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

It is known to impart a tension to the steel reinforcement of a concrete structure previous to casting the concrete. This method has gained practical importance in recent years, after the invention of methods of manufacturing steels having high yield point and tensile strength.

The concrete forms are disposed around the tensioned reinforcement, and the concrete is then poured into the forms. The tension of the steel is maintained until the concrete has hardened sufficiently, upon which the tension is relieved. The tensile force of the steel will then balance the compressive force thus produced in the concrete.

In this manner, completed girders for bridge structures, roof beams for workshop buildings etc. have been made. Common to all these structures is that the concrete elements consist of rigid sections which are delivered completed to the building site, just as steel girders.

These rigid sections only find limited utilization, being as a rule uneconomical in use in cases where a concrete slab structure, for example, is desired.

The invention relates to structures of reinforced concrete and according thereto reinforcement is effected by means of flexible concrete bars, wholly or partly incorporated in the structure, and each provided with a tensional reinforcement located at or about the neutral no-stress plane of the bar passing through the centre of gravity of its section, the tension of the said reinforcement being balanced by corresponding compressive stresses in the concrete section of the bar.

The invention also includes concrete bars incorporating reinforcing means which is subject to terminal stress which is balanced by a corresponding compressive stress on the surrounding concrete, for use in the said structures. Such concrete bars are, preferably, so dimensioned as to contain substantially no more concrete than is necessary, upon hardening of the concrete, to carry the induced compressive stress due to the tension of the steel reinforcement. Concrete bars thus made in accordance with the invention may be transported to a building site and be mounted and embedded in a concrete structure, without difficulty and just like an ordinary iron bar.

The steel reinforcement is arranged around the no-stress plane passing through the centre of gravity of the concrete bar, in order to avoid the creation of internal bending stresses. When the initial tension is relieved it will be transferred in part to the concrete mass as a compressive stress. An initial equilibrium stress will be created due to the contraction of the concrete bar until the total tensile force of the steel reinforcement becomes equal to the total compressive force of the concrete mass. The section of the concrete bar must be sufficient to permit the concrete bar to be transported to the building site without breaking or being damaged. It may, further, for technical or economical reasons, be convenient to use lower concrete stresses in the concrete bars than the maximum permissible concrete stress.

If the concrete bar is subjected to an external tensile force, the internal compressive stresses in the bar will diminish proportionately to the increase of the tensile force until the internal compressive stress of the concrete attains zero value. If the tensile force is further increased, the reinforcement will carry the whole thereof, since the concrete will be unable to carry tensile stresses.

A concrete structure with concrete bars embedded therein may be calculated in the same manner as ordinary reinforced concrete structures.

[*Price* 1/-]

A structure of reinforced concrete produced in the above described manner contains, when subjected to no load, in part tensioned reinforcing steel, in part concrete surrounding the reinforcing cores and being subjected to a compressive stress, and in part concrete subjected to no stress.

Instead of a single reinforcing steel bar, each concrete bar may be provided with two or more reinforcing steel bars having ~~their~~ common centre of gravity no-stress plane passing through the centre of gravity of the concrete bar.

The concrete bars according to the invention are treated in the same manner as ordinary reinforcing bars and may be cut and fitted in like manner. The section of the concrete bars may be square, triangular rectangular, circular, or of any other convenient shape.

In making the concrete bars, the steel reinforcement is placed within the concrete forms and subject to tension. Then the steel bar or bars to be incorporated in the concrete bar in an unstrained or nearly unstrained condition, are placed adjacent the tensioned reinforcement. Now the concrete is poured into the forms, and after the concrete has hardened the tension of the reinforcement is relieved.

It is to be understood that the term "steel" should for the purpose of this specification include other suitable metals.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A reinforced concrete structure, wherein the reinforcement is effected by means of flexible concrete bars, wholly or partly incorporated in the structure, and each provided with a tensional reinforcement located at or about the neutral no-stress plane of the bar passing through the centre of gravity of its section, the tension of the said reinforcement being balanced by corresponding compressive stresses in the concrete section of the bar.

2. A concrete bar for use in a structure according to Claim 1, in which is incorporated reinforcing means which is subject to tensional stress which is balanced by a corresponding compressive stress in the surrounding concrete.

3. A concrete bar according to Claim 1, wherein the amount of concrete is no more than is required to carry the compressive stress induced by the tension of the tensioned reinforcement.

4. Reinforced structures, and flexible concrete bars for use therein, substantially as herein described.

Dated this 17th day of October, 1945.

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