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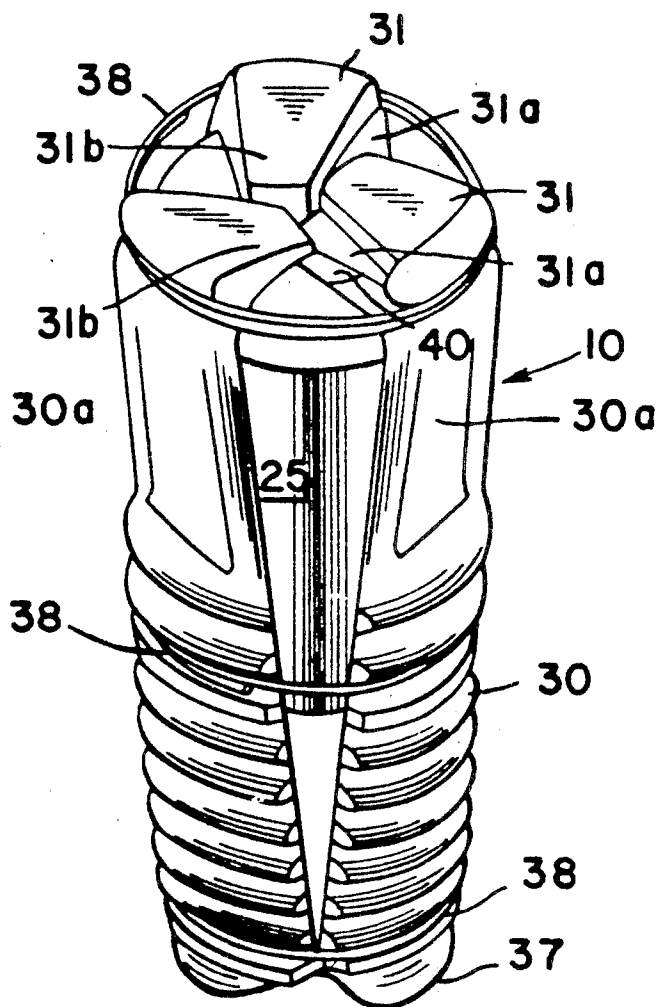
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*Primary Examiner*—Marion Parsons, Jr.  
*Attorney*—Seidel and Gonda

[54] **ANCHOR FOR MINE ROOF BOLT**  
1 Claim, Drawing Figs.

|      |                              |                                          |
|------|------------------------------|------------------------------------------|
| [52] | <b>U.S. Cl.</b> .....        | 85/75,<br>85/87                          |
| [51] | <b>Int. Cl.</b> .....        | <b>F16b 13/06</b>                        |
| [50] | <b>Field of Search</b> ..... | 85/73, 74,<br>75, 76, 67, 79, 86, 87, 88 |

**ABSTRACT:** A mine roof bolt comprising a segmented expansion shell radially expanded by a wedge nut. Each segment having a inwardly directed triangular member at its upper end which cooperate with each other to resist axial displacement.



