FORM 25 (12) PATENT granted by (19)

AFRICAN REGIONAL INDUSTRIAL PROPERTY ORGANIZATION (ARIPO)

AP 243 A

(11)

(21) Application Number: AP/P/92/00350

(22) Filing Date: 17.01.92

(24) (45) Date of Grant& Publication 02.03.93

(30) Priority Data:

(33) Country:

(31) Number:

(32) Date:

(84) Designated States:

ZM ZW

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(51) International Patent Classification Int. Cl.[5] E21C 25/12

(54) Title: PICK HOLDER

(57) Abstract: This invention discloses a holder (10) for mounting a replacement pick (50), on a rotatable drive, for use on continuous mining machines, for example. The holder (10) includes a body (12) having an elongate base portion (16) for connecting it to the rotatable drive. The body (12) defines a passage (28) directed downwardly towards the trailing edge (24) of the body (12), for accommodating the pick (50). Continuous mining machines equipped with these holders (10) have been found to operate at lower power inputs, and to require less frequent holder replacement than previously used machines.

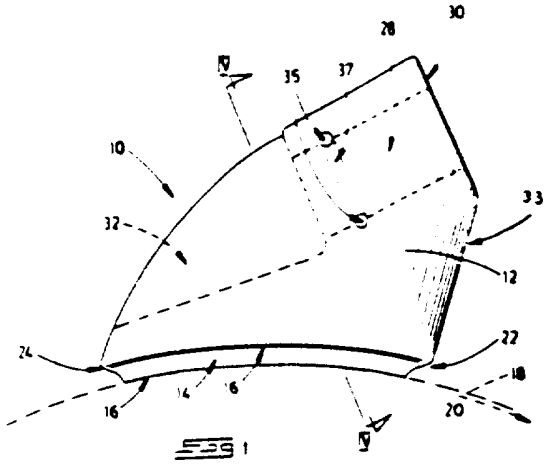

Fig 1

(56) Documents cited: EP 0 099 350 A1 EP 0 052 977 A2
EP 0 121 020 A1

AP 243

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ABSTRACT

This invention discloses a holder (10) for mounting a replacement pick (50), on a rotatable drive, for use on continuous mining machines, for example. The holder (10) includes a body (12) having an elongate base portion (16) for connecting it to the rotatable drive. The body (12) defines a passage (28) directed downwardly towards the trailing edge (24) of the body (12), for accommodating the pick (50). Continuous mining machines equipped with these holders (10) have been found to operate at lower power inputs, and to require less frequent holder replacement than previously used machines.

FIELD OF THE INVENTION

This invention relates to a pick holder, and more particularly to a holder for securing a pick on a rotatable drive on a mining machine. The invention extends to a cutting assembly which includes the above-mentioned pick holder, and further extends to a mining machine equipped with a rotatable drive on which picks are secured by way of the above-mentioned holder.

BACKGROUND TO THE INVENTION

Mining of relatively soft minerals such as coal is practised extensively by continuous mining methods. These methods involve use of rotatable drive elements equipped with cutting bits, or picks, which are driven into a seam of material that is being mined.

The picks used in these mining methods usually comprise an elongate shank having a conical tip at one end. The conical tip performs the cutting action and is commonly manufactured of a wear-resistant material.

Since the tips of the picks tend to wear out as a result of the continuous abrasion during service, these picks are most commonly located in specially designed holders to allow rapid replacement when an excessive degree of wear

is reached. The picks and their holders are usually arranged on a rotatable drive, e.g. a drum, in a carefully designed configuration to ensure as far as possible that an even breakage of the material being mined occurs as the rotating drum is propelled towards the seam of this material.

The rate at which material can be mined is dictated inter alia by the clearance between the tips of the picks and the periphery of the drum. The greater this clearance, the deeper the cut that can be made during each revolution of the drum into the material being mined. There is a practical limitation on maximising this clearance, however, since the magnitude of the shear forces acting on the picks and their holders increases progressively with the distance which the tips of the picks project beyond the periphery of the drum. In practice, failures on continuous mining machines frequently occur at the welded joints between pick holders and their associated drum, i.e. where combined stresses are the greatest.

