

- [54] **CUTTER BIT AND BLOCK**
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 [73] Assignee: Carmet Company, Pittsburgh, Pa.
 [22] Filed: Sept. 22, 1971
 [21] Appl. No.: 182,791

- [52] U.S. Cl. 299/85, 299/93
 [51] Int. Cl. E21c 25/48
 [58] Field of Search 299/85, 86, 91, 92,
 299/93; 175/292, 354; 37/142 R, 142 A

[56] **References Cited**

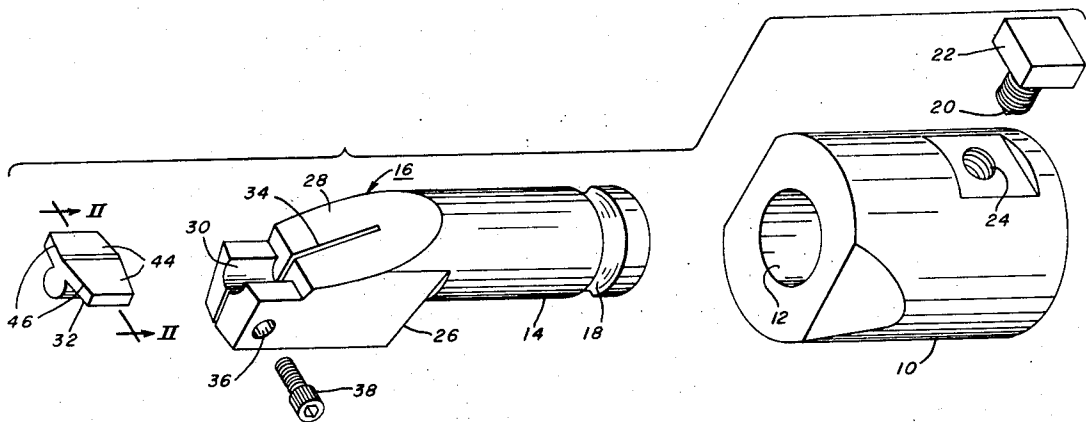
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 Attorney—Vincent G. Giolia et al.

[57] **ABSTRACT**

An improved cutter bit and block for a mining or excavating machine of the type wherein bits are circumferentially spaced around a rotary cutting head or mounted on a cutting chain, characterized in that each bit has a cylindrical shank which can rotate within a cooperating bore in a bit block secured to the cutting head or chain. The cutting tool carried on the bit has a cutting edge behind the axis of the shank in the direction of movement of the cutting head or chain such that, as the angle of attack of the cutting device is changed, the bit will rotate to cause the cutting tool to cut on its forward edge at all times, eliminating wear on the sides of the bit and the production of dust within a coal mine or other similar environment.

