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(71) Applicant: BESTOBELL SOUTH AFRICA LIMITED
Bells Circle North Reef Road
Elandsfontein Transvaal Province(ZA)

(72) Inventor: Venter, Dirk Cornelius Stephanus
11 Duffton Road Aston Manor
Kempton Park Transvaal Province(ZA)

(74) Representative: Slight, Geoffrey Charles et al,
Graham Watt & Co. Riverhead
Sevenoaks Kent TN13 2BN(GB)

(54) **Elongate mine support.**

(57) An elongate mine support comprising a timber pole (2) with a metal sleeve (3) reinforcement therearound has circumferential weaknesses (4) in the sleeve for assisting controlled collapse of the sleeve when the support is under axial load. The circumferential weaknesses may be formed between the adjacent edges of separate sleeves (29) (see Figure 6). The separate sleeves (35) (see Figure 7) may each be belled at its lower end so as to slip each one over the next lower sleeve during a controlled collapse of the support. The weaknesses (8) (see Figure 2) may be spirally formed and so as to be capable of being torn off (see Figure 4) to assist in shortening the support. The weaknesses (44) (see Figure 8) or (52) (see Figure 9) may be formed as corrugations.

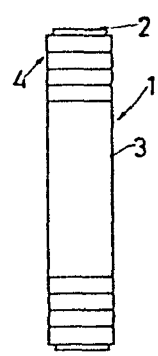

FIG.1

EP 0 142 280 A2

ELONGATE MINE SUPPORT

THIS INVENTION relates to an elongate mine support having a metal sleeve reinforcement means for restraining timber expansion transverse to the element length when the support is under axial load.

The concept of a timber pole having a sleeve therearound is well known in the art, and generally the sleeve is added to the pole to provide additional rigidity and to prevent the timber fibres collapsing transversely to the element when under load, and thus to encourage the pole to collapse in a controlled manner in an axial direction, as is desired.

However, the steel sleeves are not necessarily ideally suited for this purpose. It is known to use a number of techniques of removing wood from the timber to create voids therein, so that the wood may collapse in a controlled manner as dictated by the void pattern. A large variety of different configurations of such voids are known in the art.

However, little attention has been paid to providing the reinforcement means itself with some means of ensuring controlled collapsibility.

It is an object of this invention to provide a mine support comprising a timber load supporting element and having a circumferential metal sleeve reinforcement means with means for encouraging the controlled axial collapse of the sleeve.

In accordance with this invention there is provided a mine support comprising an elongated timber load supporting element having circumferential metal sleeve reinforcement means for restraining timber expansion transverse to the element length when the support is under axial load, the reinforcement means having at least one circumferentially extending zone of weakness adapted to allow it to collapse axially in controlled manner when the support is under axial load.

A feature of the invention provides for a zone of weakness to be formed by at least one indentation in the metal of the reinforcement means.

The indentations may be in the form of axially spaced rings, or alternatively in the form of a spiral.

The direction of indentation may be radially inwardly or outwardly, and in the latter case it is a feature of the invention that the indentations are curved in cross-section, and preferably part-circular in cross-section.

The formation of the indentations is preferably achieved by a turning tool.

The sleeve reinforcement means may include a sleeve which extends to one end of the element, and may include an integral sleeve which extends over at least a major portion of the element.

Alternatively or in addition, the sleeve reinforcement means includes a plurality of short sleeves located axially adjacent each other, the adjacent edges between the sleeves forming the zones of weakness.

A further feature of the invention provides for the reinforcement means to include a sleeve extending to at least one end of the element, and the zone of weakness to be in the form of a spiral extending to at least one of such ends, and to be adapted to be tearable along the spiral formed from at least one of such ends to shorten the sleeve.

Further alternatively, there is provided for, in the case of the use of short sleeves, for the short sleeves to be located at least one end region and to be removed by axially sliding them from the element to shorten the sleeve reinforcement means.

Still further, these short sleeves may optionally have at least one sleeve end outwardly belled, and the sleeves are then located with each belled end adjacent a non-belled end, the adjacent ends forming zones of weakness with the belled ends being adapted to expand and cause the sleeve to commence sliding over each other when the support is under axial load.