This limitation has been overcome at least to some extent in a method known to the applicant, in which pick holders are mounted on drums having helical scroll formations. These scroll formations are primarily designed to propel mined material in an axial direction in relation to the drum, and further serve to counteract any shear forces acting on the pick holders. The pick holders are usually welded to insertion pieces fitting between the holders and the drums and located within suitably sized recesses in the scroll formations. The tip of each pick projects beyond the outer periphery of its associated scroll formation and is well clear of the peripheral region of the drum itself.

In practice the scroll formations themselves tend to limit the depth of penetration of the picks into the material being mined.

It is an object of the present invention to provide a holder for securing picks on a rotatable drive, such as a drum on a continuous mining machine, which allows relatively large cutting depths to be achieved into material that is being mined while providing a relatively secure connection between the pick holder and the drive.

It is a further object of this invention to provide a pick holder which tends to minimise the degree of abrasion due to mined material impinging on the holder.

SUMMARY OF THE INVENTION

According to the present invention there is provided a holder for securing a pick to a rotatable drum, which includes

- a body having an elongate base portion by which the body is connectable to the rotatable drive, the body further defining a passage for accommodating the pick, the passage being directed downwardly towards the trailing edge of the base.

The length of the base portion is preferably at least twice its mean width. The width of the base portion may taper outwardly from its leading edge towards its trailing edge. The width of the body may further taper outwardly from its base portion towards the region surrounding the passage.

The body may further define a seat about the peripheral region of leading end of the passage whereby any impact on the pick is transferred to the body. At least a portion of this seat is preferably set forward in relation to the leading edge of the base portion. The body may further define a forward-facing curved surface extending from the lower region of the seat towards the leading edge of the base portion. The body is accordingly "streamlined" in order to minimise any obstruction to the flow of broken material from the tip of the pick past the holder.

The body of the holder may further define a channel portion extending from the region of the trailing edge of the base portion towards the trailing end of the passage. This channel facilitates access from the rear end of the pick for maintenance and replacement purposes.

The body of the holder may further define at least one further passage, preferably a pair of passages, in transverse relationship to, and intersecting the passage for accommodating the pick, so that a securing means is insertible via

the further passage or passages in order to secure the pick to the body of the holder. More particularly, the pick may be indirectly secured to the body by way of a sleeve which is locatable in the passage for accommodating the pick. The securing means may accordingly engage with the sleeve while the pick is positioned in releasable engagement within a bore defined by the sleeve.

The invention extends to a cutting assembly connectable to a rotatable drive, which includes

- a pick comprising a shank having a tapered cutting tip at its one end;
- a sleeve defining a bore into which the shank of the pick is receivable; and
- a holder which includes a body having an elongate base portion by which the body is connectable to the rotatable drive, and further defining a passage into which the sleeve is receivable, the passage being directed downwardly towards the trailing end of the base portion.

The body of the holder may define at least one further passage, preferably a pair of passages, in transverse relationship to, and intersecting the passage into which the sleeve is receivable, so that a securing means is insertible into the further passage or passages in order to engage with the sleeve.

The sleeve may define an annular groove which registers with the transverse passage or passages in the body when the sleeve is in its operative position so that, in use, the securing means engages the sleeve by way of the annular groove.

The securing means preferably includes a pair of interconnected spaced apart limbs in parallel relationship to each other. In use the securing means may accordingly be positioned with the limbs astride of the sleeve while engaging it by way of the annular groove.

