

PATENT SPECIFICATION (11)

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- (21) Application No. 40435/73 (22) Filed 28 Aug. 1973 (19)
 (23) Complete Specification filed 27 Aug. 1974
 (44) Complete Specification published 27 July 1977
 (51) INT. CL.³ F16B 13/00
 (52) Index at acceptance
 F2H 16C 16G 17A2
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(54) ANCHORING USING SELF-SETTING COMPOSITIONS

(71) We, FOSROC INTERNATIONAL LIMITED, 36 Queen Anne's Gate, London, SW1H 9AR, England, a British Company, 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 anchoring and is particularly concerned with anchoring a fixing element in a substrate in such a way that the element can be replaced without damage to the anchorage. The fixing element may be a bolt, bar, rod or the like, preferably but not necessarily formed of metal.

According to the invention, a method of releasably securing a fixing element in a hole in a substrate comprises locating in the hole a quantity of self-setting composition; urging into the self-setting composition in the hole the fixing element, an anchorage member being releasably secured at or adjacent the end of the element to be received at the blind end or the hole, a sleeve extending between the anchorage member and the other end of the fixing element, the anchorage member extending laterally beyond the sleeve and allowing the self-setting composition to set to form a column in contact with the sleeve and extending between the anchorage member and the mouth of the hole and engaging the laterally extending portion of the anchorage member to resist withdrawal thereof.

Typically the fixing element will be a metal bolt or bar, although glassfibre rods or wooden bolts may be used. For a metal fixing element the releasable connection may be a screw thread connection, i.e. the fixing element will have a threaded portion for reception in a metal threaded socket anchoring member. Preferably the socket is open at both ends so that the anchorage member may be connected to the fixing element at any point along the threaded portion.

Preferably the sleeve is formed of a flexible plastics although a rigid sleeve may

be used. One purpose of the sleeve is to prevent adhesion between the fixing element and the self-setting composition by which it is to be secured in a hole in a substrate; another is to provide corrosion resistance. Preferably the sleeve will extend substantially the length of the element but it may be shorter according to the desired depth of the anchorage. The sleeve may be held to the element in any convenient way. A grease or the like may be present in the annulus between the element and the sleeve to enhance ease of release of the fixing element and resistance to corrosion.

The anchorage member is anchored in the substrate by a self-setting composition which may be cementitious but preferably is resinous, examples being polyester, epoxy or polyurethane.

The invention includes a fixing element when releasably secured in a hole in a substrate by a method as just described. It further includes, for use in the method, a fixing element having located at or adjacent one end an anchorage member, a sleeve being heat shrunk on to the fixing element between the anchorage member and the other end of the fixing element.

Embodiments of the invention are illustrated by the accompanying diagrammatic drawings, in which:—

Figure 1 is an elevation partly in section of a bolt fixing element of the invention;

Figure 2 is a sectional view of an anchorage made using the bolt of Figure 1; and

Figure 3 is a side elevation, partly in section, of a bolt having self-levelling means.

The bolt of Figure 1 comprises a head 1 having a shank 2 and a lower threaded end portion 3. The threaded end portion 3 is partially screwed into a threaded socket 4, conveniently knurled on the outside, and of a diameter substantially greater than that of the bolt. The lower end of the socket 4 is plugged by means of a plastics cap 5.

A heat shrinkable plastics sleeve 6, for example of polyethylene, is located about

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the shank 2 and is heat shrunk thereto at the lower end to be loosely held into the shank. To assemble the bolt to the condition shown, the sleeve 6 is slid on to the shank, the lower end of the sleeve 6 is heat shrunk on the bolt using heated pliers sufficient to prevent relative axial movement between the bolt and the sleeve and then the socket 4 is threaded onto the threaded end 3, to overlie the heat shrunk portion of the sleeve 6. The bolt may have a grease coating which will lie in the annular space between the shank 2 and the sleeve 6.

5 A suitably sized hole 7 is drilled in a concrete base 8, Figure 2. A body of free flow polyester resin grout such as LOKSET (Registered Trade Mark) marketed by Chemical Building Products Limited, is located in the hole 7 and the bolt is then urged to the bottom of the hole. The resin is allowed to cure and set to anchor the bolt assembly in the hole. The sleeve bonds to the formed column of resin 9.

10 The bolt may be unthreaded from the socket 4 and pulled through the sleeve 6 out of the hole 7, leaving the sleeve bonded to the resin column 9. The bolt may be re-threaded into the hole or a longer bolt may be used, the extra length of the bolt breaking through the cap 5 (for very long bolts, the cap may be extended to form a larger cavity at the bottom of the hole to receive such extra bolt length).

15 Because of the difference in diameter between the sleeved bolt 2 and the socket 4, the latter forms a shoulder on which the column of set resin 9 stands, and the presence of this shoulder improves the resistance of the formed anchorage to a pull-out force.

20 The bolt may be used to anchor a crash barrier post, a street light pedestal or the like; if the carrier is broken, and the bolt 2 is weaker than the socket 4, the bolt will break and it may be replaced easily.

25 The bolt of Figure 3 has adjacent the head 1 a pair of plates 10, 11, between which a compression spring 12. The bolt may be secured in a hole in the way described in relation to the bolt of Figure 1. The bolt may be used as a means of leveling a pedestal base to be anchored, further torque applied to the bolt tending to compress the spring 12. Such a bolt may be used in anchoring a rail track, for example of a crane.