Preferred embodiments of the invention are described below by way of example only, and with reference to the accompanying drawings, in which:

Figure 1 is a side view of a mine support with a metal sleeve reinforcement with axially spaced ring-like zones of weakness;

Figure 2 is a side view of a mine support having a metal sleeve reinforcement with a spiral zone of weakness therearound;

Figure 3 is a side view of a mine support of Figure 1 after axial compression

Figure 4 is a side view of a portion of mine support having a sleeve with a spiral zone of weakness which extends to one end and is tearable along the spiral;

Figure 5 is a side view of a tool for assisting in tearing way the spiral strip of the embodiment of Figure 4;

Figure 6 is a side view of a portion of a mine support having a sleeve-like reinforcement and including further short sleeve reinforcements which are removable from the support elements;

Figure 7 is a side view of a portion of a mine support having a sleeve reinforcement with further short sleeve reinforcements at one end thereof, the sleeve reinforcements having belled ends;

Figure 8 is a side view of an end of a mine support having a metal sleeve reinforcement with outwardly indented radial rings as zones of weakness.

Figure 9 is a side view of an end of a mine support having metal sleeve reinforcement with a corrugated cross-sectional wall shape providing ring zones of weakness.

Referring to Figure 1, a mine support 1 comprises a length of timber 2 with a metal sleeve 3 fitted snugly therearound and extending substantially for the length of the timber. The metal sleeve has a number of circumferential ring indentations 4 spaced axially from each other from each end thereof extending for a short distance from the ends. The indentations are formed with a turning tool preferably against a backing preferably, to create radially inwardly inclined indentations.

Referring to Figure 2, a mine support 6 comprises a length of timber pole 5 having a metal sleeve 7 fitted snugly therearound and extending for the length of the timber, with a spiral indentation 8 leading from one end 9 of the sleeve and extending for a short distance therefrom.

The indentation is formed by a turning process and the indentation is radially inward, as described with reference to Figure 1.

Referring to Figure 3, a mine support 10 is shown, in a condition after axial compression, and shows the typical brushing over 11 of the timber ends, and the wrinkling or concertinaring 12 that occurs by reason of the compression of the sleeve 3, assisted by the zones of weakness in the form of either rings or a spiral. It is not claimed that this exact effect will invariably be obtained, and on occasions a stick or buckling failure will occur before much compression of the support is obtained, as is known in the case of timber elongate props.

Referring to Figure 4, a section of a mine support 15 is shown having a sleeve 16 extending the length of a timber pole 17, and being provided with a radially inwardly indented spiral 18 as described with reference to Figure 3. The indentation in this case however is sufficient to create a line of weakness along the spiral so that the sleeve may be torn therealong. The spiral extends to the sleeve end and meets the end at a position 19. In use, the spiral may be torn away as illustrated to shorten the sleeve length, and thus make it easier for the timber pole to be sawn to length undergound for use in varying stope heights.

Referring to Figure 5, a tool for assisting in the tearing away process of the sleeve of the embodiment of Figure 4 is shown. The tool comprises a shaft 20, with a T-piece handle 21, and a two-prong fork 22 opposite the handle. One prong of the fork is provided with a chisel edge 23.

The tool is used by locating the chisel edge between the sleeve and the timber, and driving it therebetween to cause the first tear along the spiral 18 at position 19 where the spiral meets the sleeve end. The tool can then be slid to a convenient position along the section of the spiral sleeve to be torn away and turned against the support to wrap the sleeve strip around it, much in the same manner as is known in certain types of preserved food tins.

Referring to Figure 6, a mine support 25 comprises a sleeve section 26 which extends towards the end 27 of a timber pole 28, but stops short thereof. Rings 29 are provided, being short lengths of sleeve which are fitted over the timber end 27 to have their ends adjacent, with the end of the innermost ring adjacent the end of the sleeve 26, so that the rings cover the timber pole to the end 27.

In use, the rings may be removed to allow easier sawing off of timber to adjust the length of the support to a required stope height.

The adjacent ends of the rings act as zones of weakness 29' along which buckling, sliding or wrinkling and concertinaring may occur. This action assists in the controlled collapse of the sleeve and thus the controlled collapse of the support itself.

Referring to Figure 7, a mine support 30 comprises a metal sleeve section 31 which extends along the length of a timber pole 32 but stops short, at a position 33, of the end 34 of the timber pole.

The timber pole along the bare end thereof is provided with three short sleeve like rings 35 much in the same manner as is provided for the embodiment of Figure 6, but one end of each of the short sleeves is belled outwardly prior to its location over the pole end. The rings 35 are located with a belled end adjacent the sleeve end 33 and a belled end adjacent each of the non-belled ends of the ring to define zones of weakness 35'.

In use, the rings can be removed by sliding them off to make shortening of the support convenient, and under axial compression the belled ends serve to allow the rings to slide over each other and expand, allowing for a controlled collapse ability and deformation of the sleeve.