In yet a further aspect of the invention there is provided a mining machine comprising

- a rotatable drum connected to a drive for rotating the drum about its longitudinal axis; and

- a plurality of picks secured to the drum, each pick projecting in the direction of rotation of the drum and being connected to the drum by way of a holder which includes a body having an elongate base portion by which the body is connected to the drum, the body further defining a passage for accommodating the pick, the passage being directed downwardly towards the trailing end of the base.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is described below with reference to the accompanying diagrammatic drawings in which

- Figure 1 shows a side elevation of a pick holder according to the invention;
- Figure 2 shows an upper plan view of the pick holder of figure 1;
- Figure 3 shows a front elevation of the pick holder of figure 1;
- Figure 4 shows a cross-sectional view taken along IV-IV on the pick holder of figure 1;
- Figure 5 shows a cross-sectional view of a pick assembly incorporating the pick holder of figure 1, the cross-section being taken along V-V on the pick holder shown in figure 3; and
- Figure 6 shows a drum for use on a continuous mining machine equipped with pick assemblies as shown in Figure 5;
- Figure 7 shows a vertical sectional view through a further, preferred pick assembly according to the invention;
- Figure 8 shows a vertical sectional view of a sleeve forming part of the assembly of figure 7, on an enlarged scale;
- Figure 9 shows a vertical sectional view through yet a further, preferred pick assembly according to the invention; and
- Figure 10 shows a vertical sectional view of a sleeve forming part of the assembly of figure 9, on an enlarged scale.

DESCRIPTION OF A PREFERRED EMBODIMENT OF THE INVENTION

In the drawings reference numeral 10 refers generally to a pick holder according to the invention. The holder 10 comprises a body 12 of forged steel, which

includes a base portion 14 having a curved face 16. The radius of curvature of the face 16 conforms with the outer periphery of a rotatable drum 18, which forms part of a continuous mining machine (not shown). The direction of rotation of the drum 18 during operation is indicated in figures 1,5 and 6 by the arrow 20.

The base portion 14 is symmetrical about its longitudinal axis (figure 2) and has a linear length of approximately 175 mm. The base portion 14 tapers outwardly from a leading edge 22, approximately 50 mm wide, towards its trailing edge 24, approximately 75 mm wide. The mean width of the face 16 is accordingly approximately 62,5 mm. The outline of the base portion 14 is completed by the lateral edges 26 extending between the parallel leading and trailing edges 22 and 24 respectively.

The edges 22, 24 and 26 of the base portion 14 are bevelled towards the face 16 and are preferably undercut slightly. In use, the recess formed between the base portion 14 and the drum 18 is filled with welding material in order to form a sound connection between the drum and the holder 10.

The body further defines a passage 28 of circular cross-section, approximately 45 mm in diameter and extending downwardly from a forward facing, circular seat 30 towards a channel portion 32 formed by two lateral side walls 34 of the body 12. The passage 28 is directed towards the trailing edge 24 of the base portion 14. More particularly at least a portion of the trailing edge 22 is visible when viewed through the passage 28 along its longitudinal axis from the direction of the seat 30.

The diameter of the seat 30 is approximately 75 mm and is arranged concentrically in relation to the passage 28. The width of the body 12 tapers outwardly from the leading edge 22 towards the periphery of the seat 30 (figure 3). The cross sectional view IV-IV shown in figure 4 illustrates the tapered shape of the body 12 at an intermediate position between the leading edge 22 and the trailing edge 24. The degree of outward taper becomes progressively less pronounced towards the trailing edge 24 as the width of the base portion 14 increases.

The lower periphery of the seat 30 is set forward in relation to the leading edge 22 of the base portion 14, as shown in figures 1 and 5. The portion of the body 12 extending from the lower periphery of the seat 30 towards the leading edge 22 defines a forward facing rounded surface 33, which is designed to present as little resistance as possible to the flow of broken material past the body 12.

The body 12 further defines a pair of parallel passages 35 spaced apart from each other and intersecting the passage 28 orthogonally. A U-shaped clip, shown partially in figure 5, having a pair of interconnected, spaced-apart limbs 36 in parallel relationship to each other fits with minimal clearance into the passages 35, as discussed more fully below.

The limbs 36 may be constituted by two separate pins in other embodiments of the invention, not further illustrated here. These pins are preferably dimensioned to be insertable into the passages 35 with minimal lateral clearance in order to prevent their dislodgement during use.