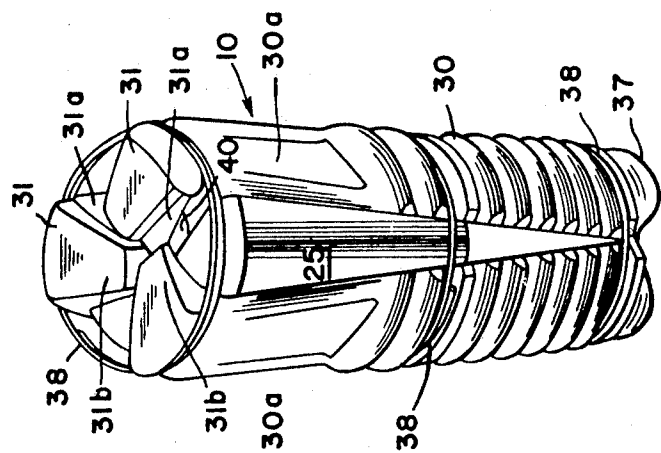


FIG. 1

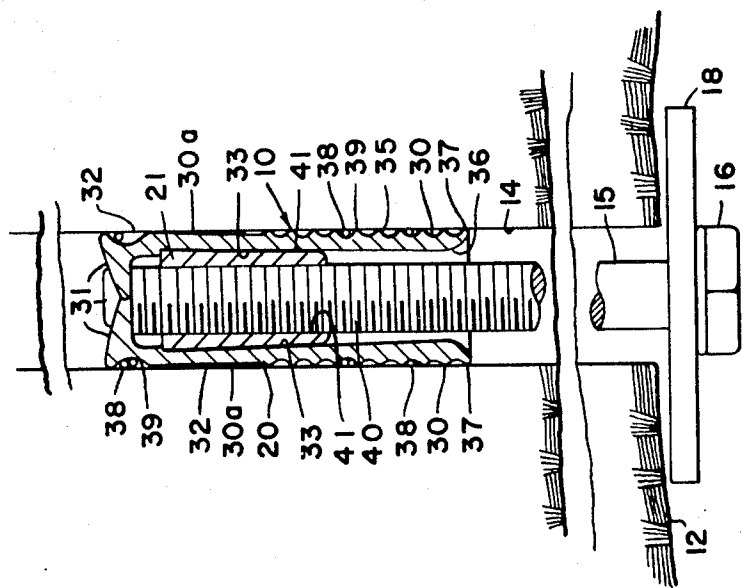


FIG. 2

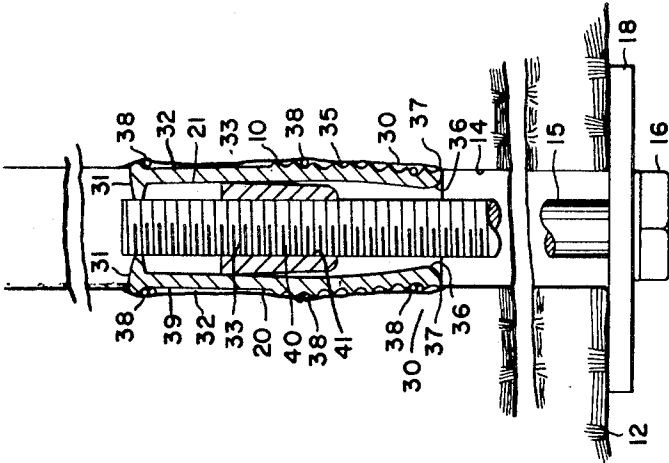


FIG. 3

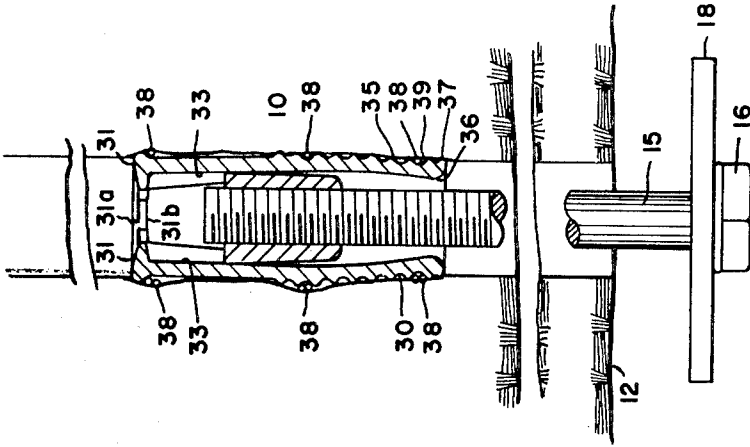


FIG. 4

U.S. PATENT 3,522,755  
ANCHOR FOR MINE ROOF BOLT

This invention relates to mine roof bolts and more particularly to a roof bolt expansion anchor.