7 Claims, 7 Drawing Figures



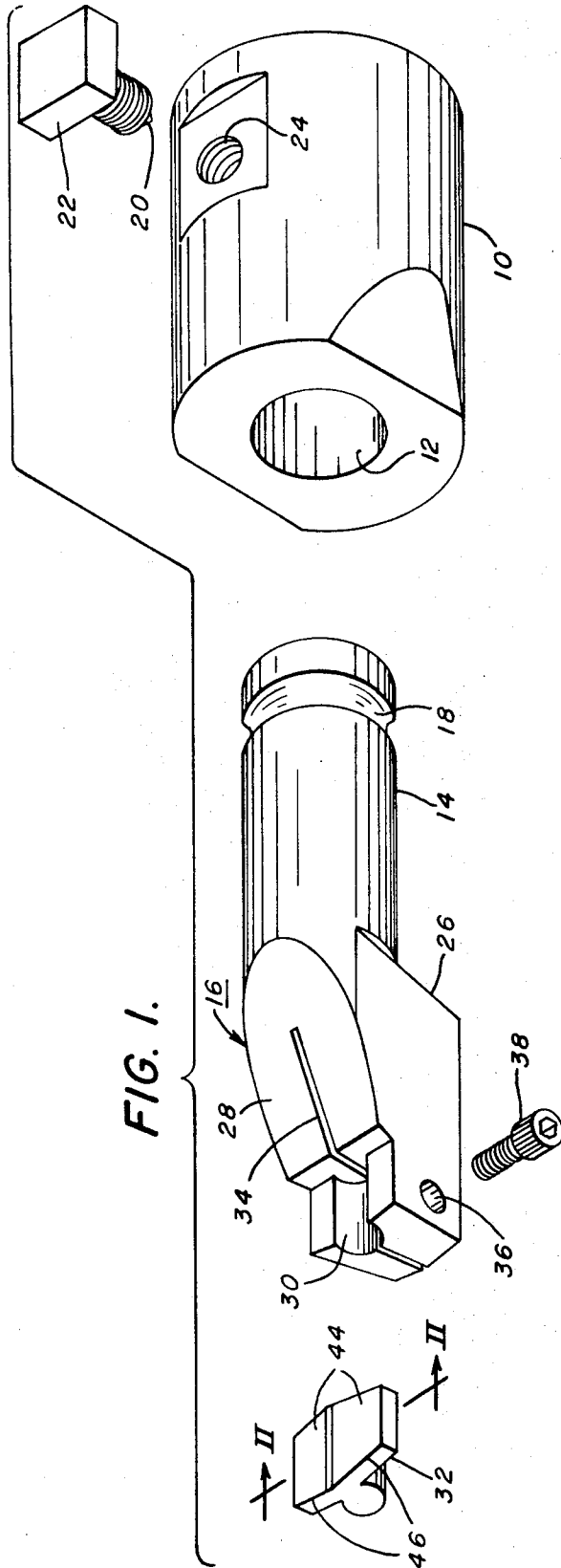


FIG. 6.

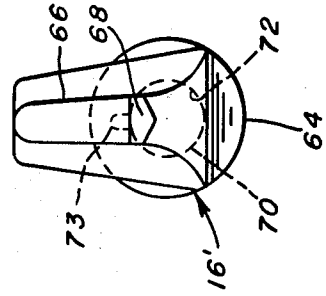


FIG. 5.

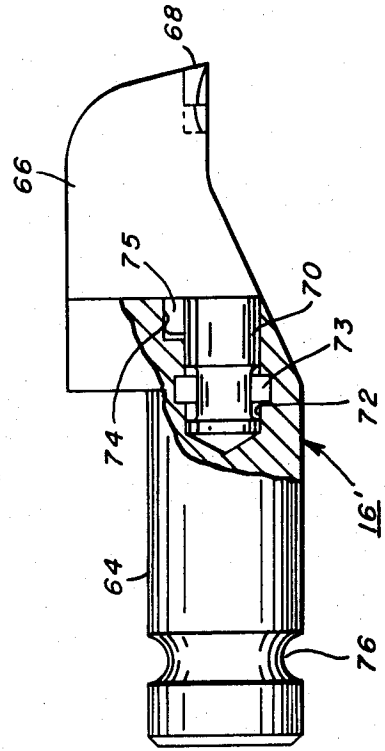


FIG. 2.

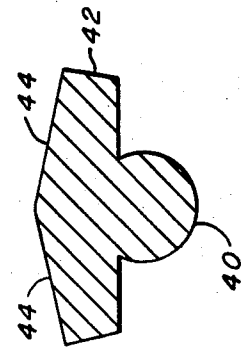


FIG. 3.

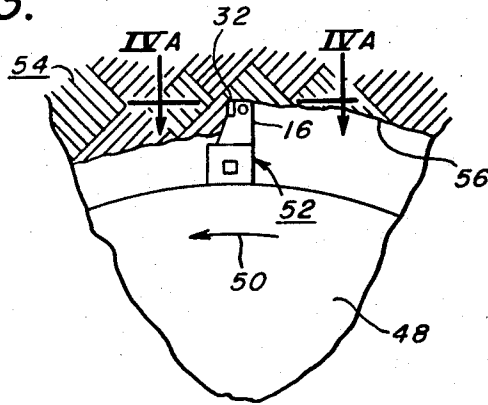


FIG. 4A.

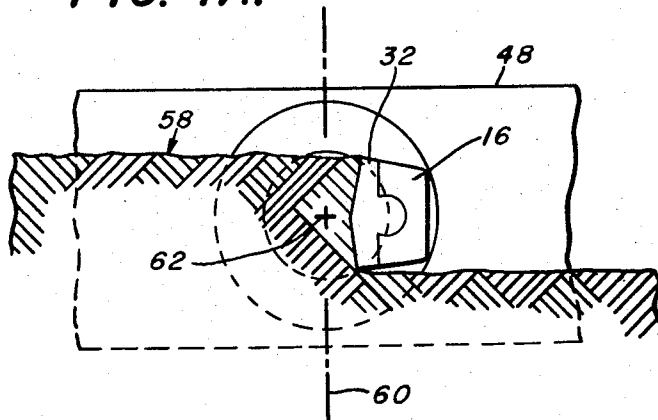
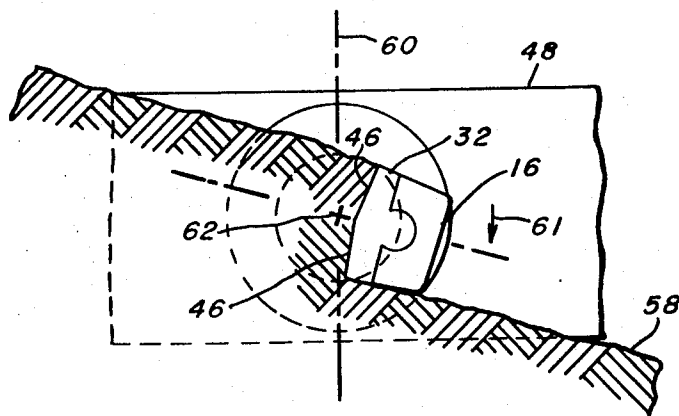