In use, the pick holder 10 is fitted with a sleeve 38 having a cylindrical portion 40 of circular cross section which fits with minimal lateral clearance into the passage 28 (figure 5). The sleeve has a frustro-conical collar 42 extending radially outwardly from the cylindrical portion 40. The cylindrical portion 40 further has an annular groove 44 which registers with the passages 35 when the collar 42 bears against the seat 30 of the body 12. In use, the sleeve 38 is locked in position by inserting the limbs 36 of the clip referred to above into the passages 35 as shown in figure 5. The bridging piece (not shown) which interconnects the limbs 36 fits into a slotted recess 37 in the side of the body 12 between the passages 35 (figure 1). The bridging piece is accordingly shielded from excessive wear due to the abrasion of mined material being swept past the body 12 during use.

The sleeve 38 further defines a composite bore 46 comprising two co-axial cylindrical passages of circular cross section separated by an annular shoulder formation 48.

A pick 50 having a shank 52 and a hardened conical tip 54 at its leading end is accommodated in the holder 10 by the sleeve 38 as shown in figure 5. A resiliently deformable clip 56 is held captive at the trailing end of the shank 52. The clip 56 is so arranged that it engages the shoulder formation 48 of the sleeve 38 when the rearwardly facing surface of the conical tip 54 bears against the sleeve 38 (figure 5).

The clip 54 is designed to allow the pick 50 to be dislodged from the sleeve 38, e.g. for the purposes of replacement, by driving a tool against the trailing end of the shank 52, thereby collapsing the spring 56 sufficiently to allow the pick to be withdrawn from the front end of the sleeve 38.

The channel portion 32 facilitates access to the trailing end of the shank 52. The configuration of the composite bore 46 further allows dust originating from the material being mined to be expelled rearwardly from the sleeve 38. Any interference with the movement of the clip 56 due to dust accumulation behind the clip is accordingly minimised.

A prototype cutting machine 58 shown in figure 6 is equipped with cutting assemblies of the type described above with reference to figure 5. Each assembly, denoted generally by reference numeral 60, is secured to the drum 18 by welding along the entire periphery of the base portion 14 of each respective holder 10. The spacing and orientation of each cutting assembly 60 is such that the loci described by the tips of the picks 50 when the drum 18 is rotated are approximately evenly spaced to ensure uniform breakage of the material being mined.

Although the radius of curvature of the face 16 of each holder 10 preferably conforms to the curvature of the drum 18, suitable insertion pieces 59 may be provided in order to facilitate the connection of the holders 10 to portions of the drum having a radius of curvature other than that of the seat 16 (figure 6).

It has been found in preliminary mining trials utilising the prototype cutting tool 58 that coal could be mined at rates of up to 18 tonnes per minute as against mining rates of approximately 9 tonnes per minute achieved by previously known continuous mining machines having drums of comparable dimensions.

The electrical power consumed by the cutting machine 58 in relation to the tonnage of coal mined during the above-mentioned trials was found to be significantly lower than for previously known machines of this type. The reduced power consumption rate, and hence the improved mining efficiency, of the machine 58 has been ascribed to the relatively low resistance offered by the assemblies 60 to the penetration by the picks 50 into the coal face being mined.

The applicant believes that comparatively long service life will be attainable for cutting assemblies of the kind described above. This is partially attributable to the elongate shape of the base portion 14, which provides an extensive connection between the body 12 and the drum 18 and accordingly tends to counteract any stresses on the holder 10 during mining operations.

The frustro-conical shape of the collar 42 further provides a relatively smooth transition from the tip 54 of the pick 50 towards the body 12 of the holder 10. The absence of projecting edges or ridges in the path of broken material being swept past the pick assemblies 60 during use accordingly minimises the expected rate of abrasion on the components of these assemblies. The collar 42 further serves to transfer any impact by the pick 50 onto the body 12 over the comparatively large surface of the seat 30. Both the pick 50 and the sleeve 38 are treated as replaceable items, which are expected to suffer a reasonable amount of wear during use. The holder 10, however, is expected to be substantially unaffected by any impact and abrasion on the pick 50 and sleeve 38.