Either bolt may have a head adapted to be received in the chuck of a rotary drill.

WHAT WE CLAIM IS:—

1. A method of releasably securing a fixing element in a hole in a substrate, comprising locating in the hole a quantity of self-setting composition; urging into the self-setting composition in the hole the fixing element, an anchorage member being releasably secured at or adjacent the end of the element to be received at the blind end of the hole, a sleeve extending between the anchorage member and the other end of the fixing element, the anchorage member extending laterally beyond the sleeve and allowing the self-setting composition to set to form a column in contact with the sleeve and extending between the anchorage member and the mouth of the hole and engaging the laterally extending portion of the anchorage member to resist withdrawal thereof.
2. A method to Claim 1 in which the fixing element and the anchorage member are releasably connected by screw threads.
3. A method according to Claim 1 or 2, in which the sleeve is heat shrunk on to the fixing element.
4. A method according to any preceding Claim, in which a grease or like lubricant is present between the sleeve and the fixing element.
5. A method according to any preceding Claim, in which the self-setting composition is a resin grout.
6. A method of releasably securing a fixing element in a hole in a substrate substantially as described with reference to the drawing.
7. A fixing element when releasably secured by a method according to any preceding Claim.
8. For use in a method according to any of Claims 1 to 6, a fixing element having located at or adjacent one end an anchorage member, a sleeve being heat shrunk on to the fixing element between the anchorage member and the other end of the fixing element.
9. A fixing element according to Claim 8, including a grease or like lubricant between the sleeve and the fixing element.
10. A fixing element substantially as described with reference to the drawings.

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the shank 2 and is heat shrunk thereto at the lower end to be loosely held into the shank. To assemble the bolt to the condition shown, the sleeve 6 is slid on to the shank, the lower end of the sleeve 6 is heat shrunk on the bolt using heated pliers sufficient to prevent relative axial movement between the bolt and the sleeve and then the socket 4 is threaded onto the threaded end 3, to overlie the heat shrunk portion of the sleeve 6. The bolt may have a grease coating which will lie in the annular space between the shank 2 and the sleeve 6.

A suitably sized hole 7 is drilled in a concrete base 8, Figure 2. A body of free flow polyester resin grout such as LOKSET (Registered Trade Mark) marketed by Chemical Building Products Limited, is located in the hole 7 and the bolt is then urged to the bottom of the hole. The resin is allowed to cure and set to anchor the bolt assembly in the hole. The sleeve bonds to the formed column of resin 9. The bolt may be unthreaded from the socket 4 and pulled through the sleeve 6 out of the hole 7, leaving the sleeve bonded to the resin column 9. The bolt may be re-threaded into the hole or a longer bolt may be used, the extra length of the bolt breaking through the cap 5 (for very long bolts, the cap may be extended to form a larger cavity at the bottom of the hole to receive such extra bolt length).

Because of the difference in diameter between the sleeved bolt 2 and the socket 4, the latter forms a shoulder on which the column of set resin 9 stands, and the presence of this shoulder improves the resistance of the formed anchorage to a pull-out force.

The bolt may be used to anchor a crash barrier post, a street light pedestal or the like; if the carrier is broken, and the bolt 2 is weaker than the socket 4, the bolt will break and it may be replaced easily.

The bolt of Figure 3 has adjacent the head 1 a pair of plates 10, 11, between which a compression spring 12. The bolt may be secured in a hole in the way described in relation to the bolt of Figure 1. The bolt may be used as a means of leveling a pedestal base to be anchored, further torque applied to the bolt tending to compress the spring 12. Such a bolt may be used in anchoring a rail track, for example of a crane.

Either bolt may have a head adapted to be received in the chuck of a rotary drill.

WHAT WE CLAIM IS:—

1. A method of releasably securing a fixing element in a hole in a substrate, comprising locating in the hole a quantity of self-setting composition; urging into the self-setting composition in the hole the fixing element, an anchorage member being releasably secured at or adjacent the end of the element to be received at the blind end of the hole, a sleeve extending between the anchorage member and the other end of the fixing element, the anchorage member extending laterally beyond the sleeve and allowing the self-setting composition to set to form a column in contact with the sleeve and extending between the anchorage member and the mouth of the hole and engaging the laterally extending portion of the anchorage member to resist withdrawal thereof.

2. A method to Claim 1 in which the fixing element and the anchorage member are releasably connected by screw threads.

3. A method according to Claim 1 or 2, in which the sleeve is heat shrunk on to the fixing element.

4. A method according to any preceding Claim, in which a grease or like lubricant is present between the sleeve and the fixing element.

5. A method according to any preceding Claim, in which the self-setting composition is a resin grout.

6. A method of releasably securing a fixing element in a hole in a substrate substantially as described with reference to the drawing.

7. A fixing element when releasably secured by a method according to any preceding Claim.

8. For use in a method according to any of Claims 1 to 6, a fixing element having located at or adjacent one end an anchorage member, a sleeve being heat shrunk on to the fixing element between the anchorage member and the other end of the fixing element.

9. A fixing element according to Claim 8, including a grease or like lubricant between the sleeve and the fixing element.

10. A fixing element substantially as described with reference to the drawings.

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