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(12) # EUROPEAN PATENT APPLICATION

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(71) Applicant: **ANDERSON STRATHCLYDE PLC**
Station Works
Saunderton High Wycombe Buckingshamshire HP14 4HS (GB)

(72) Inventor: **Wakefield, Alan Wilfred**
13 Chadbone Close The Prebendel
Aylesbury Bucks HP19 3PQ (GB)

(74) Representative: **Woodin, Anthony John et al**
Fitzpatricks 53A High Street
Huntingdon Cambridgeshire PE18 6AQ (GB)

(54) **Cutting tool and holder therefor.**

(57) A cutting tool (10) (particularly for cutting minerals) has a cutting head (12) and a shank (11) extending therefrom for insertion into a socket (16) in a holder (17). The shank (11) is a sliding fit in and is axially movable in the socket (16) and resilient means (14) (e.g. at least one elastomeric pad and/or spring washers) are provided between the tool (10) and the holder (17) to cushion axial movement of the shank in the socket.

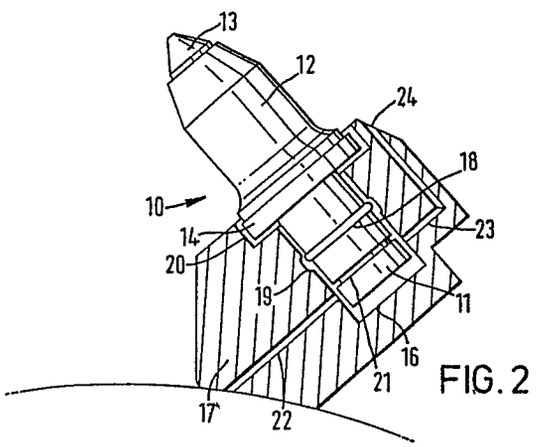

FIG. 2

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Description

Cutting Tool and Holder Therefor

This invention relates to cutting tools and holders therefor and particularly but not exclusively to cutting tools and holders for use in cutting minerals, e.g. in coal mining.

Mineral cutting tools are conventionally provided with cutting tip inserts of so-called hard metal which are subject to great and varying stresses in use. The tips are therefore very vulnerable to wear and damage in use. It is an object of the present invention to provide means for reducing the wear and damage and thereby increasing the useful life of the cutting tips.

According to one aspect of the invention, there is provided the combination of a cutting tool and a holder therefor, the holder having a socket and the tool having a cutting head and a shank extending therefrom for insertion into the socket, characterised in that the shank is a sliding fit in and is axially movable in the socket and resilient means is provided between the tool and the holder to resiliently cushion axial movement of the shank in the socket.

Suitably, an aforesaid resilient means is provided around the shank over a minor part of the length thereof and adjacent to the cutting head. The resilient means may be disposed in recess at the end of the socket. Alternatively or additionally, the shank may have a stepped portion distant from the cutting head and an aforesaid resilient means may be provided between said stepped portion of the shank and a stepped portion of the socket.

The resilient means may comprise at least one elastomeric pad and/or at least one resilient metal member (e.g. a spring washer).

The tool and the holder may have registerable water passages for providing a water spray emerging from the tool and/or the holder. In a preferred arrangement, the water passages in the tool and the holder are axially displaced relative to one another when the tool is not under load but register when the tool is under sufficient load.

If desired, the shank may be rotatable in the socket and provided with vanes or paddles which cause the water to rotate the tool when the tool is not under load.

According to another aspect of the invention, there is provided a cutting tool having a cutting head, a shank extending from the head for insertion into a socket of a holder, and resilient means around said shank for engagement with the holder to permit resilient axial oscillation of the shank in the holder. An aforesaid resilient means may by provided around the shank below and adjacent to the cutting head. Additionally or alternatively, an aforesaid resilient means may be provided around the shank below a step in the shank distant from the cutting head. The tool may if desired have other features making it suitable with a holder in a combination as set out above.

According to a further aspect of the invention, there is provided a holder for a cutting tool, which holder is adapted to be used in a combination as set out above, said holder if desired incorporating at least one elastomeric pad.

The following is a description, by way of example only, of different embodiments of the present invention. Reference is made to the accompanying schematic drawings, in which

Fig. 1 is a side view of a round-shank mineral cutting tool in accordance with the invention,

Fig. 2 is a part-sectional side view of another embodiment of round-shank tool in its holder,

Fig. 3A is a part-sectional side view of a further embodiment of round-shank tool in its holder in unloaded condition,

Fig. 3B is a part-sectional side view corresponding to Fig. 3A but with the tool under load,

Fig. 4 is a part-sectional side view of a further embodiment of round-shank tool in its holder,

Fig. 5 is a part-sectional side view of a modification of the embodiment of Fig. 4,

Fig. 6 is a part-sectional side view of a further embodiment in the form of a radial tool in its holder,

Fig. 7 is a part-sectional side view of a further embodiment in the form of a semi- or forward attack tool in its holder,

Fig. 8 is a perspective view of a pad assembly for use with the embodiments of Figs. 6 and 7,

Fig. 9 is an elevational view of a steel dished type steel washer.