Figures 7 and 9 show further, particularly preferred pick assemblies according to the invention, generally denoted by reference numerals 160 and 260 respectively.

The pick assembly 160 includes a pick holder 110 having a body 112 with substantially the same external dimensions as the pick holder 10 described above. The pick holder 110 defines a composite passage described more fully below for accommodating a sleeve 138 shown on an enlarged scale in **figure 8**.

This sleeve has a cylindrical portion 140 connected to a collar 142, which is structurally similar to the collar 42 in **figure 5**, and seats against the body 112 during use. The cylindrical portion 140 is circular in cross-section and of constant diameter, extending from the collar 142 towards an annular groove 143 approximately midway between the rearwardly facing surface of the collar 142 and the trailing end of the sleeve 138. A second cylindrical portion 141, co-axially connected to the first cylindrical portion 140, extends from the trailing end of the sleeve 138 to the groove 143, and has a slightly smaller cross-sectional diameter than the cylindrical portion 140.

The first and second cylindrical portions 140 and 141 define a continuous co-axial bore 146 of constant diameter into which a pick 50 is receivable with slight clearance between the shank 52 and the sleeve 138 (**figure 7**). In use, the clip 56 of the pick 50 registers with an annular groove 147 arranged adjacent to the bore 146, whereby the pick is releasably engageable with the sleeve 138.

The body 112 of the pick holder 110 defines a composite passage comprising a first bore 127 and a second bore 131 extending in co-axial relationship with each other, and separated by a transition region 129. The diameters of the bores 127 and 131 are only marginally larger than the respective outer diameters of the cylindrical portions 140 and 141 of the sleeve 138. The pick holder 110 and sleeve 138 accordingly produce an interference fit with each other in the assembled condition, thereby restraining the sleeve from rotating within the pick holder.

The transition region 129 is so arranged that it overlaps with the annular groove 143 of the sleeve 138 when the collar 142 seats against the body 112. The particular advantage of the pick assembly 160 lies in the fact that removal of a worn sleeve 138 requires urging the sleeve only approximately half way out of the body 110 in order to free it for replacement. This is significantly simpler than removing a sleeve having a cylindrical portion of constant outer diameter from a body similar to the body 112, having an interference fit along the full length of the cylindrical portion.

In further embodiments of the invention, not further illustrated herein, the transition region 129 may be constituted by an annular groove. This reduces the overlapping areas between the cylindrical portions 140 and 141 and the first and second bores 127 and 131 respectively. The force required to press-fit the sleeve in the holder 110, or to remove it therefrom, is thereby generally reduced.

The sleeve 138 and body 112 may be conveniently adapted to provide 3 or more stepped cylindrical portions matching correspondingly stepped bores in a pick holder body of the type described above, in order to achieve a multiple interference fit between the body and the corresponding sleeve.

The sleeve 138 is additionally secured to the holder 110 by means of a pair of locking pins 136 which are releasably insertable in a pair of passages partially intersecting an annular groove 144 in the sleeve 138 when the sleeve seats against the body 112 (**figure 7**). In some embodiments of the invention, not further illustrated herein, the interference fit between the sleeve 138 and holder 110 will on its own be adequate to keep the sleeve securely in place during use. The provision of passages and locking pins may hence be dispensed with, without adverse effect on the integrity of the pick assembly 160.

Figure 9 shows yet a further pick assembly 260 which includes a pick holder 210 having a body 212 of substantially the same external dimensions as the body 12 described earlier. The body 212 defines a passage 228 of circular cross section and constant diameter.

The pick assembly 260 further includes a sleeve 238 shown in **figure 10**, having a collar 242 connected to a cylindrical portion 240 of circular cross-section and constant diameter, which fits into the passage 228 with slight lateral clearance. The sleeve 238 is retained in the holder 210 by means of a pair of locking pins 236 which are releasably insertable in a pair of passages defined by the body 212 and partially intersecting an annular groove 224 in the sleeve, when the collar 242 seats against the body 212 (**figure 9**).

