

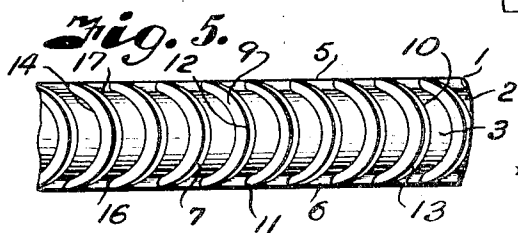
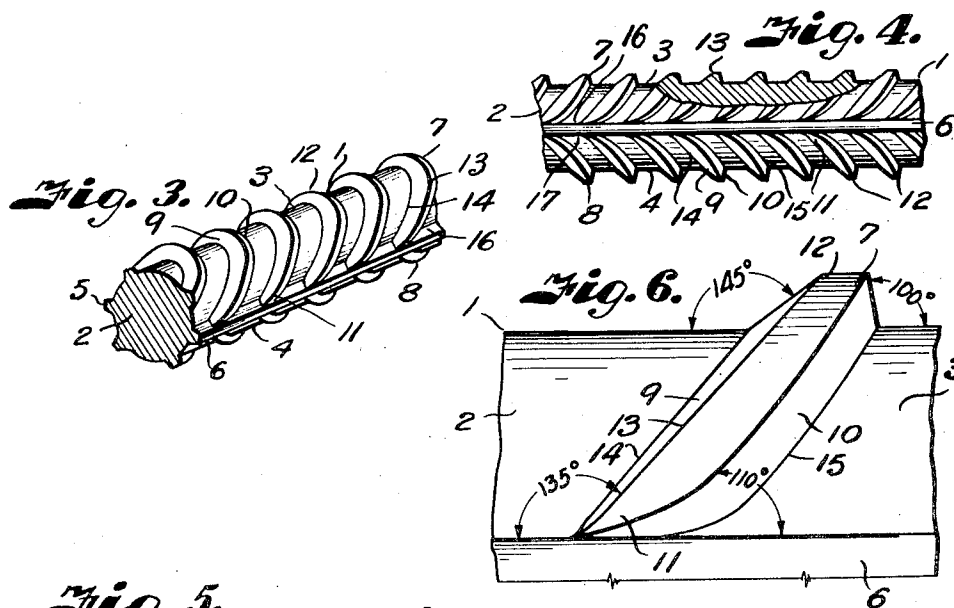
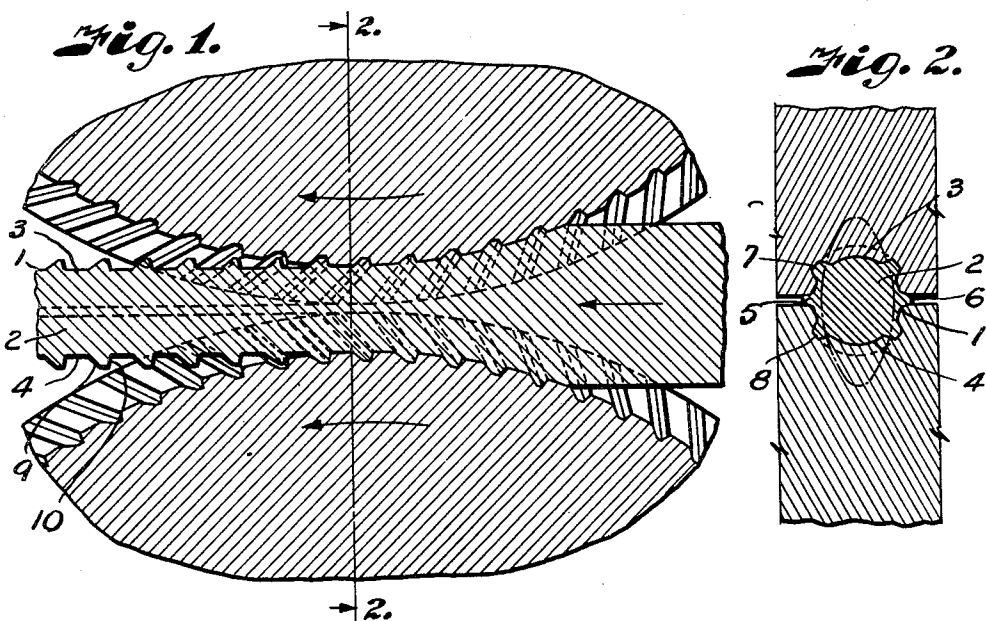
May 8, 1951