Fig. 10 is a sectional view on line A-A of Fig. 9

Fig. 11 is a part-sectional side view of a modification of the embodiment of Fig. 2, and

Fig. 12 is a part-sectional side view of a further modification of the embodiment of Fig. 2.

In the embodiments of Fig. 1, a coal cutting tool 10 has a shank 11 of circular cross-section and an enlarged cutting head 12 with a cutting tip 13 of suitable hard material. Immediately below the cutting head 12, an annular pad 14 of elastomeric material (e.g. neoprene or rubber) is provided around the shank 11. In use, the shank 11 is inserted in a socket of a holder and retained in place by a retainer inserted into groove 15, in known manner. The pad 14 abuts against the holder (e.g. as shown in Fig. 2) so that, under impact on tip 13, the tool is resiliently displaced against the pad 14 to minimise damage to the tip.

In the embodiment of Fig. 2, the tool 10 is similar to the tool of Fig. 1. Its shank 11 fits with a sliding fit into a socket 16 in a holder 17. There is clearance between the bottom of the shank 11 and the bottom of the socket 16 and a locking device 18 on the shank 11 cooperates with an axially-extending annular recess 19 in the socket 16, so that the shank 11 is capable of limited axial movement in the recess under forces on the tip 13 subject to the resilient constraint of the pad 14. The pad 14 is received in an enlarged recess 20 in the holder 17 at the open end of the socket 16. The shank 11 also has an annular

groove 21 extending round it. In the inoperative (i.e. unloaded) condition of the tool, as shown in Fig. 2, the groove 21 is slightly out of register with passageways 22 and 23 on opposite sides of the socket. Water for dust suppression is fed into the passage 22 of the holder but because the groove 21 is not in line with the passageway 22, little water can pass into the passageway 23 to be emitted from the spray 24. However, there is some leakage of water around the shank 11, which has the effect of flushing out dirt and leaving the tool free to rotate. When the tool is under load, particularly for a very short period at the start of each cutting cycle, the groove 21 moves into alignment with the passageways 22 and 23 and water at high pressure is emitted for a short period from the spray at the start of each cutting cycle. This would assist in clearing any blockages prior to the start of each cutting cycle when water at system pressure would be emitted.

The tool and holder of the embodiment of Figs. 3A and 3B are similar to those of Fig. 2, but a second annular pad 25 of elastomeric material is provided at a position distant from the cutting head 12 between a shoulder 26 on the shank 11 and a shoulder 27 in the socket 16. Also, the tool is retained, in known manner, by a retainer 28 fitting in a groove on the shank 11 outside the holder 17. Fig. 3A illustrates the tool in its inoperative condition (i.e. without load) while Fig. 3B shows the tool in a loaded position with the groove 21 registering the passageways 22 and 23. It will be seen that the movement of the tool in the holder controls the flow of water to the spray 24.

In the embodiments of Figs. 4 and 5, many features will be seen to correspond to features in previously-described embodiments. However, the shank 11 is provided with vanes or paddles 29 and the passageways 22 and 23 in the holder 17 are off-set so that water supplied to passageway 22 for dust suppression will flow through the holder and turn the pick when the latter is not under load.

The tools of Figs. 6 and 7 have flat cutting heads 30 and rectangular-section shanks 31 fitting into correspondingly-sectioned sockets 32 in a tool holder 33. Elastomeric pads 34 are provided around the shanks 31 below the cutting heads 30 and abut the outside of the holders 33 in recesses 35. In order to spread the load over the whole area of pads 34, steel plates 36 are provided between the pads 34 and the undersides of the cutting heads 30. The form of the pads 34 and plates 36 is shown most clearly in Fig. 8. The movement of the tool in the holder under the restraint of the pad 34, as in previously-described embodiments, controls the flow of water through passageways 37,38,39,40 to a spray 41,42 which may be located either in the holder or on the blade of the tool itself. In Figs. 6 and 7, suitable arrangements of passageways in the holder and the tool are shown for both a spray from the holder and a spray from the tool. Whichever arrangement is preferred may be provided. Water seals 43 on the shank 31 are slidable in grooves 44 in the holder 33. The shank 31 may be retained in its socket by any suitable known form of latching mechanism arranged to permit the necessary axial movement of the shank.

Cutting forces vary considerably between different types of mining machines and it may sometimes be desirable to use resilient means other than the elastomeric pad 14. One suitable different form of resilient means comprises steel dished type spring washers 45 (see Figs. 9 and 10) used in pairs. As shown in Figs. 11 and 12 , the spring washers 45 are used in pairs, with their external peripheries abutting each other. In Fig. 12, the space between the washers is filled with elastomeric material 46 to exclude entry of dust or small particles of cut mineral which might become compacted and prevent movement of the tool.