FIG. 4B.



CUTTER BIT AND BLOCK

BACKGROUND OF THE INVENTION

As is known, mining and excavating machines are provided with one or more rotary cutting heads on which are carried spaced cutting bits. These bits comprise the actual tools which engage and cut the material to be mined. Similarly, bits of this type are provided on cutting chains in other types of mining apparatus. In the usual case, the bits are removable in order that they can be replaced periodically due to wear. The bit itself usually includes a shank having a rearward end which fits into a bit block welded to the rotary cutting head or chain and a forward end which receives a metal carbide or the like cutting tool.

The bit is usually fastened within its block or holder. That means that when the mining machine is skewed and advances into the material to be mined at an angle to its longitudinal axis, the cutting tips carried by the bits will attempt to cut not only on their forward knife-edge but will also engage the material to be mined on their unsharpened sides. This reduces cutting efficiency and creates dust due to the scraping action at the sides of the cutting tools, a condition which obviously should be avoided in a mine.

SUMMARY OF THE INVENTION

In accordance with the present invention, a tool bit holder arrangement is provided wherein the bit can rotate within a socket provided within a holder and wherein the cutting edge of a tool carried on the bit is behind the center line of the shank portion of the bit fitted into the holder. In this manner, the cutting tool and the bit on which it is carried will automatically rotate into a position where the forward cutting edge of the cutting tip will always cut directly into the material to be mined or excavated without substantial wear on the sides of the cutting tip, and this regardless of whether the angle of attack of the mining machine is at an angle to its longitudinal axis.

The forward, cutting edge of the cutting tip is preferably, although not necessarily, wide enough in order to insure that the pressure exerted on the cutting edge will automatically cause the shank portion of the bit to rotate into a position where the cutting edge engages the material to be mined directly rather than at an angle thereto.

The above and other objects and features of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings which form a part of this specification, and in which:

FIG. 1 is an exploded view of one embodiment of the invention;

FIG. 2 is a cross-sectional view taken substantially along line II—II of FIG. 1 showing the cross-sectional configuration of the replaceable cutter tip used in the embodiment of the invention of FIG. 1;

FIG. 3 is a side view illustrating the manner in which the bit of FIG. 1 can be mounted on a rotary mining head;

FIG. 4A is a top view taken substantially along line IVA—IVA of FIG. 3 showing the manner in which the bit of the invention cuts into a rock, ore or coal face when the face is at right angles to the direction of rotation of the mining head;

FIG. 4B illustrates the manner in which the bit of the invention can rotate when the rotary mining head approaches the rock, ore or coal face at an angle;

FIG. 5 is a side view of an alternative embodiment of the invention; and

FIG. 6 is an end view of the embodiment of the invention shown in FIG. 5.

With reference now to the drawings, and particularly to FIG. 1, there is shown a tool bit holder 10, which is generally cylindrical in shape and is welded or otherwise securely fastened to a rotary mining head in a manner hereinafter described. Provided in the bit holder 10 is a cylindrical bore 12 which receives the cylindrical shank portion 14 of a tool bit, generally indicated by the reference numeral 16. The shank portion 14 is provided with an annular recess or groove 18 which receives a semi-spherical element 20 at the lower end of a lock screw 22 threaded into a bore 24 provided in the bit holder 10. When the screw 22 is threaded into the bore 24, the element 20 enters the groove 18 and prevents removal of the bit 16. However, the bit 16, and more particularly the shank portion 14, can rotate within the bore 12.