W. E. BRADBURY
REINFORCING BAR OR ROD

2,552,364

Filed June 10, 1946

2 Sheets-Sheet 1



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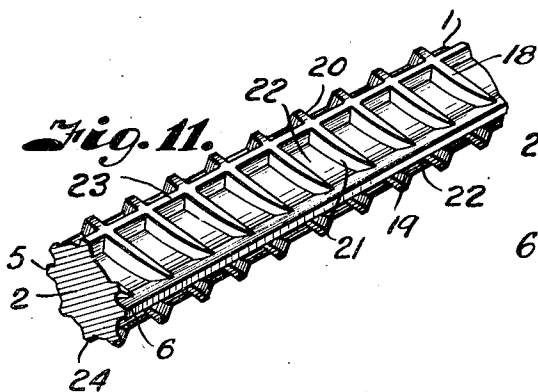
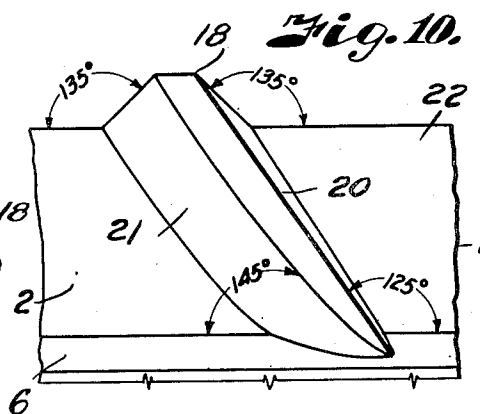
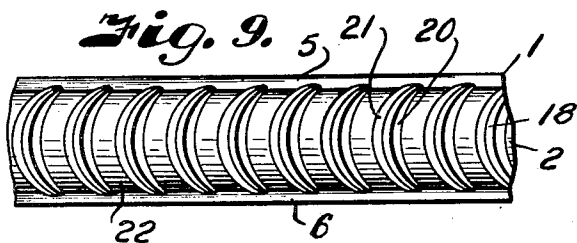
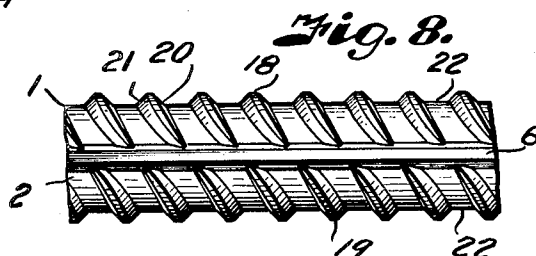
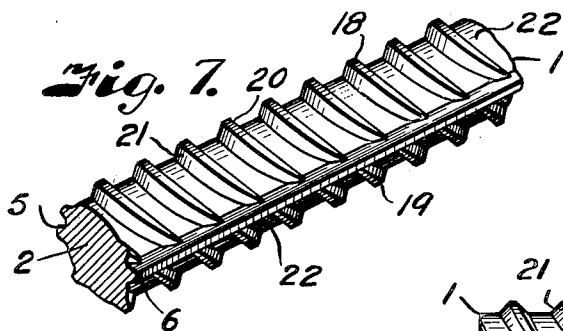
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UNITED STATES PATENT OFFICE

2,552,364

REINFORCING BAR OR ROD

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Application June 10, 1946, Serial No. 675,760

6 Claims. (Cl. 72-111)

1

This invention relates to bars or rods used in reinforcing concrete and is a continuation in part of my copending application on "Reinforcing Bar and Method of Making the Same," filed April 10, 1944, Serial No. 530,269, now abandoned.

The principal object of the present invention is to provide a reinforcing bar having deformations or lugs arranged and shaped so that the metal therein is usable in the tensile strength of the bar and the deformations are readily formed in relatively simple, inexpensively machined rolls without shearing or wiping off of the metal of the deformations when the bar clears the forming rolls or without using an excessive portion of the deformation metal in fillets.

Other objects of the invention are to provide a reinforcing bar with deformations shaped and arranged so that there are no torsional strains produced in the bar during formation thereof; to provide a reinforcing bar having deformations to accomplish an approximate 1-5 ratio in bearing and shear with the surrounding concrete and at the same time provide relative overlap of the deformations; and to provide a reinforcing bar with deformations which provides an efficient bond with concrete when stress is applied in either axial direction of the bar.

In accomplishing these and other objects of the invention hereinafter pointed out, I have provided improved structure, the preferred forms of which are illustrated in the accompanying drawings wherein:

Fig. 1 is a vertical section through a pair of forming rolls particularly illustrating production of a reinforcing bar constructed in accordance with the present invention.