The spring washer arrangement of Fig. 11 or Fig. 12 may be used to replace the elastomeric pad of Figs. 1, 2 and 4 or either one or both of the two elastomeric pads of Figs. 3A, 3B and 5.

The "shock absorbing" effect obtained by the present invention may enable the use of substantially harder tungsten carbide cutting tips than heretofore and/or the use of ceramic or man-made diamond tips.

Claims

1. The combination of a cutting tool (10) and a holder (17,33) therefor, the holder (17,33) having a socket (16,32) and the tool having a cutting head (12,30) and a shank (11,31) extending therefrom for insertion into the socket (16,32), characterised in that the shank (11,31) is a sliding fit in and is axially movable in the socket (16,32) and resilient means (14,25,34,45,46) is provided between the tool (10) and the holder (17,33) to resiliently cushion axial movement of the shank (11,31) in the socket (16,32).

2. The combination of claim 1 wherein an aforesaid resilient means (14,34,45,46) is provided around the shank (11,31) over a minor part of the length thereof and adjacent to the cutting head (12,30).

3. The combination according to claim 2 wherein the resilient means (14,34,45,46) is disposed in a recess (20,35) at the end of the socket (16,32).

4. The combination according to any preceding claim wherein the shank (11,31) has a stepped portion (26) distant from the cutting head (12) and an aforesaid resilient means (25) is provided between said stepped portion (26) of the shank and a stepped portion (27) of the socket.

5. The combination according to any preceding claim wherein the resilient means comprises at least one elastomeric pad (14,25,34,46).

6. The combination according to any preceding claim wherein the resilient means comprises at least one resilient metal member (45).

7. The combination according to any preceding claim wherein the tool (10) and the holder (17,33) have registerable water passages (21,22,23,37,38,40) for providing a water spray,

the water passages in the tool and the holder being axially displaced relative to one another when the tool is not under load but registering when the tool is under sufficient load.

8. The combination according to any preceding claim wherein the shank (11) is rotatable in the socket (16) and is provided with vanes or paddles (29) which causes water to rotate the tool when the tool is not under load.

9. A cutting tool having a cutting head (12,30) and a shank (11,31) extending from the head for insertion into a socket (16,32) of a holder, characterised in that resilient means (14,25,34,45,46) are provided around the shank (11,31) for engagement with the holder to permit resilient axial oscillation of the shank in the holder.

10. A cutting tool according to claim 9 wherein an aforesaid resilient means (14,34,45,46) is provided around the shank below and adjacent to the cutting head (12,30).

11. A cutting tool according to claim 9 or claim 10 wherein an aforesaid resilient means (25) is provided around the shank (11) below a step (26) in the shank (11) distant from the cutting head (12).

12. A cutting tool according to any of claims 9 to 11 wherein the resilient means comprises at least one elastomeric pad (14,25,34,46).

13. A cutting tool according to any of claims 9 to 12 wherein the resilient means comprises at least one resilient metal member (45).

