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(54) Method for producing reinforcement for concrete members, preferably concrete piles, reinforcement and a strut member incorporated therein.

(57) The invention relates to a method for producing reinforcement intended for concrete members, preferably concrete piles. Through internal means acting as strut members or compression members in the form of diagonally, or otherwise, acting struts, the longitudinally extending reinforcing bars 20 within an elongated coil are brought into place against the inside of the coil with a predetermined force, thereby stabilizing the coil.

The struts can be arranged as diagonally acting elements in a reinforcement having four bars forming a square seen in cross-section or the struts can contact all or certain of the reinforcing bars, but preferably in such a way that the struts mutual orientation is changed as the supporting operation proceeds along the elongated coil.

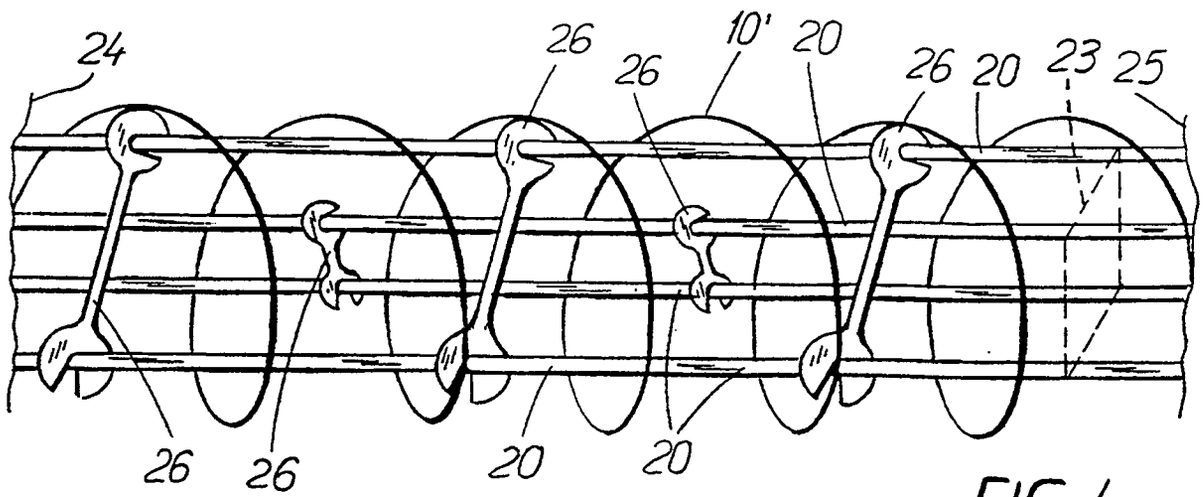

FIG.4

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METHOD FOR PRODUCING REINFORCEMENT FOR CONCRETE MEMBERS, PREFERABLY CONCRETE PILES, REINFORCEMENT AND A STRUT MEMBER INCORPORATED THEREIN

The present invention relates to a method for production of reinforcement for concrete members, preferably concrete piles, according to the preamble of claim 1, reinforcement for concrete members according to the preamble of claim 5 and a strut member intended for such reinforcement according to the preamble of claim 7.

As is known, concrete piles play an important role in connection with ground strengthening. The piles normally comprise an inner reinforcement of steel and a concrete body cast around the reinforcement, in most cases with some form of end strengthening.

A known technique for producing such piles comprises elongating a steel wire in the form of a compact coil to an extented coil, placing the elongated coil on a height-adjustable support and, by means of a feeding device, inserting reinforcing iron bars into the extended coil on the support.

Usually the support is height-adjustable and in a first phase two reinforcing bars or two groups of such bars are fed in and placed mutually spaced apart in the horizontal plane. Thereafter these bars are affixed to the elongated steel wire coil by means of a binding operation which can comprise binding at mutually spaced locations, for example in the order of one meter apart.

This attachment can be seen as maintaining the bars by means of binding wires in which the bars quite simply hang.

