Feb. 20, 1940. L. HERZKA 2,191,233

REINFORCEMENT FOR CONCRETE

Filed Dec. 20, 1938

Fig.1

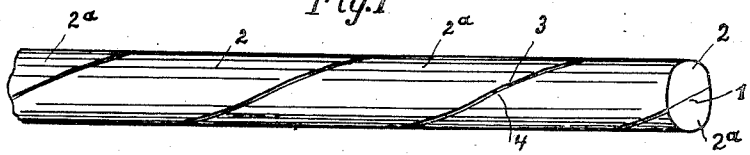


Fig.2

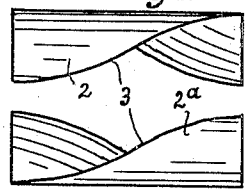


Fig.3

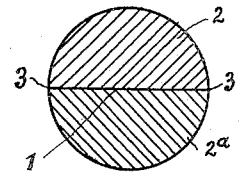


Fig.4

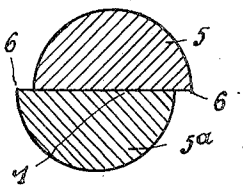


Fig.5

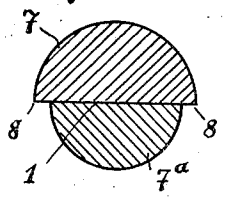


Fig.6

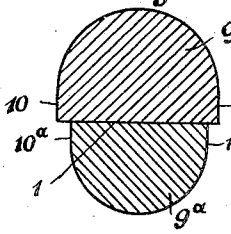


Fig.7

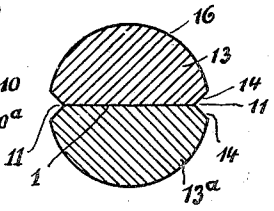


Fig.8

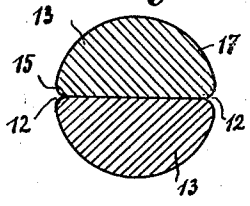


Fig.9

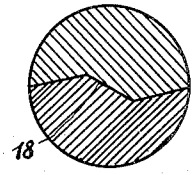


Fig.10

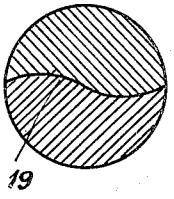
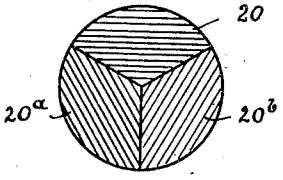


Fig.11



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UNITED STATES PATENT OFFICE

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REINFORCEMENT FOR CONCRETE

Leopold Herzka, Vienna, Germany, assignor, by mesne assignments, to Comtec Limited, London, England

Application December 20, 1938, Serial No. 246,819
In Austria December 21, 1937

7 Claims. (Cl. 72—111)

The present invention relates to reinforcements for concrete consisting of bars.

For producing reinforced concrete, steels are at present used, the mechanical properties of which are improved by cold stretching. The best known among these types are those in which two round bars are twisted together and those which consist only of one round bar twisted round its axis. It is true that the bars of the first type when embedded in concrete have a considerable adhesion force, but on the other hand the improvement of the mechanical properties in comparison with the untwisted bars of the same material is only slight in view of the unequal stresses in respect to the axis to which the steel fibres are subject in twisting. The bars of the second type show high mechanical properties owing to their circular cross section and to the uniform stretching of the fibres equidistant from the axis. On the other hand their adhesion force in concrete is small owing to their circular cross section. It has been tried to eliminate the latter drawback by providing the steel with ribs forming spirals in consequence of the twisting. This however results in a reduction of the mechanical strength as the fibres situated in the ribs are exposed to different and higher strains than the fibres of the round bars.

The main object of the invention is a reinforcement for concrete uniting the advantages of the two steel reinforcements mentioned above without their drawbacks.

It is a further object of the present invention to provide a composite reinforcement consisting of two or more bars, said bars having faces being in intimate contact throughout, said bars being twisted together in helical relationship. It is still another object of the invention to make the bars with faces having a rectilinear cross section being in intimate contact throughout. In order to improve the mechanical strength of the composite reinforcement it may be of advantage to give the contacting faces a cross section in form of a broken or wavy line.

It is still a further object of the invention to improve the adhesion force of the composite reinforcement by making one of the bars forming the reinforcement protruding, preferably in radial direction, beyond the other bar or bars, and twisting said bars together in helical relationship forming hereby a helical ridge or roll along the reinforcement. The adhesion force of the reinforcement may also be improved by providing at least along one edge between the contacting faces of the bars and the substantially cylindrical circumferential faces of said bars further narrower faces inclined towards said contacting faces forming thereby a groove or grooves along the outer surface of said reinforcement.

According to a preferred embodiment of the invention the reinforcement may be produced by twisting two commercial half round bars, having their plane faces being in intimate contact throughout, around their common axis of gravity. By using two half round bars the reinforcement has substantially the form of one round bar; in this case the elongation of the fibres is practically equal to their elongation in a twisted round bar however an excellent adhesion in the concrete is obtained by the helical faces even if these faces are in perfect correspondence, as the edges of the bars form a pronounced seam along the surface of the reinforcement which resembles in its appearance to that of a round bar. The adhesion of this seam may be increased by having the one helical face protruding beyond the other whereby a helical ridge or roll is formed along the reinforcement the outer cross-section of which section comes near to that of a round bar. As this ridge or roll is formed of a bar uniformly stressed on its circumference, no detrimental elongations can occur. The adhesion force of the twisted reinforcing bars may be increased by the helical face of each bar being flush with the remaining outer surface of said bar or forming an angle with same. Thereby a helical groove is formed running round the twisted reinforcement.