14. A cutting tool according to any of claims 9 to 13 wherein the shank (11) is provided with vanes or paddles (29).

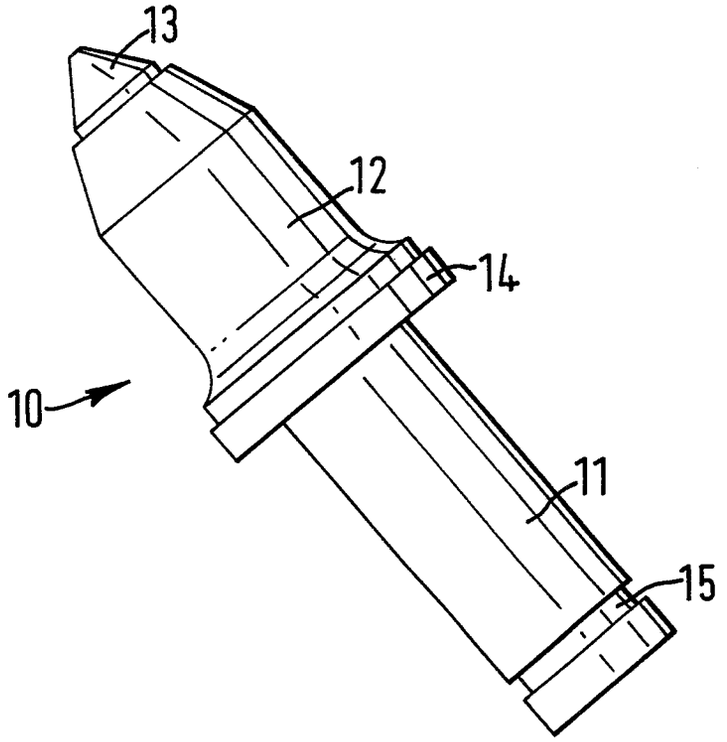

FIG.1

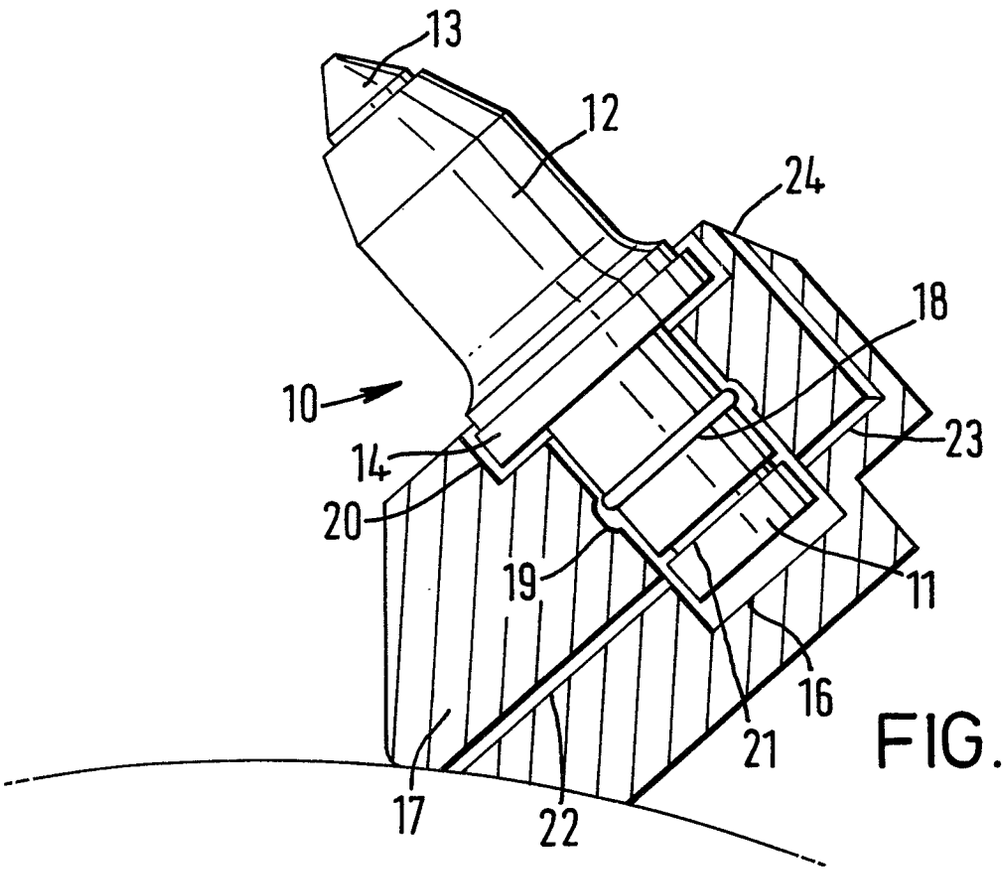

FIG. 2

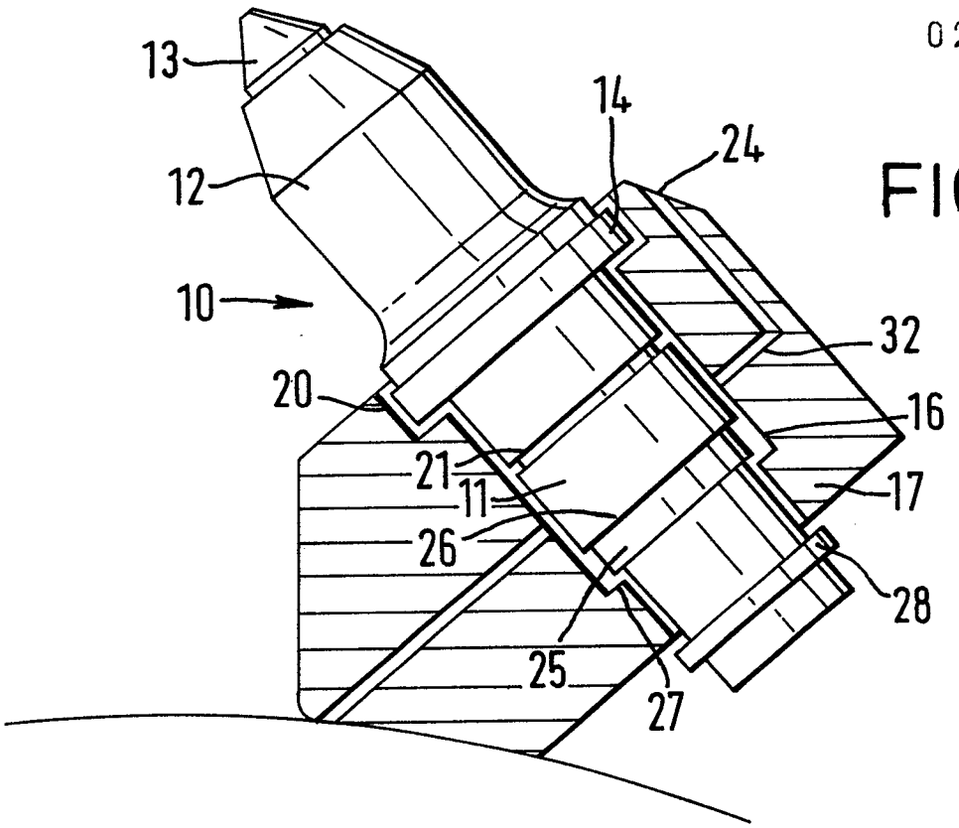
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FIG. 3A

