Aug. 15, 1967 S. SORETZ 3,335,539

SPIRALLY RIBBED REINFORCING BAR FOR CONCRETE

Original Filed June 7, 1960

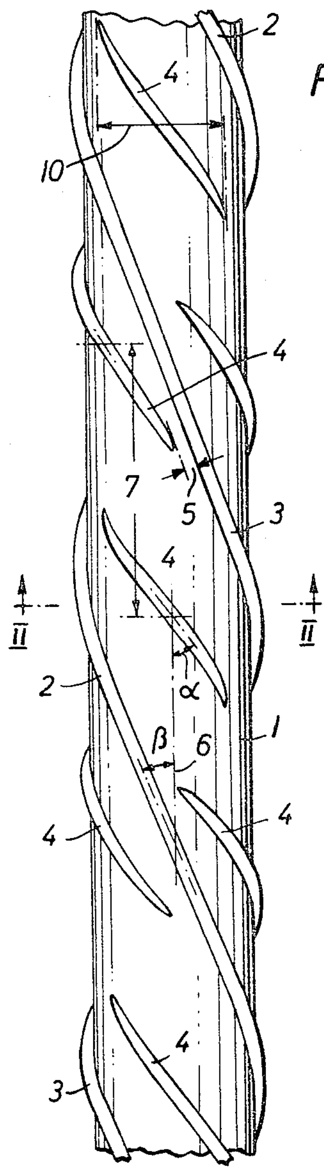

Fig.1

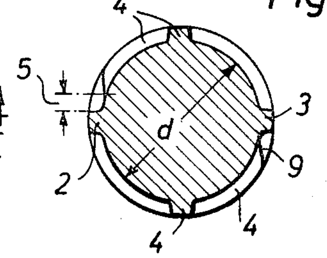

Fig.2

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United States Patent Office 3,335,539
Patented Aug. 15, 1967

3,335,539
SPIRALLY RIBBED REINFORCING BAR FOR CONCRETE

Stefan Soretz, Vienna, Austria, assignor to Tor-Isteg Steel Corporation, S.A.H., Luxembourg, Luxembourg
Continuation of application Ser. No. 34,412, June 7, 1960. This application Sept. 9, 1963, Ser. No. 307,489
Claims priority, application Germany, June 10, 1959, T 16,798
2 Claims. (Cl. 52—737)

This invention relates to reinforcing bars for concrete, each bar comprising a core, at least one continuous longitudinal rib which extends helically circumferentially around the core and oblique lugs are longitudinally spaced on the core periphery, which are separate from and interspersed between the longitudinal rib, and is a continuation-in-part of the application filed by Stefan Soretz on June 7, 1960, Ser. No. 34,412 and now abandoned.

Conventional reinforcing bars are provided with transverse and oblique ribs which terminate in the flanks of longitudinal ribs and are inclined with respect to the bar axis, involve considerable disadvantages. Conventional transverse ribs constitute a thickened portion extending around the core of the bar over short lengths and this construction results in local resistance to free deformation under tension, which results in stress peak at the sloping surfaces where the flanks of the transverse ribs merge into the core surface. When these bars are subsequently bent, a notch effect of the transverse ribs results in further stress peaks at these regions, which is further increased if a bending roller impinges against the transverse ribs, which is practically unavoidable. Thus there results an increased tendency of such bars to develop fractures and be unreliable when placed in situ. Further, the arrangement of oblique ribs which merge in the longitudinal ribs produces stress peaks at the places where the oblique ribs merge in the longitudinal ribs, since an alteration of the angle at these places is prevented when the bar is twisted. Although oblique ribs reduce the danger of fracture development as compared with transverse ribs, the reduction is not adequate.

The reinforcing bar for concrete is characterized in having a cylindrical core, two continuous longitudinal ribs extending helically around the periphery of the core and a longitudinal series of relatively short spaced-apart lugs arranged on the core between the two continuous longitudinal ribs in overlapping spiral relation to each other regarding the component of the ribs transverse to the longitudinal axis of the bar and obliquely disposed on the core periphery in angular relation relative to the spiral rib with the rear ends of succeeding lugs overlapping the forward ends of preceding lugs, the length of the component of the oblique lugs transverse to the longitudinal axis of the bar, comprising at least half of the core diameter and said oblique lugs having an angle of inclination not greater than 50° relative to the longitudinal axis of said core and extending toward said longitudinal rib and terminating in spaced relation thereto, said angle being greater than the angularity of said helical rib relative to the longitudinal axis of said core.

The combination of the specific limitations affords a reinforcing bar for concrete which gives optimum desired characteristics for such bars. The bar guarantees excellent bonding with the enclosing concrete and simultaneously provides means preventing turning out of the bar from the concrete in case of overstressing. This problem arises only in reinforcing bars which have continuous helically extending longitudinal ribs.

The reinforcing bar according to the claimed invention remains completely bendable, that is, the bar may be bent first in the one direction and then in the opposite direction without showing cracks or a rupture in the bar. The danger of brittle fracture or formation of cracks at the end of the oblique lugs is avoided.