The sleeve 238 defines an inner bore 246 of constant diameter extending co-axially with the cylindrical portion 240. The bore 246 is sized to receive the

shank 52 of a pick 50 described above with reference to **figure 5**. In use, the clip 56 of the pick 50 registers with an annular groove 247 adjacent to the bore 246 when the pick 50 seats against the collar 242.

The main advantage of the pick assembly 260 lies in the fact that in use, both the sleeve 238 and pick 50 are independently rotatable about their respective longitudinal axes, generally allowing relatively uniform wear on the outer surfaces of these components during mining operations.

Although the pick holder 10, pick assembly 60 and cutting machine 58 described above constitute preferred embodiments of the invention, the applicant envisages a variety of adaptations of these depending on the particular application of the invention, all falling within the scope of the invention as described above. The scope of the invention should accordingly in no way be construed as being limited to the description of the preferred embodiments described above.

HAVING NOW PARTICULARLY DESCRIBED AND AS
MY/OUR INVENTION AND IN WHAT MANNER
TO BE PERFORMED, I/WE DECLARE THAT WHAT I/WE CLAIM

CLAIMS

1. A holder for securing a pick to a rotatable drive, which includes a body defining a passage for accommodating the pick, and further defining a base portion having a leading end and a trailing end, whereby the body is connectable to the rotatable drive, characterised by the passage being directed downwardly towards the trailing edge of the base portion.

2. A holder according to claim 1 in which the length of the base portion is at least twice its mean width.

3. A holder according to claim 1 or claim 2 in which the width of the base portion tapers outwardly from its leading edge towards its trailing edge.

4. A holder according to any of the preceding claims in which the width of the body tapers outwardly from its base portion towards the region surrounding the passage.

5. A holder according to any of the preceding claims in which the body further defines a seat about the peripheral region of the leading end of the passage whereby any impact on the pick is transferred to the body, at least a portion of the seat being set forward in relation to the leading edge of the base portion.

6. A cutting assembly connectable to a rotatable drive, which includes a pick comprising a shank having a tapered tip towards one of its ends, a sleeve defining a bore into which the shank of the pick is receivable, and a holder which includes a body defining a passage into which the sleeve is receivable, and further defining a base portion having a leading end and a trailing end, whereby the holder is connectable to the rotatable drive, characterised by the passage of the holder being directed downwardly towards the trailing end of the base portion.

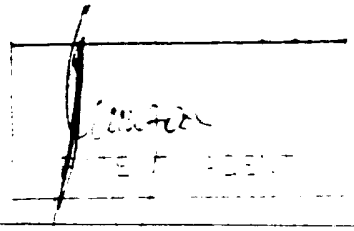
7. A cutting assembly according to claim 9 in which the body of the holder defines at least one further passage in transverse relationship to, and intersecting the passage into which the sleeve is receivable, so that a securing means is insertible into the further passage or passages in order to releasably engage with the sleeve.

8. A cutting assembly according to claim 6 in which the sleeve includes a composite cylindrical portion forming an interference fit with corresponding surfaces defined by the passage of the holder.

9. A cutting assembly according to claim 6 in which the sleeve includes a cylindrical portion fitting with clearance into the passage of the holder, permitting rotation of the sleeve in the holder during use.

10. A mining machine comprising a rotatable drum connected to a drive for rotating the drum about its longitudinal axis, and a plurality of picks each projecting in the direction of rotation of the drum respectively secured by way of a holder which includes a body defining a passage for accommodating a pick, and further defining a base portion having a leading end and trailing end, adjacent to the drum, characterised by the passage of the holder being directed downwardly towards the trailing end of the base.

Dated this 17 Day of January 1992.