When the placement in a first horizontal plane has been completed, the support is raised and a corresponding feeding and affixing is made in the upper part of the loop-shaped steel wire.

The result of this attachment is a reinforcement which is not fully stable, i.e. the attachment between the bars and the coil is not always perhaps that which is desired. An improvement in quality of this fastening is thus desirable.

Furthermore, the binding is a totally manual operation which requires great speed and which, because of its monotony, becomes extremely tiring in the long run.

Since in recent times ever quicker casting machines have been produced which more or less fully automatically deal with one or several finished reinforcements, the pressure becomes intense on the workers who are to carry out the boring monotonous binding work at the rate which the casting machine requires.

A different type of locating means for reinforcing bars is described in US-A-1556178. In this document two strips of wire having U-shaped loops at uniform intervals therealong are placed around a spiral reinforcement. Reinforcing bars are then inserted one at a time, which bars pass through the aligned openings formed by the loops. Whilst this method is more effective than the previously described binding operation, much time is taken up affixing the strips of wire to the coil and, in addition, great accuracy is required to feed the bars through the loops. Since the bars have to pass through the loops, the bars cannot be held firmly against the coil. As such, stability of the reinforcement is still not optimal.

With this in mind, the invention thus provides a solution not only for the stability problem of the bars, i.e. its quality as reinforcement in piles, but also, on the one hand, the problem of the tiresome, monotonous manual binding and, on the other hand, the need for great accuracy during manufacturing. Since the problem is the same in connection with, for example reinforced concrete beams and other weight-bearing building members, the invention relates to concrete members in general, even though concrete piles are presently of most interest.

The invention accordingly provides a method for producing reinforcement for concrete members, preferably concrete piles, in which steel wire is formed into an extended coil and reinforcing bars are placed within the coil and in which means are arranged to hold the coil and the reinforcing bars together.

The method is characterized in that the coil and the reinforcing bars are brought to be held together by a plurality of tensioning members pushed onto, and acting between, at least two reinforcing bars or groups thereof which press the reinforcing bars into contact with the coil.

In one embodiment the reinforcing bars or groups thereof form the corners in an imaginary rectangle, seen in cross-section, and the tensioning means are designed as struts acting diagonally in said rectangle so that one strut lies in a first diagonal direction and the adjacent strut lies in the other diagonal direction. In another embodiment the tensioning means is formed and placed such that, seen along the circumference of the coil, it presses three closely lying reinforcing bars or groups thereof against the coil.

In yet another embodiment the tensioning means is designed and arranged such that, seen along the circumference of the coil, it presses all the reinforcing bars or groups thereof against the coil.

The invention also provides reinforcement for concrete members, preferably concrete piles, comprising a steel wire formed into an extended coil and reinforcing iron bars placed internally along the total length of the coil, and means for holding together the coil and the reinforcing bars.

The reinforcement is characterized by a plurality of tensioning means mutually spaced in the coil's lon-

gitudinal direction which act between at least two reinforcing bars or groups thereof to press the reinforcing bars into contact with the coil and thereby stabilize the reinforcement.

In one embodiment the reinforcing bars or the groups thereof form the corners in an imaginary rectangle, seen in cross-section, whereby the reinforcement is characterized by tension members acting as struts diagonally in said rectangle and whereby sequentially following struts are oriented in differing diagonal directions.

The invention also provides a strut member intended for reinforcement which comprises a steel wire formed into an extended coil and in which reinforcing bars are arranged, wherein said reinforcement is intended for concrete members, preferably concrete piles.

The strut member is characterized by means for attachment to a first reinforcing bar or group of reinforcing bars and means for attachment to a second reinforcing bar or group of reinforcing bars, whereby the length of each strut member is such that the strut members, when placed in reinforcement, press the reinforcing bars outwards into contact with the coil.

Naturally the invention relates also to a concrete member, preferably a concrete pile, provided with the said reinforcement.