In the accompanying drawing which illustrates several embodiments of the invention,

Figure 1 shows a perspective view of a reinforcement composed of two equal half round bars,

Figure 2 shows a perspective view of parts of the bars shown in Figure 1,

Figure 3 shows a cross section through a bar shown in Figures 1 and 2,

Figure 4 shows a cross section of a reinforcement made of equal half round bars displaced in respect to each other so that the one helical face protrudes beyond the other,

Figure 5 shows the cross section of a reinforcement made of unequal half round bars,

Figure 6 shows a cross section of a reinforcement having outer faces with a rectilinear cross section adjacent to the contacting helical faces,

Figure 7 shows a cross section of a reinforcement with helical faces forming angles with the other parts of the outer surface,

Figure 8 shows a cross section of a reinforcement with helical faces which passes flush with the other parts of the outer surface,

Figure 9 shows a cross-section of a reinforcement consisting of two bars being in intimate contact along two faces with a cross section in form of a broken line,

Figure 10 shows the cross section of a reinforcement consisting of two bars having faces with a cross section in form of a wavy line, and

Figure 11 shows a cross section of a reinforcement made of three bars.

The reinforcement according to Figs. 1–3 is composed of two half round bars **2**, **2***a* of equal cross section placed upon each other and intimately contacting along a helical face whereby the helical faces of the bars are in intimate contact and perfect correspondence. The reinforcement is produced by placing upon each other commercial half round bars in such a manner, that the plain faces are made to contact whereupon they are twisted together round the center line of the cross section, i. e., round the axis of the bars joined together. Owing to the irregularities inherent to the bars which are increased by twisting the edges **3** will not exactly touch each other but they will partly protrude beyond the substantially circular cross section formed by the circumference of the bars twisted together and will partly form a groove **4**. These projecting parts and grooves will impart to the reinforcement an excellent adhesion force which may further be increased by placing and twisting together half round bars **5**, **5***a* of equal semicircular cross section whereby the cross section as shown in Figure 4 of the bars protrude, one beyond the other. In this manner the edges **6** form along the reinforcements helical ridges or rolls which ridges or rolls are fibre-connected with the bars. The same effect may be obtained with bars of different cross sections as shown in Figure 5. The bar **7** has a larger cross section then the bar **7***a* and protrudes on both sides with ports of its helical face adjacent to the edges **8** beyond the bar **7***a*. In this case too the twisting does not destroy the connection of the fibres in the bars. Fig. 6 shows the cross section of a reinforcement similar to the reinforcement shown in Fig. 5. In the reinforcement shown in Fig. 6 the faces **10** and **10***a* adjacent to the helical faces **1** of the bars **9** and **9***a* are plane prolongations of the half round faces forming the circumferential surface of the reinforcement. These plane faces **10** and **10***a* are parallel to a plane passing through the axis of the reinforcement.

The reinforcements shown in Figs. 7 and 8 are provided with grooves. These grooves are formed on the outer surface of the reinforcement shown in Fig. 7 by the inclined faces **14** connecting the helical faces **1** and the half round faces **16** of the bars **13** and **13***a*. On the outer surface of the reinforcement shown in Fig. 8 grooves are formed by arc shaped faces **14** passing flush into the helical faces and into the half round outer faces **17** of the bars **13**.

In order to warrant a reliable guidance in twisting the bars it is advantageous to use contacting faces having a cross section in form of a broken line **18** as shown in Fig. 9 or in form of a wavy line **19** as shown in Fig. 10.

In order to produce more than two adhesive seams formed by edges of the bars it is useful to combine the reinforcement of three bars **20**, **20***a*, and **20***b*, as shown in Fig. 11. In this case the section of the bars is that of a sector or of a segment of a circle.

Having thus described my invention, I claim:

1. Reinforcement for concrete consisting of bars, said bars having faces being in intimate contact throughout, said bars being twisted together in helical relationship to provide a composite reinforcement.

2. Reinforcement for concrete consisting of bars, said bars having faces with a rectilinear cross section being in intimate contact throughout, said bars twisted together in helical relationship to provide a composite reinforcement.

3. Reinforcement for concrete consisting of bars, said bars having faces with a cross section in form of a broken line being in intimate contact throughout, said bars being twisted together in helical relationship.

4. Reinforcement for concrete consisting of bars, said bars having faces being in intimate contact throughout and the face of one of said bars protruding in radial direction beyond the other bar, said bars being twisted together in helical relationship to provide a composite reinforcement.

5. Reinforcement for concrete consisting of bars, said bars having faces with a rectilinear cross section in intimate contact throughout and the face of one of said bars being wider than the face or faces of the other bar or bars, said bars being twisted together in helical relationship to provide a composite reinforcement.

6. Reinforcement for concrete consisting of bars, said bars having faces being in intimate contact throughout and having at least along one edge between said faces and the substantially cylindrical circumferential faces of said bars further narrower faces inclined towards said intimately contacting faces, said bars being twisted together in helical relationship to provide a composite reinforcement.

7. Reinforcement for concrete consisting of bars, said bars having faces being in intimate contact throughout and having outer faces forming a substantially cylindrical outer surface, said bars being twisted together in helical relationship to provide a composite reinforcement.

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