Referring to Figure 8, a section of a mine support is shown having a metal sleeve 41 extending substantially for the length of and surrounding a length of timber pole 42. Towards one end 43 of the timber pole, are located three axially spaced apart outwardly indented rings.

These rings are formed by a turning tool being located on the inside of the tube, and are part-circular in configuration. The rings extend for a short distance from the end of the support 43. In use, the rings, or convolutions, allow the sleeve to deform by wrinkling and concertinaring in a reasonably controlled manner.

Referring now to Figure 9, a mine support 50 comprises a length of timber pole 51 having a sleeve 52 located therearound and extending for the length of the pole. The sleeve 52 has a sectional wall shape of a continuous "corrugated" configuration, which may be formed by the shaping a length of right cylindrical sleeve, or the sleeve may be formed from corrugated sheeting. It is envisaged that the corrugations provided will allow for a controlled concertinaring and wrinkling of the sleeve under axial load.

It will be appreciated that in all the embodiments described above, the extent of the indentation or weakness induced in the sleeve, the number of indentations and the spacing thereof will determine the extent of the collapsability of the sleeve. For example, it has been established that with certain kinds of configurations of timber pole, the ring or spiral indentations of the embodiments of Figure 1 or 2 should not have a spacing or pitch of greater than 2 cms for a timber pole of approximately 150 mm in diameter, and having a sleeve of the type described below.

In general, it is preferred that the sleeve is of a thin walled type, having a wall thickness of some 1,3 to 1, 5 mm and being manufactured by seam welding of cold rolled sheeting having a yield stress of 230 MPa, a tensile strengh of 320 MPa, and an elongation percentage of between 37 and 43. It is considered that this type of sleeving allows sufficient axial rigidity whilst providing ductility for the formation of indentations or other zones of weakness, and the subsequent deformation thereof under axial load.

It will further be appreciated that whilst indentations are convenient method of inducing axial weakness in the sleeve reinforcement means, a cutting or the like process can also be used. A rolling process by which the sleeve metal may be thinned out in a zone of weakness may also of course by used. Any suitable method may be utilised to induce a circumferentially extending zone of weakness.

1. A mine support comprising an elongated timber load supporting element (2 or 5 or 17 or 28 or 32 or 42 or 51) having circumferential metal sleeve reinforcement means (3 or 7 or 16 or 26 or 31 or 41 or 52) for restraining timber expansion transverse to the element length when the support is under axial load, the reinforcement means having at least one circumferentially extending zone of weakness (4 or 8 or 18 or 29' or 35' or 44 or 52) adapted to allow it to collapse axially in controlled manner when the support is under axial load.

2. A mine support as claimed in claim 1 in which a zone of weakness is formed by at least one indentation in the metal of the reinforcement means.

3. A mine support as claimed in claim 2 in which the indentations are in the form of axially spaced rings.

4. A mine support as claimed in Claim 2 in which there is at least one indentation in the form of a spiral.

5. A mine support as claimed in any one of Claims 2, 3 or 4 in which at least one indentation is formed radially outwardly.

6. A mine support as claimed in any one of Claims 2, 3 or 4 in which at least one indentation is formed radially inwardly.

7. A mine support as claimed in claim 5 in which the indentations are curved in cross-section.

8. A mine support as claimed in claim 5 in which the indentations are part-circular in cross-section.

9. A mine support as claimed in claim 7 or 8 in which the indentations are formed outwardly by a turning tool.

10. A mine support as claimed in any one of the preceding claims in which the reinforcement means includes an integral sleeve which extends to one end of the element.

11. A mine support as claimed in any one of the preceding claims 1 to 9 in which there is an integral sleeve extending over at least a major part of the element length.

12. A mine support as claimed in any one of the preceding claims in which the reinforcement means includes a plurality of short sleeves located axially adjacent each other, the adjacent edges between the sleeves forming the zones of weakness.

13. A mine support as claimed in Claim 1 or 2 in which the reinforcement means includes a sleeve extending to at least one end of the element, and the zone of weakness is in the form of a spiral extending to at

least one of such ends, and is adapted to be tearable along the spiral from at least one of such ends to shorten the sleeve.

14. A mine support as claimed in claim 12 in which the short sleeves are located at at least one end region and are removable by axially sliding them from the element to shorten the sleeve reinforcement means.

15. A mine support as claimed in claim 12 in which one sleeve end of at least one sleeve is outwardly belled, and the sleeves are located with each belled end adjacent a non-belled end, the adjacent ends forming zones of weakness with the belled ends being adapted to expand and cause the sleeves to commence sliding over each other when the support is under axial load.