Embodiments of the invention will now be exemplified with reference to the attached drawings, in which

Fig. 1 schematically shows a steel wire coil in its initial condition intended to form the coil in a pile reinforcement,

Fig. 2 schematically shows a steel wire elongated to an extended coil lying on height-adjustable stands,

Fig. 3 schematically shows the arrangement of Fig. 2 together with feed rollers for reinforcing bars,

Fig. 4 is a schematic partial view showing a four-sided reinforcement in cross-section intended for concrete piles,

Fig. 5 is a side-view throught the reinforcement showing a first type of tensioning- or strut member,

Fig. 6 schematically shows a second type of tensioning- or strut member,

Fig. 7 shows another type of tensioning- or strut member, and

Fig. 8 finally shows yet another type of tensioning- or strut member.

Figure reference numeral 10 in Fig. 1 refers to a wound steel wire compact coil and figure reference numeral 10′ refers to the same steel wire but elongated to an extended coil 10′.

This coil 10′ can have a length of for example several meters, say four to eight meters, and is placed on height-adjustable supports 11, 12 and 13. Holders 14, 15 and 16 on these supports fix the coil 10′ in its extended condition and thus counteract the spring force therein.

Arrows 17, 18 and 19 indicate that respective supports are height-adjustable. In a first vertical position of the supports a first set of reinforcing bars 20 is fed in between a pair of rollers 21, 22 of which one is a driven roller. Individual reinforcing bars 20 or a plurality thereof, for example two, are laid in the first vertical position such that they extend along the whole coil 10′ and have a certain mutual spacing in the horizontal plane. Thereafter the supports 11, 12 and 13 are lowered a little, sufficiently for the subsequent batch of reinforcing bars 20 to be able to be positioned, so that they are placed with mutual spacing in the horizontal plane at a level substantially in contact with the inside of the coil 10′.

With the reinforcing bars and the supports in this position, the reinforcing bars are temporarily fixed in their positions by means of spacing members of the type shown in Fig. 5. The spacing members can be placed not only diagonally, but also along the sides of the imaginary rectangle.

After this preliminary fixation of the introduced bars has taken place, the arrangement of bars and elongated coil is ready to be fastened together.

Fig. 4 shows four reinforcing bars 20 placed so that the four-sided cross-section 23 shown with dashed lines is formed. The broken lines 24, 25 indicate that a section of the elongated coil 10′ somewhere between its ends is being considered, which ends, as mentioned earlier, are temporarily fixed by means of spacing members of the type shown in Fig. 5, or shorter such members placed along the sides of the imaginary rectangle. In Fig. 5 the tensioning- or strut members 26 are shown in the form of elongated struts with a notch 27 symmetrically located relative to the strut in the one end and a notch 28 turned through 90° with respect to the notch 27. Thus, the notch 27 is placed over its corresponding reinforcing bar and, by means of for example a rubber mallet, the notch 28 is banged into place on its reinforcing bar 20.

Thereafter a further strut or tensioning member is introduced at a suitable spacing from the former, for example in the order of one meter. The latter strut 26 is oriented so that it is in a different diagonal direction in relation to the first strut.

Since the struts 26 are used as means for pressing the reinforcing bars outwards against the inside of the coil, a robust and easily reproducable arrangement for effecting stability of the pile reinforcement is provided, at the same time that this is achieved with a number of simple manual operations. The need for the binding wires along with their unpredictable retaining ability is accordingly avoided and there is further no need for any welding with the troublesome weld fumes emitted therefrom.

In Fig. 6 it is shown how three reinforcing bars 20

in cross-section are located by means of another type of tensioning-strut arrangement 26.

A tensioning-strut arrangement 26b is given in Fig. 7 which cooperates with all four sets of reinforcing bars 20. In the embodiment in Fig. 7 there are two reinforcing bars in each group of corner-located bars.

Fig. 8 shows another type of four-cornered supporting tensioning- or strut arrangement in the form of a four-sided frame.

Naturally, further embodiments of support or strut members are possible within the scope of the invention which is solely restricted by that given in the appended claims.