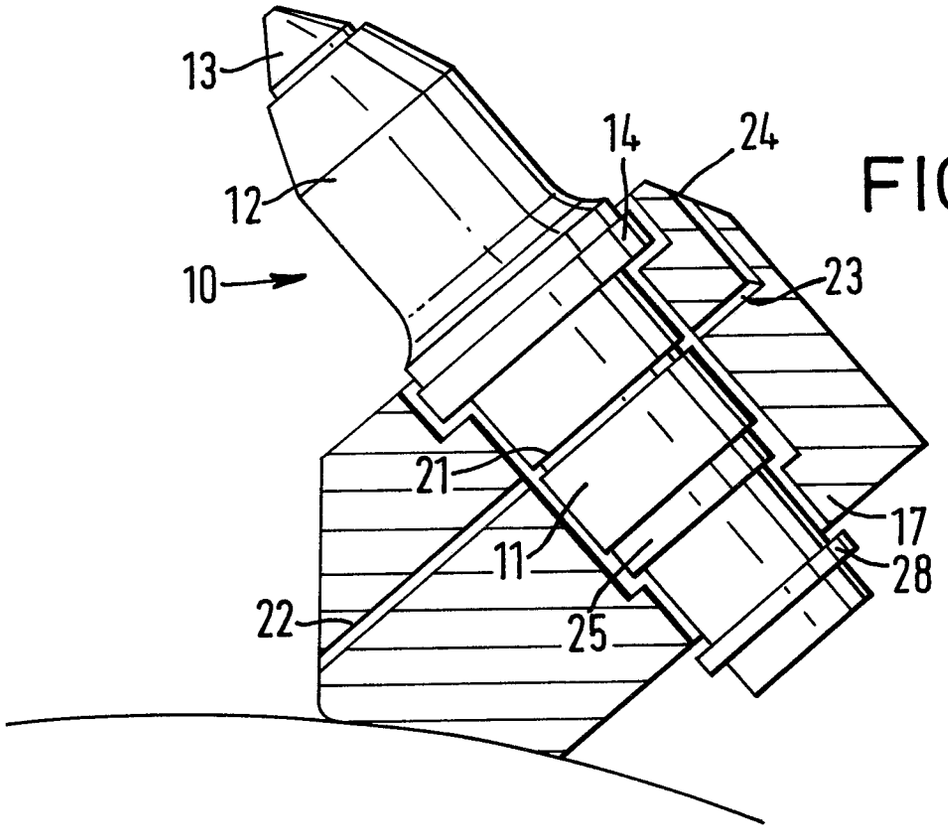
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FIG. 3B