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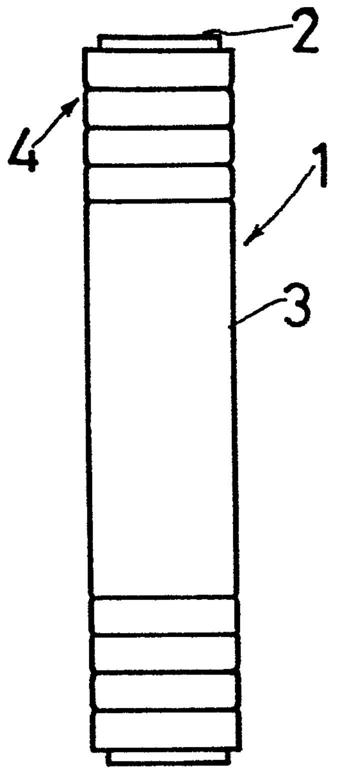

FIG.1

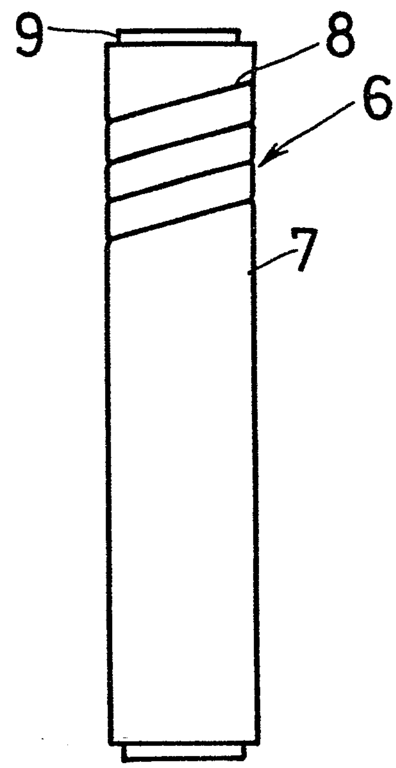

FIG.2

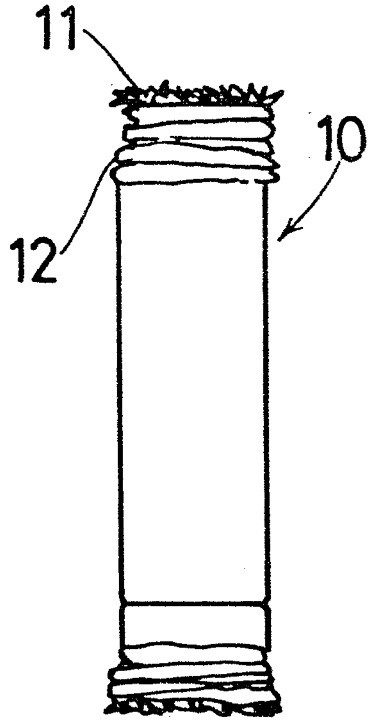

FIG.3

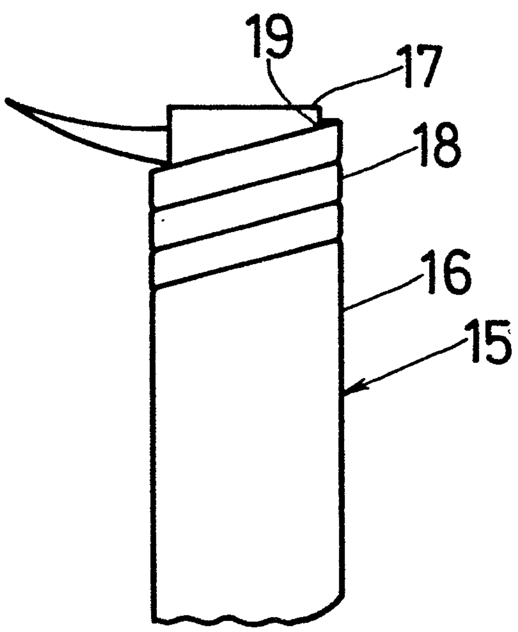

FIG.4

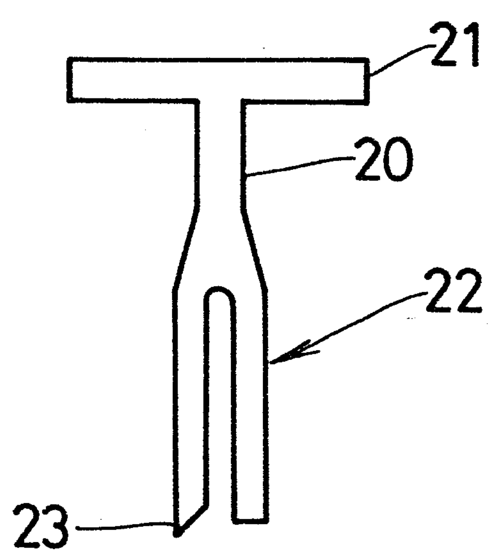