In present day mining operations wooden supports have been replaced by bolts inserted in holes drilled in the mine ceiling for supporting the mine ceiling. This practice is popularly called rock bolting.

In one type of rock bolt installation, bolts which may be from three to six feet or more in length, are disposed in drilled holes extending into the rock or other roof strata. The bolt extends through an apertured steel plate or the like which engages the surface of the rock. An anchor unit is provided on the threaded upper end of the bolt.

The anchor unit expands laterally as the bolt is tightened so as to firmly engage the sides of the drill hole. Further tightening of the bolt draws the steel plate tightly against the rock thus providing the desired tension in the bolt.

It will be appreciated that a great number of such anchors are required as the mine tunnels are extended. However when areas of the mine are no longer in use, the anchors may not be required and could be used elsewhere.

It is therefore an object of this invention to provide a readily retrievable anchor unit which is capable of being used a number of times.

In one type of anchor laterally spreadable sections or wings are shaped to provide a generally cylindrical exterior for engagement in the drill hole. The wings are adapted to be moved radially outwardly by an expander plug threadedly received on the roof bolt. The expander plug and the wing portions have cooperating cam surfaces which move the wing portions outwardly when the plug is moved longitudinally relative to the wing portions. This longitudinal movement of the wedge plug is provided mainly by the tension developed in the bolt as the head of the bolt engages the apertured steel plate and the bolt is turned to reduce the effective length of the bolt.

The disadvantage of providing the longitudinal movement of the wedge in the foregoing manner is that it is possible for the wing portions to move down the bolt with the plug and little if any expansion of the anchor unit takes place. Such a situation could arise for example as the result of a portion of the bore being over sized.

This disadvantage can be overcome by providing each of the upper wing portions with a member adapted to engage the end of the bolt thereby ensuring movement of the wedge plug relative to the wing portions. However the member adapted to be engaged by the end of the bolt must be strong enough to provide the desired longitudinal movement of the wedge plug.

A further problem encountered is that of preventing misalignment or separation of the wing portions as the bolt is driven into the anchor or if the assembly is subjected to rough handling.

The present invention overcomes the above-mentioned disadvantages of the prior devices by providing a rock anchor unit including a shell comprising segments of a cylinder each said segment terminating at its normally upper end in a radially inwardly directed member adapted to interlock with inwardly directed members on adjacent said segments of said shell, a wedge plug received between the segments of the shell and at least one ring encircling said shell whereby a bolt threadedly received in said plug moves the plug longitudinally to expand the shell. The inwardly directed members are adapted to be engaged by the end of a bolt to initiate expansion of said shell and the bolt may be driven through the interlocking top structure formed by the members without damaging the shell.

In the drawings which illustrate a preferred embodiment of the invention:

FIG. 1 is a perspective view of an anchor unit in accordance with this invention.

FIG. 2 is a sectional side elevational view of the expansion anchor assembly inserted in a bore hole in a mine ceiling prior to expansion of the anchor unit.

FIG. 3 is a sectional side elevational view of the expansion anchor of FIGURE 1 and FIGURE 2 in use in a mine ceiling bore, and

FIG. 4 is a sectional view similar to FIG. 3 showing the anchor about to be retrieved.

Referring now in detail to the drawings, an expansion anchor assembly indicated generally by numeral 10 is shown installed in a mine ceiling 12 provided with a drilled hole 14. The anchor unit 10 is adapted to anchor a roof bolt 15 having a head 16 bearing against a plate 18 which is to be drawn into supporting engagement with the mine ceiling 12.

The anchor unit 10 includes a shell 20 and an expander plug 21. The shell 20 is preferably cast metal and includes three wing portions 30 which are segments of a cylinder each having an integral inwardly extending triangular portion 31 at their normally upper ends 32. Each of the triangular portions 31 has flanges 31a and 31b on its side edges adapted to fit under or over similar flanges on adjacent triangular portions 31. The triangular portions have rounded upper surfaces to provide for easier insertion of the anchor unit 10 in the drill hole 14.