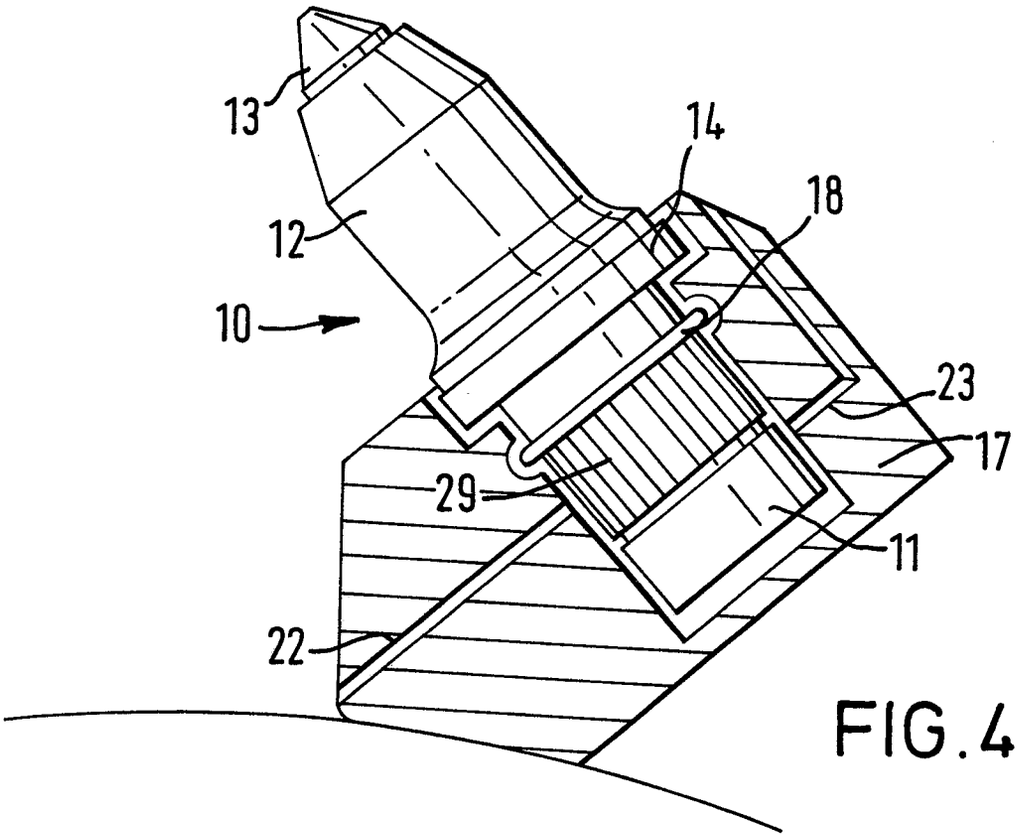

FIG. 4

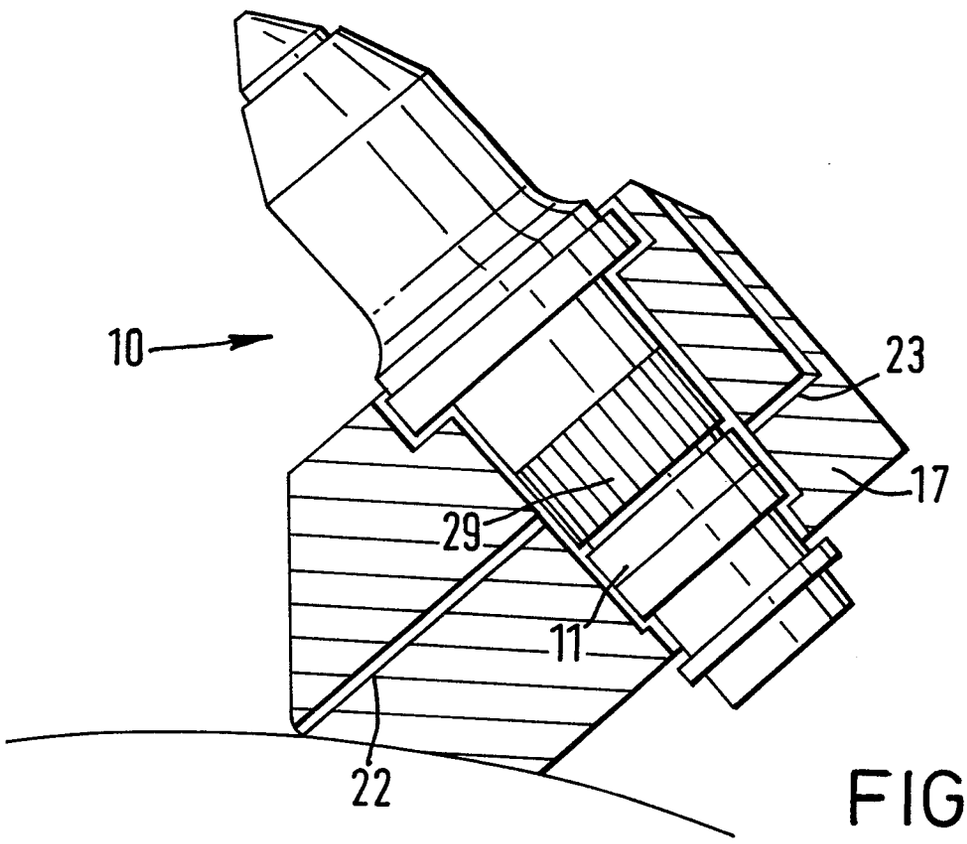

FIG. 5

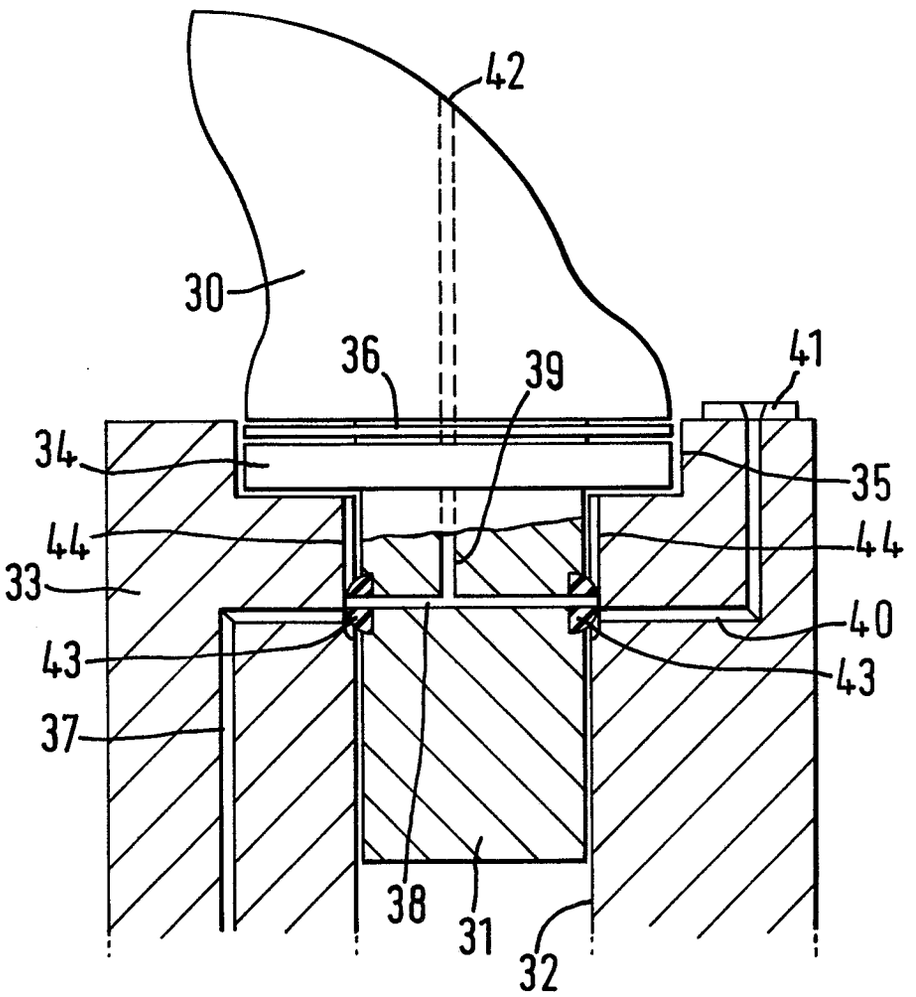

FIG. 6

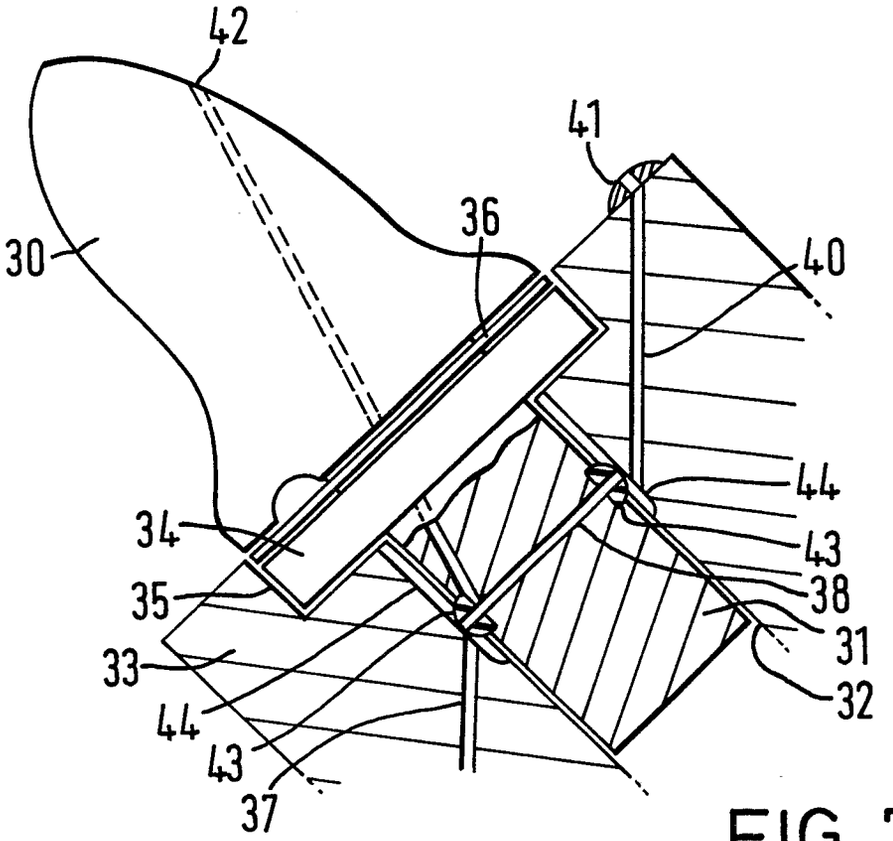

FIG. 7

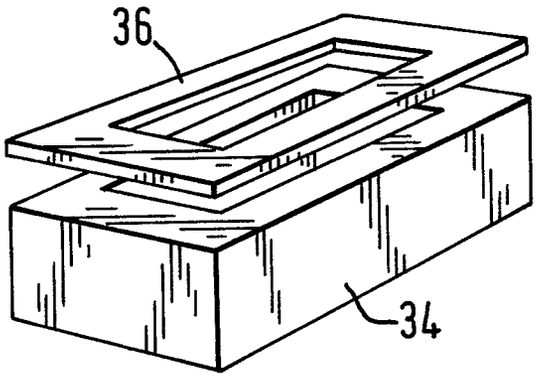

FIG. 8

FIG.9

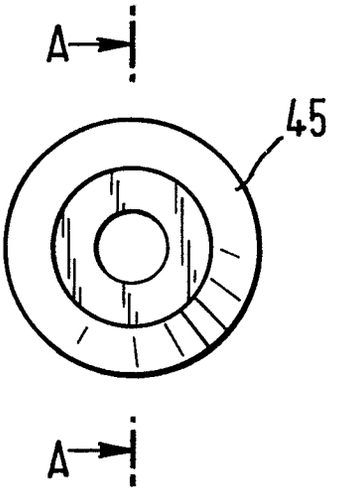

FIG.10

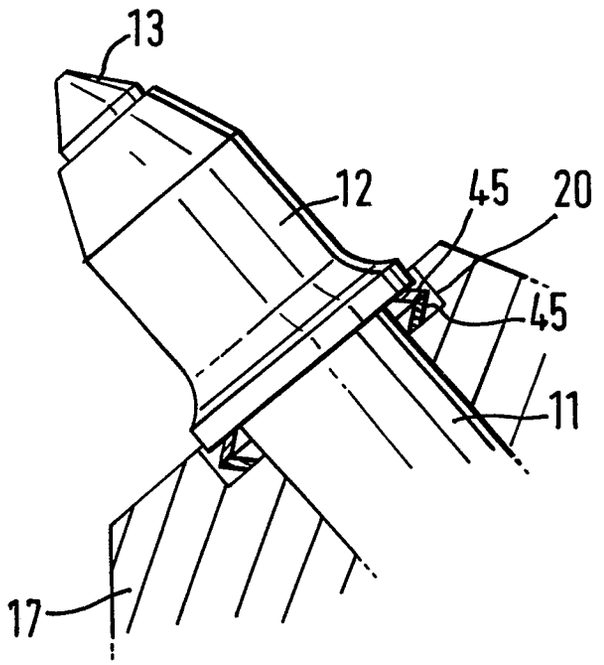

FIG.11

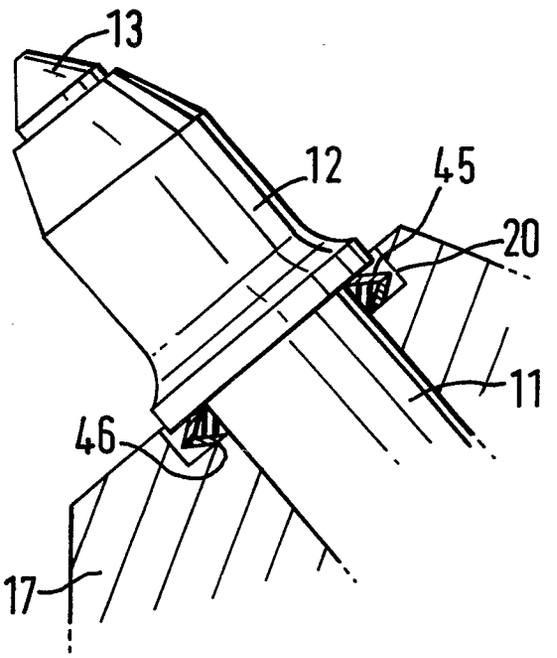

FIG.12

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EUROPEAN SEARCH REPORT

Application number

EP 87 30 0584

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	US-A-3 697 137 (KREKELER) * Column 4, line 12 - column 5, line 9; column 10, line 67 - column 11, line 51; figures 1,2,14,15 *	1,5,6, 9,12, 13	E 21 C 35/18 E 21 C 35/22
Y		14	

Y	GB-A-2 101 657 (STAGGS) * Abstract; figures 1,3 *	14	
A		8	

X	US-A-4 302 053 (ROEPKE) * Abstract; figures 1,2 *	1,6,9, 13,14	TECHNICAL FIELDS SEARCHED (Int. Cl.4) E 21 C
A		8	

A	GB-A-2 055 928 (KRUPP) * Abstract; figure 3 *	2,3	

A	DE-A-2 854 307 (KENNAMETAL) * Claim 1; figure 1 *	7	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	13-04-1987	RAMPELMANN J.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EUROPEAN SEARCH REPORT

Application number

EP 87 30 0584

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	EP-A-0 142 124 (STRANOVSKY) * Page 5, line 26 - page 6, line 20; figure *	8	
A	EP-A-0 111 143 (VOEST-ALPINE) * Claims 1,2; figure 2 *	1,7	
A	US-A-3 101 934 (POUNDSTONE)		
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)

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