FIG.5

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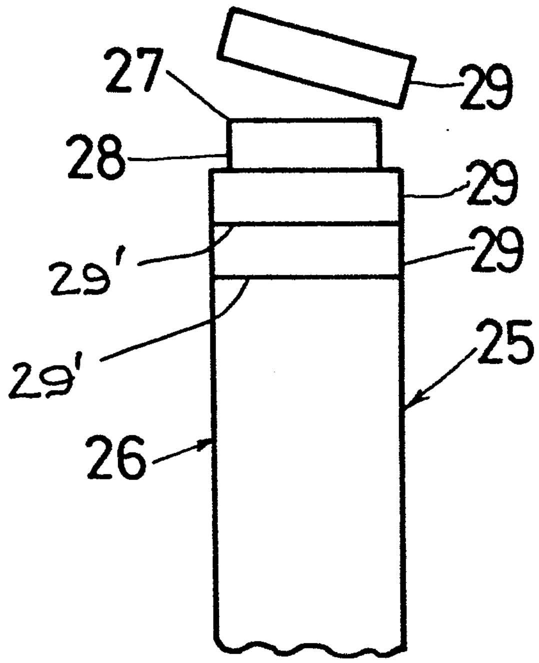

FIG.6

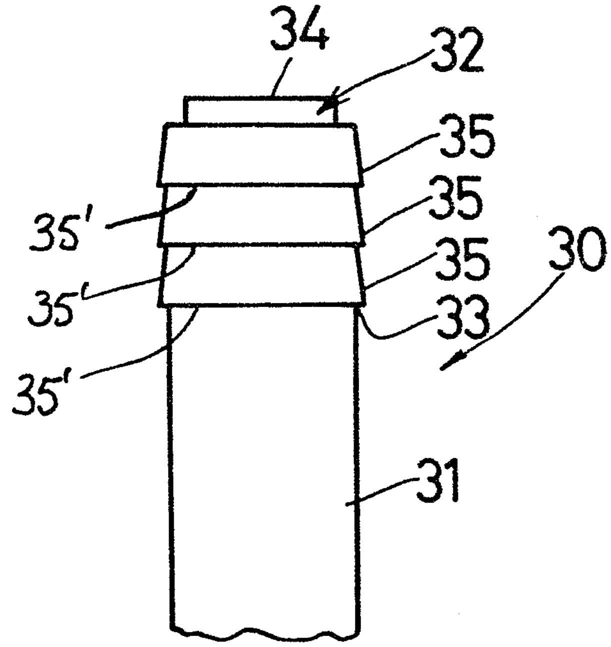

FIG.7

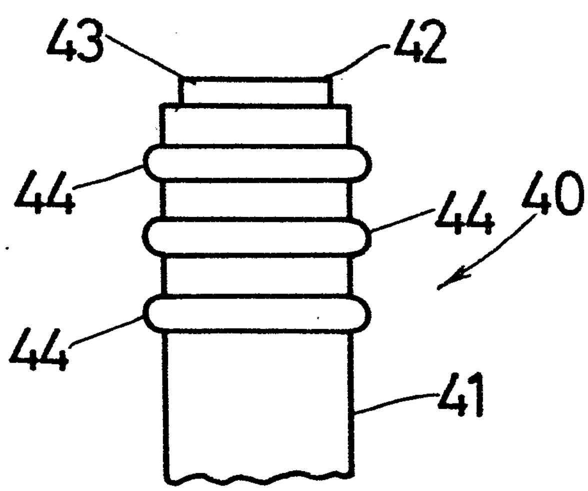

FIG.8

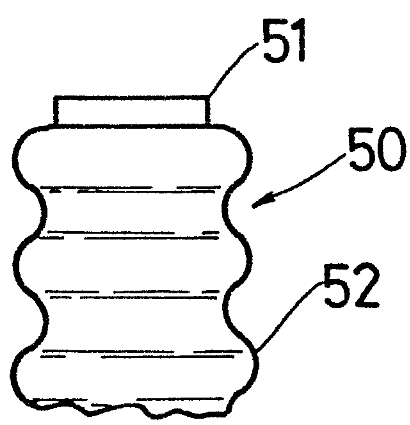

FIG.9