It is pointed out in this connection that the requirements for avoiding brittle fraction which have to be put to a twisted bar or to a bar strengthened in the cold state, are contrary to the requirements which have to be put to a bar with a high bonding effect in the concrete.

In the case of the latter requirement, the short rib should lie as much as possible transverse to the longitudinal axis of the bar. But the transverse position of the short rib causes an increased or total danger of brittle fracture. If the bar is, however, formed according to the claimed invention by a cooperation of the above mentioned combination features, there is provided a reinforcing bar strengthened in the cold state by twisting which has all required properties to be obtained in a practical and novel manner. A sufficient bonding effect is obtained without the danger of brittle fracture.

For a better understanding of the invention and to show how the same may be carried into effect, reference will now be made to the accompanying diagrammatic drawings, in which:

FIG. 1 is an elevational view of portion of a reinforcin bar for concrete according to the invention;

FIG. 2 is a section on the line II—II of FIG. 1.

A reinforcing bar for concrete is illustrated in the drawings and comprises a core **1** and two continuous, parallel longitudinal ribs **2** and **3** which extend helically around the core by twisting. Provided between these longitudinal ribs are oblique lugs **4**.

The oblique lugs **4** do not terminate in the flanks of the longitudinal ribs **2** or **3**, but terminate at a distance **5** from the longitudinal ribs, which distance can amount to about 0.1 d, where d is the diameter of the core, see FIG. 2.

The inclination α of the oblique lugs **4** relative to the longitudinal bar axis **6**, designated by a dot-dash line, is kept within the range of 30° to 50°. This ensures that the oblique position of the lugs is such that the length **10** of the component of the oblique lugs **4** transverse to the longitudinal axis of the bar amounts to at least half of the core diameter. It is necessary to ensure that the deviation of the oblique lugs **4** from the parallel to the longitudinal ribs **2** amounts to at least 5°, in order to give an adequate guarantee against rotation of the bars in a concrete mass when the bar is subjected to stress. If the reinforcing bar is twisted by ten times d, the inclination of the longitudinal rib **2** relatively to the longitudinal bar axis **6** will amount to an inclination β equal to about 17°. Thus, the oblique lugs **4** must be disposed at at least 22° in order to provide adequate security against turning movement. The angle α will advantageously be chosen between 30° and 50°.

The spacing **7** of the oblique lugs from one another is, on the average, about the size of the diameter when measured along the length of the bar. In the case of relatively thin reinforcing bars the spacing apart can increase to four dimes d. With very thick reinforcing bars, the spacing apart of the oblique lugs can be reduced to about 0.5 d. It is also important that in the case of thin bars the oblique lugs should be so arranged that the terminal ends overlap one another (FIG. 1). This measure has the advantage that all the oblique lugs participate in the ability of the bar to withstand tensile stresses, i.e. no dead weight occurs such as is unavoidable with the conventional transverse and oblique ribs.

What I claim is:

1. A reinforcing bar for concrete, said bar having a right cylindrical core which is circular in transverse cross-section, two continuous longitudinal ribs extending helically around the periphery of the core, a longitudinal

series of relatively short spiral lugs arranged on the core between the two continuous longitudinal ribs, each of said lugs having forward and rear ends, the rear end of each lug being in longitudinal overlapping relationship with the forward end of an adjacent preceding lug, each of said lugs being obliquely disposed on the core with the forward and rear ends terminating short of the ribs, the longitudinal axis of each lug defining an acute angle with the longitudinal axis of the core ranging between 30 to 50 degrees, each of said lugs having a transverse and longitudinal component of length measured respectively parallel and normal to the longitudinal axis of the core, the transverse component of length of each lug being at least half the core diameter, each of said ribs defining an angle with the longitudinal axis of the core, and said last mentioned angle being less than the angle defined by each longitudinal lug axis and the longitudinal axis of the core.

2. A reinforcing bar for concrete, said bar having a right cylindrical core which is circular in transverse cross-section, two continuous longitudinal ribs extending helically around the periphery of the core, a longitudinal series of relatively short spiral lugs arranged on the core between the two continuous longitudinal ribs, each of said lugs having forward and rear ends, the rear end of each lug being in longitudinal overlapping relationship with the forward end of an adjacent preceding lug, each of said lugs being obliquely disposed on the core with the forward and rear ends terminating short of the ribs, the longitudinal axis of each lug defining an acute angle with the longitudinal axis of the core ranging between

30 to 50 degrees, each of said lugs having a transverse and longitudinal component of length measured respectively parallel and normal to the longitudinal axis of the core, the transverse component of length of each lug being at least half the core diameter, each of said ribs defining an angle with the longitudinal axis of the core, said last mentioned angle being less than the angle defined by each longitudinal lug axis and spacing of said oblique lugs from one another, measured substantially at their midpoints, ranging between one to four times the diameter of said core.

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