It will be noted that the exterior portion of each wing portion 30 adjacent its triangular portion 31 is flat at 30a and that transverse teeth or ribs 35 are formed on the periphery of the lower portion of each wing portion 30. The shell segments also have arcuate recesses 36 formed in their lower inner faces to receive the bolt 15 when the shell 20 is unexpanded (See FIG. 2). A further rib or tooth 37 is provided at the lower end of each wing portion 31.

Retaining rings 38 preferably of spring wire encircle the shell 20 and are seated in grooves 39.

The expander plug 21 may be cast or forged to provide a threaded axial bore 40 and three downwardly and inwardly tapering flat wedging surfaces 41 to cooperate with the flat wedging surfaces 33 of the shell 20.

The anchor unit 10 is assembled by arranging the wing portions 30 about the plug 21, expanding the rings 38 and sliding the rings onto the shell 20.

It will be apparent that the anchor unit 10 will remain in the assembled condition even though subjected to the extremely rough handling generally encountered in the mine. This ruggedness of the unit 10 is due to the interlocking crown structure formed by the triangular portions 31.

In use of the anchor unit 10, the bolt 15 is inserted through the plate 18 and the upper end thereof is threaded into the bore 40 of the expander plug 21. The anchor unit 10 and bolt 15 are then inserted in the mine ceiling bore 14. The wings 30 exert some pressure on the walls of the bore 14 and thus the sharp edges of the lower ribs 37 engage the wall to keep the shell 20 from turning in the initial stage of installation. The bolt 15 is preferably capable of being turned to move the wedge plug 21 a distance sufficient to expand the shell 20 the desired amount before tension is developed in the bolt 15.

Turning the bolt 15 into the wedge plug 21 causes the upper end of the bolt 15 to engage the underside of the triangular portions 31 of the shell 20. Continued rotation of the bolt 15 forces the wedge plug 21 axially downwardly toward the open end of the shell 20. This axial movement of the wedge plug 21 causes the wing portions 30 to be spread as shown in FIG. 3 due to the cooperative engagement of the wedging surfaces 33 and 41. It will be appreciated that the ribs 35 will indent themselves to some extent in the wall of the drill hole 14 during expansion of the shell 20. The flattened portions of the wings 30 are more flexible and allow the shell 20 to "barrel" as shown in FIG. 2 without fracturing.

After the anchor unit 10 has been expanded to a point of secure anchorage, rotation of the bolt 15 is continued causing the plate 18 to be drawn into engagement with the mine ceiling 12 by the bolt head as shown in FIG. 3.

It will be noted that the wing portions 30 are maintained in proper alignment by the rings 38 although the bolt 15 has been driven past the triangular portions 31 as illustrated in FIGURE 3.

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Retrieval of the anchor 10 merely involves loosening the bolt 15 until it is in the approximate position shown in **FIGURE 4**. The bolt 15 and the wedge plug 21 are then driven upward as by a hammer blow allowing the shell 20 to contract aided by the resilient retaining rings 38 and the bolt 15 and anchor 10 are withdrawn from the bore 14.

I claim:

1. A retrievable anchor for a mine roof suspension bolt said anchor comprising a shell including at least three segments each of which is a segment of a hollow cylinder having a flat outer surface at an upper portion of each said segment to facilitate bending and a flat inner bearing surface, each said segment terminating at its normally upper end in an inwardly directed triangular member having an integral flange below said triangular member and extending from a side edge

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thereof for engaging an underside of a triangular portion of an adjacent member whereby when assembled said inwardly directed members of adjacent segments interlock to resist axial displacement, a wedge plug received between the segments of the shell and having flat bearing surfaces to cooperate with said bearing surfaces of said segments and expandable resilient rings encircling said shell at an upper and a lower end whereby inward movement of an upper end of a bolt threadedly received in said plug engages said inwardly directed members to cause initial expansion of said anchor and further inward movement of said bolt causes said triangular members to spread apart to allow passage of said bolt therethrough.

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