Fig. 2 is a section on the line 2-2 of Fig. 1 illustrating a section through the bar midway of the pass between the rolls.

Fig. 3 is a perspective view of a portion of a bar embodying the features of the present invention.

Fig. 4 is a side elevational view of the bar partly in section to better illustrate the angles of the face portion of the bar midway between the ends of the deformations.

Fig. 5 is a plan view of the bar.

Fig. 6 is a diagrammatic view showing the change in angle of the faces of a deformation relative to the longitudinal surface of the bar.

Fig. 7 is a perspective view of a modified form of bar.

Fig. 8 is a side elevational view of the modified form of bar.

Fig. 9 is a plan view of the modified form of bar.

2

Fig. 10 is a diagrammatic view similar to Fig. 6 showing the change in angle of the faces of a deformation.

Fig. 11 is a perspective view of a further modified form of bar.

Referring more in detail to the drawings:

1 designates a reinforcing bar constructed in accordance with the present invention and which includes a core or body portion 2 of generally circular cross section and having substantially semi-cylindrical faces 3 and 4 for contact with the concrete when the bar is in use.

Extending longitudinally of the core on opposite diametric sides thereof and intermediate the semi-cylindrical bearing faces 3 and 4 are laterally extending ribs 5 and 6 which are sometimes termed overfills. The faces 3 and 4 of the bar have deformations 7 and 8 respectively arranged in longitudinal series with the deformations spaced apart to provide contact of the faces 3 and 4 with the concrete when the rod is used. The deformations are of such shape and relative arrangement that the metal therein is utilized in the tensile strength of the bar and so that the deformations readily clear the rolls without shearing or wiping off thereof or without the use of relatively large fillets.

In order to utilize as much of the metal in the deformations as possible in the tensile strength of the bar, the deformations are substantially crescent-shaped and extend transversely across the respective faces 3 and 4 of the bar with the deformations inclined relative to the lengthwise direction of the bar and with the ends of each deformation in symmetry so that the forming action of the rolls is uniform on the respective sides of the bar to assure straightness of the finished bar when delivered from the forming rolls. The crescent-shaped deformations have inner and outer faces 9 and 10 on the respective sides thereof, the inner face 9 forming an angle at the mid portion of the deformation no less than 135° with the angularity gradually decreasing in value toward the ends of the deformation. This is desirable as it results in increasing the bond with the concrete when the bar is in use and is made possible due to the inclination of the deformations. The angle of the outer face 10 of each deformation may be as steep as 100° in the mid portion of the deformation relative to the longitudinal direction of the bar and increases in angle toward the ends of the deformation as indicated in Fig. 6 in order to allow sufficient clearance for the bar to clear itself from the forming rolls. The deformations also preferably decrease in depth

from the mid portions thereof toward the ends so as to clear the rolls without danger of shearing or wiping off of the metal and without the necessity of large fillets.

In the illustrated instance the angle of the deformations are such that the tips 11 or juncture points of the deformations with the side ribs underlie the mid portion 12 of an adjacent deformation and at an angle of approximately 43° relative to the axis of the bar.

The space between the deformations and maximum height may be varied as desired; for example, to conform with accepted practice of an approximate bearing and shear ratio of 1 to 5 and to provide the overlap above mentioned. This placement and overlap provides a bar of substantially constant cross section area in which a substantial part of the metal and deformations is used in the tensile strength of the bar.

In the deformations as described, the inner inclined face 9 of each deformation is substantially flat and the marginal edges 13 join with the oppositely sloping outer face 10. The faces 9 and 10 also have substantial line contact with the bearing faces 3 and 4 of the core as indicated at 14 and 15 but the over-fills may have slight fillets 16 and 17 on the respective sides thereof. The crescent formation and lapping relation of the deformations provide sufficient metal to retain the shape of the deformations and they are not readily sheared or wiped off by the rolls as the finished bars leave the rolls; however, the amount of metal in the deformations is sufficient to obtain the desired shear and bearing ratio in forming the constant degree of bond usually required in standard reinforcing bar specifications. While the deformations on one side of the bar may register with deformations on the opposite side of the bar, registry is not essential as substantially uniform cross section is assured even when the deformations on one side are staggered with respect to the deformations on the other side.