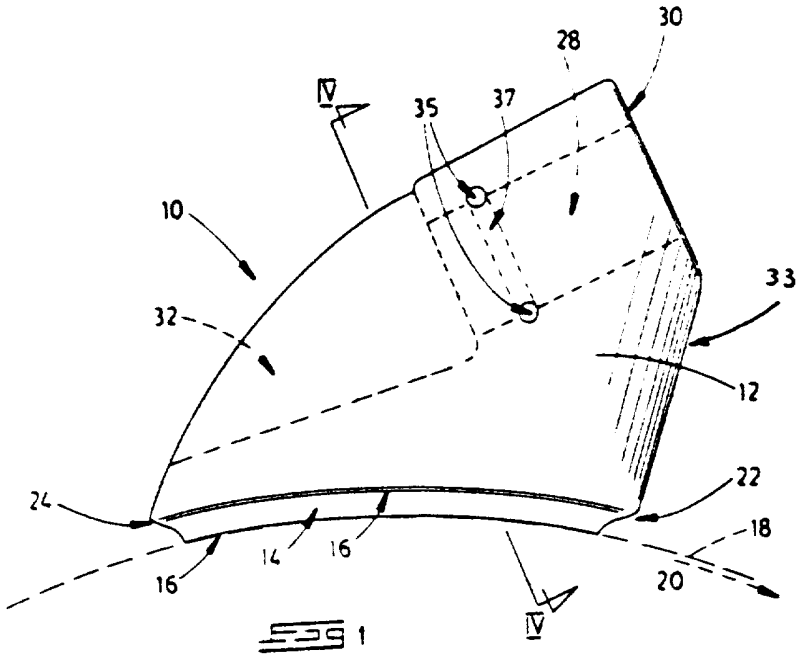


Fig 1

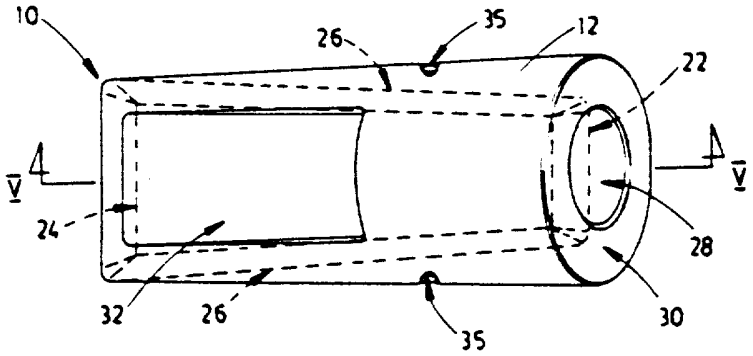


Fig 2

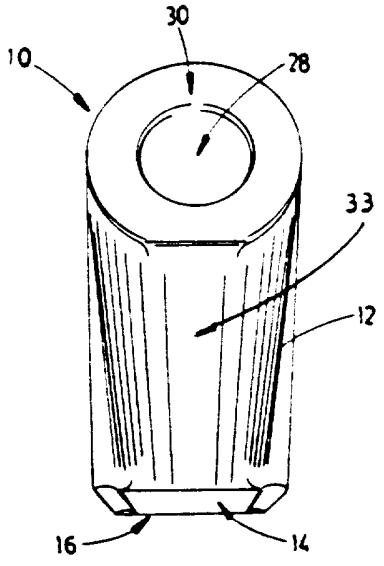


Fig 3

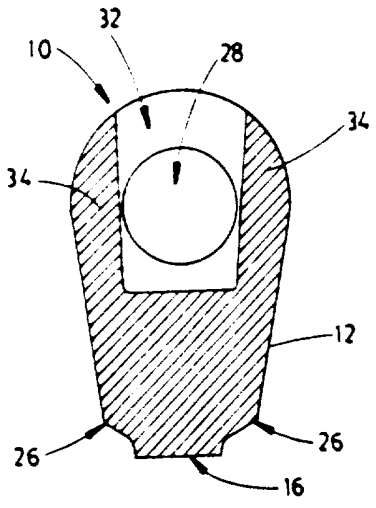


Fig 4