

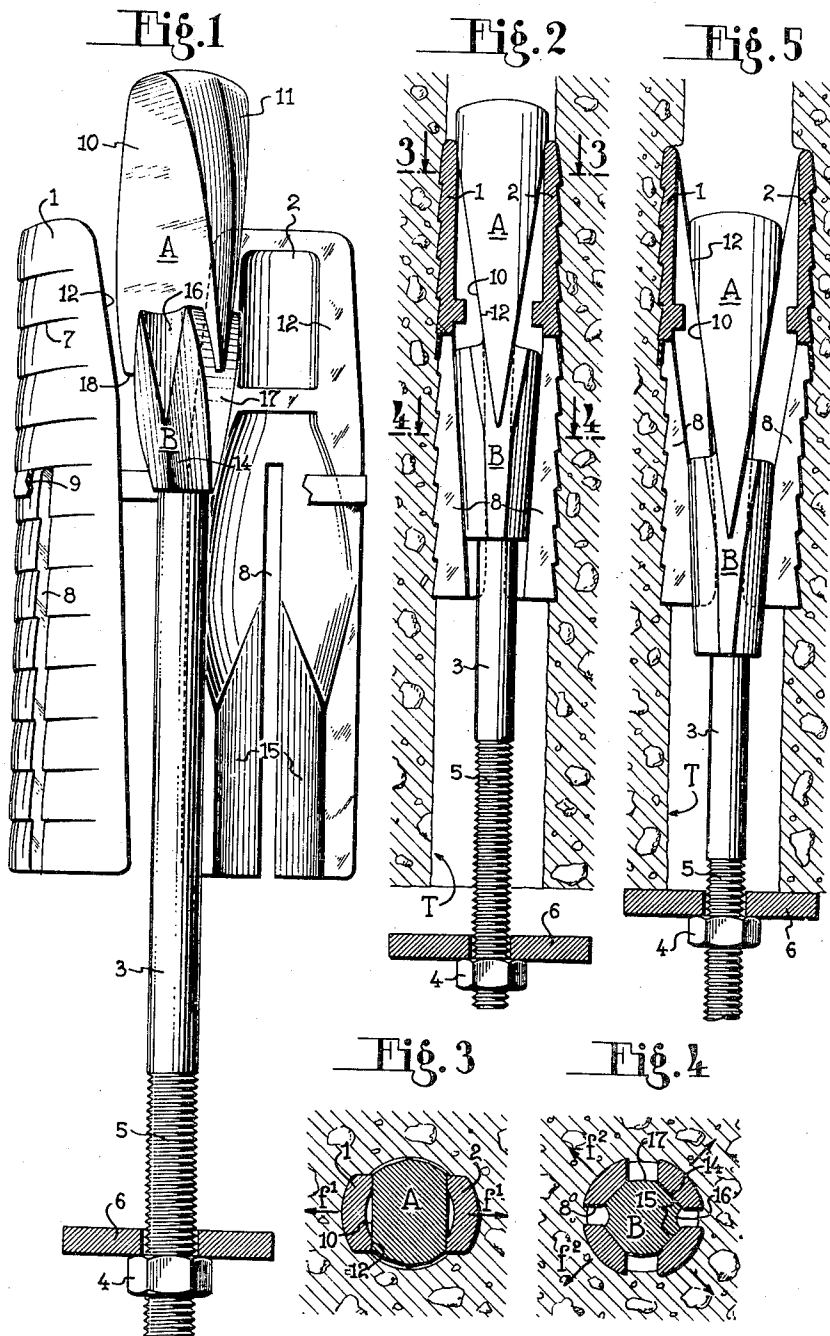
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ANCHORING DEVICE

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ANCHORING DEVICE

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The present invention relates to anchoring devices and in particular anchoring devices of the type comprising a traction rod provided with a plurality of groups of cams in different regions which co-operate with corresponding groups of ramps provided on shells forming a segmented tube encompassing the rod.

