

PATENT SPECIFICATION

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(54) ANCHORING OF CONCRETE REINFORCING BARS

(71) We, FOSROC INTERNATIONAL LIMITED, a British company of 36 Queen Anne's Gate, London, SW1H 9AR, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to the anchoring of an elongate element in a hole in a substrate, for example the anchoring of a bolt in a mine gallery roof or a civil engineering installation such as a parapet anchored to a rock substrate. Generally speaking the bolt is made of a reinforcing bar. Unfortunately this reinforcing bar has two disadvantages: first, it is necessary to thread the bar in order that it can receive a coupling and secondly, the bar is expensive.

In our Patent No. 1,382,054 we have described and claimed a method of anchoring such a bar in a hole of a diameter at least 5 mm larger than that of the bar, in which a sleeve is cast or otherwise located on the end of the bar which sleeve tends to fill the annular clearance between the bar and the hole wall, mixes up the self-setting composition used to anchor the bar within the hole and also enhances the tensile strength of the anchorage formed.

There has recently become available in Britain and other countries a reinforcing bar having preformed roll deformations which serve as threads onto which nuts or threaded sleeves can be received. Such a bar is known under a variety of names including 'threaded bar'. Because the bar deformations can serve as threads the bar may be cut at any point and coupled to another bar by means of a threaded coupler or the like, without a threading operation.

The invention is based upon the realisation that a threaded bar may be sleeved and used according to the earlier patent to give certain advantages.

According to the invention, there is provided as an improvement in or modification of our earlier application, a length of concrete reinforcing bar having thread like deformations formed thereon during rolling,

a sleeve being retained on the bar, the sleeve being cast of a self-setting composition and extending along a length of the bar.

Preferably the sleeve has been pre-formed of a self-setting composition of a resinous or cementitious nature. Where the composition is resinous this may be based on an epoxy, polyester, polyurethane or acrylate.

The sleeve may be formed in variety of ways. In one way the sleeve is cast about the bar, so forming a permanently sleeved bar. In another way the sleeve is cast about a threaded former to make a discrete sleeve having an internally threaded bore. Such a sleeve may be threaded onto a bar to form a sleeved bar which may be used as an anchor following which the bar may be unscrewed and removed for reuse.

Preferably the sleeve projects beyond one end of the bar, the projection being pointed to ease in guiding the sleeved bar into and within a hole or generally to serve for anchorage keying or mixing of the self-setting composition by which the sleeved bar may be anchored in a hole in a substrate.

The sleeve may have longitudinally spaced apart external circumferential ridges for improved keying of the sleeved bar in a hole in a substrate.

A particular use of a sleeve of the invention is in so-called one-sided shuttering where the bar is used to anchor a vertical shuttering wall parallel to a rock substrate and concrete is cast in the space between the wall and the substrate. In use, a hole is drilled in the rock, following which a cartridge according to Patent No. 1,460,588 is inserted and then a sleeved bar of the invention is inserted with rotation to rupture the cartridge and mix up its ingredients to form a self-setting composition by which the bar is anchored. At the free end of the bar (or any extension there) a nut is fixed to hold the shutter wall in position. Following casting and setting of the concrete, the nut may be removed and the bar removed by rotation and recovered for subsequent reuse. Free flowing self-setting composition may be used instead of a cartridge.

Two embodiments of the invention are 100

illustrated in the diagrammatic drawing accompanying the Provisional Specification in which:—

5 Figure 1 is a longitudinal section through an anchorage incorporating a sleeved bar according to the invention, and

Figure 2 is a cross sectional view of another sleeved bar.

10 In the embodiments shown a length of threaded bar 1 comprising a deformed billet steel concrete reinforcing bar having deformations 2 which serve as threads is anchored in a rock substrate 5. A sleeve 3 of filled polyester resin is cast onto the end portion of the bar 1, and extends along a length of about 40 mm. The sleeve 3 extends beyond the free end of the bar 1 by a distance of about 5 mm and terminates in the point 4. The bar is 16 mm in diameter and the sleeve 3 is of nominal 28 mm diameter. The sleeve 3 may be cast onto the bar 1 by known techniques, and as shown in Figure 2, has longitudinally spaced apart ridges.

25 In use, a resin cartridge of the type described in Patent No. 1,460,588, not shown, is located in the bottom of a hole 6 in the substrate 5. Thereafter the bar 1 is advanced with the sleeve end portion leading and the bar 1 is rotated to cause the point 4 to rupture the cartridge and release the ingredients of the self-setting composition contained within the cartridge and intermix them to form the self-setting composition 7 to anchor the sleeved bar within the hole 6. Thereafter an anchor plate 8 is secured to the exposed end portion of the bar 1 by a nut 9.

40 In the embodiment of Figure 2, a portion of a sleeved bar 1A is joined in end-to-end relation to another sleeved bar 1B. Where possible the reference numerals of Figure 1 are used in Figure 2. The lower end of the sleeved bar 1A has a metal internally threaded coupling sleeve 10, which is half threaded onto the bar 1A so as to leave a lower portion open. The free end of the lower bar 1B projects beyond its sleeve 3 and this is threaded into free end portion 50 of the coupler 10.