Claims

1. Method for producing reinforcement for concrete members, preferably concrete piles, in which steel wire is formed into an extended coil and reinforcing bars are placed within the coil and in which means are arranged to hold the coil and the reinforcing bars together, **characterized** in that the coil and the reinforcing bars are brought to be held together by a plurality of tensioning members pushed onto, and acting between, at least two reinforcing bars or groups thereof, which press the reinforcing bars into contact with the coil.

2. Method according to claim 1 in which the reinforcing bars, or the groups thereof, form the corners in an imaginary rectangle seen in cross-section, **characterized** in that the tensioning means are designed as struts acting diagonally in said rectangle so that one strut lies in a first diagonal direction and the adjacent strut lies in the other diagonal direction.

3. Method according to claim 1, characterized in that the tensioning means is formed and placed such that, seen along the circumference of the coil, it presses three closely lying reinforcing bars or groups thereof against the coil.

4. Method according to claim 1, characterized in that the tensioning means is designed and arranged such that, seen along the circumference of the coil, it presses all the reinforcing bars or groups thereof against the coil.

5. Reinforcement for concrete members, preferably concrete piles, comprising a steel wire formed into an extended coil and reinforcing bars placed internally along the total length of the coil, and means for holding the coil and the reinforcing bars together, **characterized** by a plurality of tensioning means (26, 26a, 26b, 26c) mutually spaced in the coil's (10') longitudinal direction which act between at least two reinforcing bars (20) or groups thereof to press the reinforcing bars into contact with the coil and thereby stabilize the reinforcement.

6. Reinforcement according to claim 6 in which the reinforcing bars, or the groups thereof, form the corners in an imaginary rectangle seen in cross-section, characterized in that tensioning members are arranged diagonally in said rectangle, acting as struts, whereby sequentially following struts are oriented in differing diagonal directions.

7. Strut member for use in reinforcement which comprises a steel wire formed into an extended coil and in which reinforcing bars are arranged, the reinforcement being intended for concrete members, preferably concrete piles, characterized in that the strut member comprises means for attachment to a first reinforcing bar, or group of reinforcing bars, and means for attachment to a second reinforcing bar, or group of reinforcing bars, whereby the length of the strut members is such that, when placed in the reinforcement, they press the reinforcing bars outwards into contact with the coil.

8. Concrete member, preferably a concrete pile, characterized in that it is provided with reinforcement according to one or more of the previous claims.

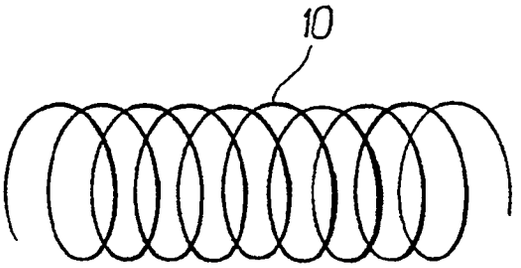


FIG.1

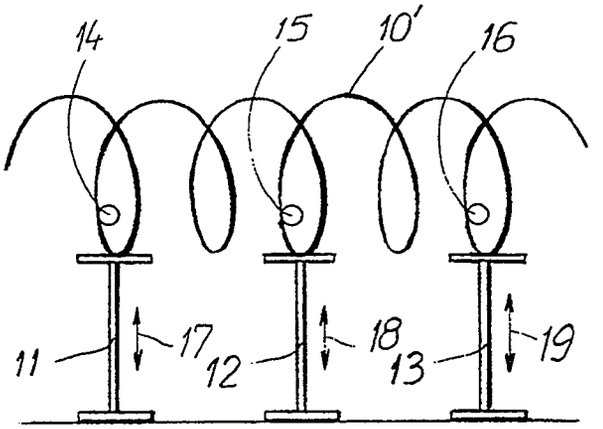
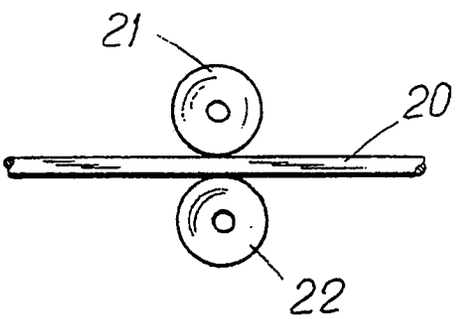