These anchoring devices are used for various purposes and particularly for setting objects in walls, bedding down machines and for any application involving rigidly holding an object to material in which it is possible to make a hole.

These devices are of particular use in mines for the bolting of the roofing, facings and wall. In these various applications, and notably the latter application, very great tensile stresses are produced in the anchoring device and it is therefore necessary—if the anchoring device is to remain in position and perform its function—that the shells should be perfectly hooked or anchored in the material in which they are embedded.

The object of the present invention is to provide an anchoring device which is an improvement over known anchoring devices in this respect.

The anchoring device of the invention is of the aforementioned type and is characterised in that at least a first of the groups of cams and the corresponding group of ramps are so arranged as to obtain a parallel separation of the shells in the direction of a diameter of the tube constituted by the shells, and at least a second of said groups of cams and its corresponding group of ramps are so arranged as to ensure a circumferential expansion of the shells which are split in their corresponding part in the longitudinal direction relative to the anchoring device.

As a result of these two expansions of different type there is obtained a particularly satisfactory anchoring, inasmuch as the shells are deformed over a crooked or uneven surface which anchors in a very effective manner into the wall of the bored hole, the shells exactly conforming to the shape of this wall.

In a preferred embodiment, the first group of cams acts on ramps formed at the joints of the shells and the second group of cams is located nearer to the traction end of the rod and acts on ramps provided on the inner face of the shells.

Further features and advantages of the invention will be apparent from the ensuing description, with reference to the accompanying drawing, to which the invention is in no way limited.

In the drawing:

FIG. 1 is an exploded view of the elements constituting the anchoring device of the invention;

FIG. 2 is a longitudinal sectional view of the device shown in FIG. 1 in the position it occupies at the start of anchoring in a bored hole;

FIGS. 3 and 4 are cross-sectional views taken along lines 3—3 and 4—4 of FIG. 2, and

FIG. 5 is a view similar to FIG. 2 of the anchoring device at the end of anchoring.

In the embodiment shown in the figures, the anchoring device comprises two shells 1 and 2 forming by their adjacent relationship a segmented tube in which is disposed a traction rod, which is provided with two groups of cams A and B in different regions.

Traction means, such as a nut 4 screw-threadedly en-

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gaged on the lower screw-threaded end 5 of the rod 3, permits pulling the traction rod downwardly relative to the shells, this traction means bearing against the outer end of the bored hole through the medium of a plate 6 (FIG. 1).

The outer face of the shells 1 and 2 are provided with notches or recesses 7 adapted to facilitate their anchoring in the bored hole. The shells also comprise longitudinally extending slits or slots 8 at their lower part for the purpose mentioned hereinafter.

The shells 1 and 2 are applied against the rod 3 and cams by elastically yieldable connecting means 9 which bear against one of the notches 7 or in recesses provided for this purpose.

In accordance with the invention, the two groups of cams A and B and their corresponding groups of ramps formed on the shells are arranged in a special manner.

The cams of the group A are formed by the opposed lateral faces 10 of a first wedge 11. These lateral faces act on inclined ramps 12 formed at the joints of the shells, that is, on the longitudinally extending edges of the latter.

The cams of group B are formed by the lateral faces 14 of a second wedge in the form of a truncated pyramid which co-operates with similarly inclined ramps 15 formed on the inner face of the shells. Two ramps 15 are provided on each shell on either side of the longitudinal slit 8 and on which two lateral faces of the truncated pyramid act. This pyramid has truncations 16 and 17 in regions adapted to face respectively the slots 8 and the shell joints (FIGS. 1 and 4).

It is clear therefore that the group of cams A and the group of cams B interpenetrate or, in other words, overlap. Thus, the edge 18 of the wedge 11 penetrates the base of the wedge B. This reduces the overall height of the cams and in consequence that of the shells and results in a better seating of the cams on the shells, the surface of the latter co-operating with the cams being very great relative to the inoperative surface.