The modified form of bar shown in Fig. 7 is very similar to the form just described with the exception that the crescent-shaped deformations 18 on one side of the bar have been turned around or reversed with respect to the deformations 19 at the opposite side of the bar. In order to obtain the desired clearance of the bar from the roll, the angles of the inner and outer faces 20 and 21 are substantially 135° with respect to the surfaces 22 of the core of the bar. The angle of the outer face 21 of the deformation increases in angle toward the ends of deformation as shown in Fig. 10. The inner face 20 of the deformation correspondingly decreases in angularity toward the ends so as to accomplish the desired clearance and to maintain uniform width of the deformations. The deformations also decrease in height from the mid points thereof toward the sides of the bar and are completely symmetrical relative to the diameter of the bar at the ends of the deformations.

The form of the invention shown in Fig. 11 is substantially the same as the bar illustrated in Fig. 7 with the exception that the bar is provided with longitudinal ribs 23 and 24 extending transversely of the deformations at the central portions thereof to help distribute localized bending stresses in the bars so that when the bars are formed of exceptionally hard grade steel breakage of the bars will be minimized.

Attention is directed to the fact that the deformations at the respective sides of the bar span substantially the major portion of the width of

the side faces of the body portion of the bar; however, with the angles and shape of the deformations as above described, the bars are readily formed in simple, inexpensively machined rolls without shearing or wiping off of portions of the metal or requiring the use of heavy fillets.

What I claim and desire to secure by Letters Patent is:

1. A reinforcing rod including a cylindrical body portion having a series of substantially crescent-shaped transverse deformations projecting from each of two opposite sides of the body portion of the bar with ends of the crescent-shaped deformations disposed on substantially opposite sides of said faces and with convex and concave sides of said deformations diverging and forming obtuse angles with respect to the side faces in the longitudinal direction of the rod, said convex sides increasing and the concave sides decreasing in angularity from midway of said deformations toward the ends of the deformations.

2. A reinforcing rod including a cylindrical body portion having a series of crescent-shaped transverse deformations projecting from each of two opposite sides of the body portion of the bar with ends of the crescent-shaped deformations disposed on substantially opposite sides of said faces and with convex and concave sides of said deformations diverging and forming obtuse angles with respect to the side faces in the longitudinal direction of the rod, said convex sides increasing and the concave sides decreasing in angularity from midway of said deformations toward the ends of the deformations, and longitudinal ribs projecting from the body portion and joining the ends of said crescent-shaped deformations.

3. A reinforcing rod including a cylindrical body portion having a series of crescent-shaped transverse deformations projecting from each of two opposite sides of the body portion of the bar with ends of the crescent-shaped deformations disposed on substantially opposite sides of said faces and with convex and concave sides of said deformations diverging and forming obtuse angles with respect to the side faces in the longitudinal direction of the rod, said convex sides increasing and the concave sides decreasing in angularity from midway of said deformations toward the ends of the deformations, the deformations on one side face being arranged in reverse relation with deformations on the other side face.

4. A reinforcing rod including a cylindrical body portion having a series of substantially crescent-shaped transverse deformations projecting from each of two opposite sides of the body portion of the bar with ends of the crescent-shaped deformations disposed in substantially opposite sides of said faces and with convex and concave sides of said deformations diverging and forming at a mid point of the crescent-shaped deformations obtuse angles of substantially 135° with respect to the side faces in the longitudinal direction of the rod, said angle on the convex sides increasing from said mid point to ends of the deformations to substantially 125° and on the concave sides decreasing from said mid point to substantially 125° at the ends of said deformations, and longitudinal ribs projecting from the body portion and joining ends of said crescent-shaped deformations, the crescent-shaped deformations on one side face being reversely ar-

5

ranged with respect to the deformations on the other side face.

5. A reinforcing rod including a cylindrical body portion having a series of crescent-shaped transverse deformations projecting from each of two opposite sides of the body portion of the bar with ends of the deformations disposed on substantially opposite sides of said faces and with convex and concave sides of said deformations diverging and forming obtuse angles with respect to the side faces in the longitudinal direction of the rod, and joining with said body portion on substantially sharply defined lines, said convex sides increasing and the concave sides decreasing in angularity from midway of said deformations toward the ends of the deformations.

6. A reinforcing rod including a cylindrical body portion having a series of crescent-shaped transverse deformations projecting from each of two opposite sides of the body portion of the bar with ends of the deformations disposed on substantially opposite sides of said faces and with convex and concave sides of said deforma-

6

tions diverging and forming obtuse angles with respect to the side faces in the longitudinal direction of the rod, and joining with said body portion on substantially sharply defined lines, said convex sides increasing and the concave sides decreasing in angularity from midway of said deformations toward the ends of the deformations, the deformations on one side face being arranged in reverse relation with deformations on the other side face.

WILLIAM EDWARD BRADBURY.

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