FIG.2



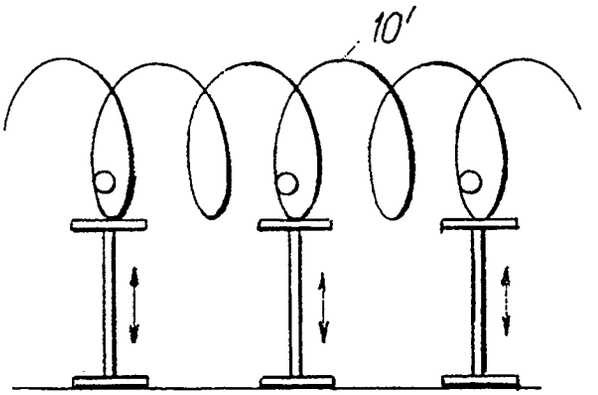


FIG.3

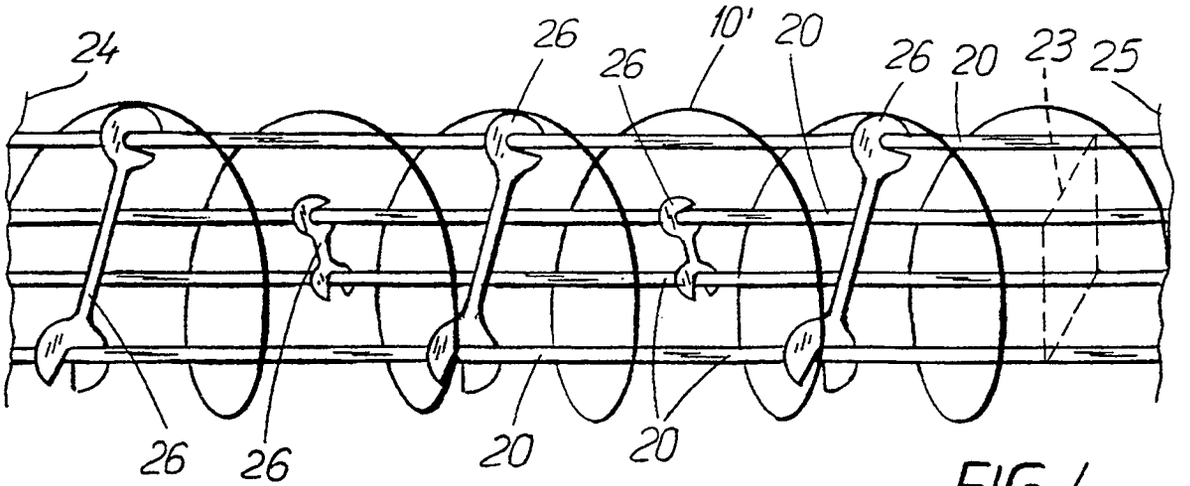


FIG.4

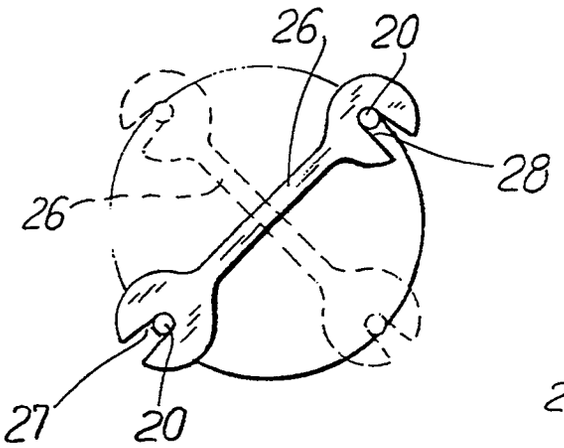


FIG.5

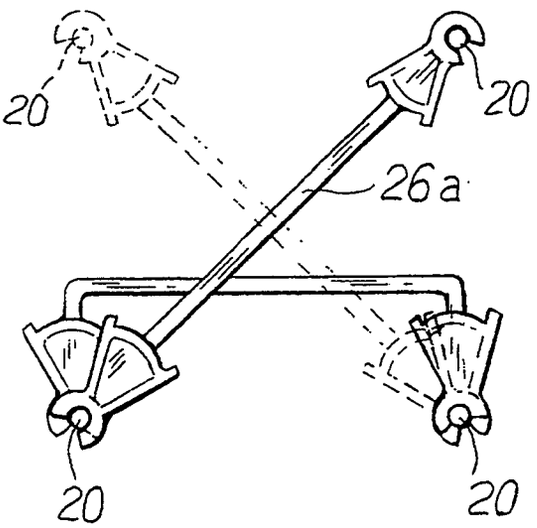


FIG.6

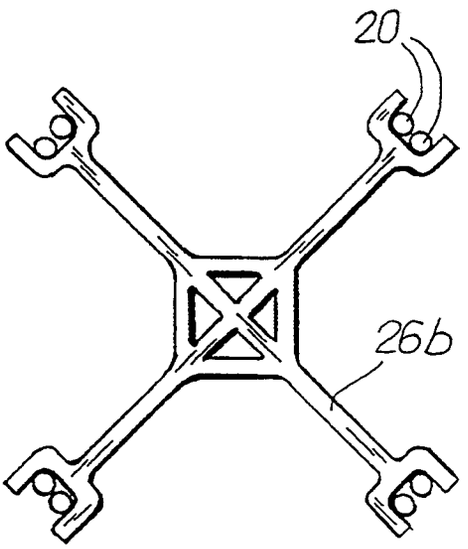


FIG.7

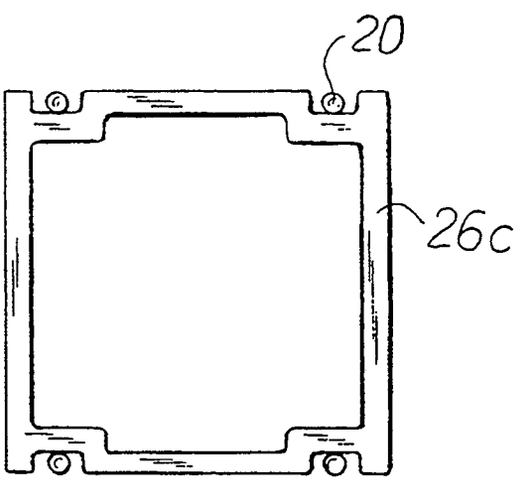


FIG.8

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 90 85 0388

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	FR-E- 19 585 (P. LECLER) * Page 3, lines 19-48; figure 12 *	1-8	E 04 C 5/16 E 04 C 5/06
Y	BE-A- 730 492 (M. KIDA) * Page 11, line 18 - page 12, line 6; figures 1,3 *	1,3-5,7,8	
Y	GB-A- 21 851 (W.J. STEWART)(A.D. 1914) * Page 3, lines 27-30; figures 1,2 *	1,2,5,6	
A	DE-U-8 702 254 (BTH GmbH) * Page 5, lines 25-36; figures 1-3 *	1,3-5,7,8	
A	BE-A- 719 634 (H.J. KREPS) * The whole document *	2,6	
A	EP-A-0 196 542 (H. KELLER) * Page 6, lines 4-13,27 - page 7, line 9; figures 1-3,7-9 *	1,2,6	
A	FR-A-2 146 170 (ENTREPRISE J. MANDELLI) * Claims 1,2; figures 1,2 *	2,6	TECHNICAL FIELDS SEARCHED (Int. Cl.5) E 04 C E 04 H
A	US-A-1 896 279 (D.H. BITNEY) * Page 1, lines 29-54; figures 1-3 *	1,2,6	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	17-01-1991	RIGHETTI R.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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