The sleeve may be cast separately from the bar using a threaded former, not shown, and then it may be threaded on the bar.

Advantages of the invention include a

lower initial cost, and full corrosion protection together with freedom from dependence on the diameter of the hole in the substrate.

WHAT WE CLAIM IS:—

60 1. A length of concrete reinforcing bar having thread like deformations formed thereon during rolling, a sleeve being retained on the bar, the sleeve being cast of a self-setting composition and extending 65 along a length of the bar.

2. A bar according to Claim 1, in which the sleeve has been pre-formed of a self-setting composition of a resinous or cementitious nature before being held on to the bar.

3. A bar according to Claim 1 or 2, in which the sleeve has been pre-formed of an epoxy, polyester, polyurethane or acrylate resinous composition.

4. A bar according to any preceding Claim, in which the sleeve projects beyond one end of the bar, the projection being pointed for anchorage keying or mixing of a self-setting composition by which the 80 sleeved bar may be anchored in a hole in a substrate.

5. A bar according to any preceding Claim, in which the sleeve has longitudinally spaced apart external circumferential ridges.

6. A method of making a sleeved bar according to any of Claims 1, 3, 4 or 5, comprising casting the sleeve about the bar to form the sleeved bar.

7. A method of making a sleeved bar 90 according to any of Claims 1 to 5, comprising first casting the sleeve about a threaded former to make a discrete sleeve having an internally threaded bore, and then threading the sleeve on to the bar.

8. A sleeved bar whenever made by a method according to Claim 6 or 7.

9. A sleeved bar substantially as described with reference to the drawing accompanying the Provisional Specification. 100

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illustrated in the diagrammatic drawing accompanying the Provisional Specification in which:—

Figure 1 is a longitudinal section through an anchorage incorporating a sleeved bar according to the invention, and

Figure 2 is a cross sectional view of another sleeved bar.

In the embodiments shown a length of threaded bar 1 comprising a deformed billet steel concrete reinforcing bar having deformations 2 which serve as threads is anchored in a rock substrate 5. A sleeve 3 of filled polyester resin is cast onto the end portion of the bar 1, and extends along a length of about 40 mm. The sleeve 3 extends beyond the free end of the bar 1 by a distance of about 5 mm and terminates in the point 4. The bar is 16 mm in diameter and the sleeve 3 is of nominal 28 mm diameter. The sleeve 3 may be cast onto the bar 1 by known techniques, and as shown in Figure 2, has longitudinally spaced apart ridges.

In use, a resin cartridge of the type described in Patent No. 1,460,588, not shown, is located in the bottom of a hole 6 in the substrate 5. Thereafter the bar 1 is advanced with the sleeve end portion leading and the bar 1 is rotated to cause the point 4 to rupture the cartridge and release the ingredients of the self-setting composition contained within the cartridge and intermix them to form the self-setting composition 7 to anchor the sleeved bar within the hole 6. Thereafter an anchor plate 8 is secured to the exposed end portion of the bar 1 by a nut 9.

In the embodiment of Figure 2, a portion of a sleeved bar 1A is joined in end-to-end relation to another sleeved bar 1B. Where possible the reference numerals of Figure 1 are used in Figure 2. The lower end of the sleeved bar 1A has a metal internally threaded coupling sleeve 10, which is half threaded onto the bar 1A so as to leave a lower portion open. The free end of the lower bar 1B projects beyond its sleeve 3 and this is threaded into free end portion of the coupler 10.

The sleeve may be cast separately from the bar using a threaded former, not shown, and then it may be threaded on the bar.

Advantages of the invention include a

lower initial cost, and full corrosion protection together with freedom from dependence on the diameter of the hole in the substrate.

WHAT WE CLAIM IS:—

1. A length of concrete reinforcing bar having thread like deformations formed thereon during rolling, a sleeve being retained on the bar, the sleeve being cast of a self-setting composition and extending along a length of the bar.

2. A bar according to Claim 1, in which the sleeve has been pre-formed of a self-setting composition of a resinous or cementitious nature before being held on to the bar.

3. A bar according to Claim 1 or 2, in which the sleeve has been pre-formed of an epoxy, polyester, polyurethane or acrylate resinous composition.

4. A bar according to any preceding Claim, in which the sleeve projects beyond one end of the bar, the projection being pointed for anchorage keying or mixing of a self-setting composition by which the sleeved bar may be anchored in a hole in a substrate.

5. A bar according to any preceding Claim, in which the sleeve has longitudinally spaced apart external circumferential ridges.

6. A method of making a sleeved bar according to any of Claims 1, 3, 4 or 5, comprising casting the sleeve about the bar to form the sleeved bar.

7. A method of making a sleeved bar according to any of Claims 1 to 5, comprising first casting the sleeve about a threaded former to make a discrete sleeve having an internally threaded bore, and then threading the sleeve on to the bar.

8. A sleeved bar whenever made by a method according to Claim 6 or 7.

9. A sleeved bar substantially as described with reference to the drawing accompanying the Provisional Specification.

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