The operation of the anchoring device will now be described with reference to FIGS. 2 to 5.

FIG. 2 shows the device at the start of anchoring, that is, just after it has been inserted in the bored hole T. Owing to its weight or to a manual traction exerted thereon, the rod 3 slightly separates the shells 1 and 2 which anchor in the wall of the hole T through the medium of their notches 7.

The plate 6 is then placed in position on the rod 3 and the nut 4 is screwed on the latter.

In the first stage, the nut 4 is screwed on the rod to take up play and bring the plate 6 against the outer end of the hole T. Further screwing of the nut causes the rod to move downwardly relative to the shells and causes the cams to act on their corresponding ramps.

FIG. 3 shows the action of the group of cams A. The faces 10 acting on the ramps 12 tend to separate the shells 1 and 2 in the direction of a diameter of the tube constituted by these shells, the forces exerted on the shells in opposition to the resistance of the surrounding material in which the shells are embedded, being shown by the arrows f_1 .

Thus the upper part of the shells undergoes a diametral expansion but the lower part thereof undergoes, under the effect of the cam faces 14 acting on the inner ramps 15 (FIG. 4), a circumferential expansion permitted by the slots 8, this expansion being in the direction of arrows f_2 (FIG. 4). In other words, there is created at the base of the shells a region of annular pressure which is also affected by the action of the upper group of cams A. In this way there is obtained a self-blocking action which improves the anchoring.

The position of the device at the end of anchoring is

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shown in FIG. 5, the shells 1 and 2 having undergone maximum expansion and anchoring positively in the wall of the hole T. It will be observed that the groups A and B and their corresponding ramps can be so arranged as to obtain a simultaneous action of the two groups or an action which is staggered at the start of the anchoring. Thus, the group of cams B could be the first to act so as to obtain an initial anchoring or hooking of the shells in the wall of the hole T.

Although a specific embodiment of the invention has been described, many modifications and changes may be made therein without departing from the scope of the invention as defined in the appended claims.

Thus, there could be provided groups of cams other than the groups A and B; in this case the groups A and B could be separated by one or more groups of cams acting in the diametral or circumferential direction. Further, it is not necessary that the groups of cams A and B should overlap as shown in the figures, although there is thereby obtained an important advantage as concerns the overall length of the device and an improved seating of the ramps on the cams. The traction means provided at the base of the rod 3 could be other than a nut. The group of cams B could be formed by the lateral face of a truncated cone and not a truncated pyramid.

Having now described my invention what I claim as new and desire to secure by Letters Patent is:

1. Anchoring device comprising two shells constituting a tube segmented along a first axial plane thereof, said shells being provided along the portion thereof facing said first axial plane with a first group of ramps and being split longitudinally at one of their ends spaced from said first group of ramps, thereby forming slots which extend along a second axial plane of said tube substantially perpendicular to said first axial plane, said shells being provided on their inner face with a second group of ramps dis-

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posed on each side of said slots, said second group of ramps being secured to said first group of ramps by a bendable neck portion, a traction rod disposed inside said tube, traction means for exerting a traction on one end of said rod and moving the latter axially in said tube, said traction rod comprising in different regions thereof a wedge, two opposed lateral faces of which constitute a first group of cams, and a block convergent toward said one end of the rod and having a quadrangular cross section, the four lateral faces of which constitute a second group of cams, whereas the longitudinal edges of said block limiting said four lateral faces are disposed alternately in said first axial plane and in said second axial plane, each of said groups of cams being adapted to face its corresponding group of ramps, said parts being so constructed and arranged that, upon axial movement of said rod, the cooperation of said first group of cams with said first group of ramps effects a separation of said shells in a direction parallel with said first axial plane, and the cooperation of said second group of cams with said second group of ramps causes a bending movement thereof about said neck portion to effect a circumferential expansion of said shells.

2. An anchoring device as claimed in claim 1, wherein said longitudinal edges of said block are truncated.

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