At the forward end of the shank portion 14 of bit 16 is an integral block 26 having a beveled upper surface 28 terminating in a receptacle 30 for a replaceable cutting tip 32 formed from metal carbide or the like. The block 26 is slotted as at 34 and is provided, beneath the receptacle 30, with a threaded opening 36 which extends on either side of the slot 34 and which receives a tightening bolt 38. As will be understood, the bolt 38, when tightened within the threaded bore 36, will tend to force the two sides of the block 26 on opposite sides of the slot 34 together, thereby holding the tip 32 in place. However, when the bolt 38 is loosened, the tip 32 may be removed and replaced.

The tip used in the embodiment of the invention shown in FIG. 1 is exemplary only. Its cross section is shown in FIG. 2; and it includes a lower, generally semicylindrical portion 40 which is received within a cooperating, generally semicylindrical portion of receptacle 30. Integral with the portion 40 is an upper portion 42 having sloping faces 44 which terminate at their forward ends in cutting edges 46 shown in FIG. 1. The cutting edges 46 are those which are intended to engage the material to be mined.

The use of a cutter bit assembly such as that shown in FIG. 1 on a mining machine is illustrated in FIG. 3. A rotary mining head, identified by the reference numeral 48, rotates in the direction of arrow 50 and carries on its periphery a plurality of cutter bit assemblies 52, only one of which is shown in FIG. 3. The cutter bit assembly 52 is the same as that shown in FIG. 1. As the mining head 48 rotates, the cutting tip 32 carried on the bit 16 will engage the material 54 to be mined, thereby cutting a groove 56.

In FIG. 4A, the action of the bit 16 is shown for the case where the face 58 of the material being mined is perpendicular to the longitudinal axis 60 of the mining machine and the cutter head 48. Under these circumstances, the tip 32 engages the material to be mined squarely, causing the coal to be broken away. However, should the axis 60 of the cutter head 48 be skewed with respect to the face 58 as shown in FIG. 4B, the bit 16 will rotate in the direction of arrow 61 about the axis 62 of shank 14. Note that the cutting edges of the tip 32 still engage the material to be mined squarely, not-

withstanding the fact that the cutter head 48 is at an angle to the material being mined. This is facilitated by virtue of the fact that the shank 14 is rotatable within bore 12 and since the cutting edges 46 are behind the axis 62 of the shank 14 in the direction of rotation of the cutter head 48. If it were not for the fact that the bit 16 could rotate about axis 62, the side of the cutting tip 32 and the bit 16 would scrape against the face 58, causing a decrease in cutting efficiency and the generation of excessive dust.

With reference now to FIGS. 5 and 6, an alternative embodiment of the invention is shown wherein the bit 16' is formed in two parts 64 and 66. Part 66 carries, at its forward end, a rounded cutting tool 68 and has, at its trailing end, a cylindrical portion 70 which fits into a cooperating bore 72 within the shank portion 64. Suitable means, such as expansible washer 73, are provided for securing the cylindrical portion 70 within the bore 72. Rotation of part 66 with respect to part 64 is prevented by means of a key 75 which fits into a keyway 74. Aside from this, the operation of the device is the same as that of FIG. 1, the annular groove 76 in the trailing end of the shank portion 64 fitting into a block, such as block 10 of FIG. 1, and secured therein by means of a screw which has an inner end fitting into the groove 76.

Although the invention has been shown in connection with certain specific embodiments, it will be readily apparent to those skilled in the art that various changes in form and arrangement of parts may be made to suit requirements without departing from the spirit and scope of the invention. In this respect, it will be apparent that the bit arrangement of the invention can be used equally well on longwall mining machines wherein the bits are carried on what can be compared to a plow which moves transverse to, and cuts into, the face of material to be mined.

I claim as my invention:

1. A machine for cutting material in the ground comprising a rotary member adapted to be positioned adjacent the material to be cut, a plurality of cutter bit assemblies mounted in spaced apart relationship on the

periphery of said rotary member, each of said cutter bit assemblies including a bit block secured to said rotary member, a generally cylindrical bore in said bit block, a cutter bit having a cylindrical shank portion fitted into the bore in said bit block and rotatable therein, and a cutting tip carried on said cutter bit and having a forward cutting edge offset with respect to the axis of said cylindrical shank portion, the arrangement being such that as said head rotates and said cutting edge engages material to be mined, the cutter bit and the tip carried thereby can rotate about the axis of said shank portion to a position where the cutting edge is behind the axis of the shank portion in the direction of movement of the cutter bit toward the material.

2. A machine according to claim 1 in which the axis of said shank portion is substantially normal to the axis of movement of said cutter bit assembly toward said material.

3. A machine according to claim 1 wherein said shank portion is provided with an annular groove which receives the radial inner end of a fastening bolt extending through the wall of said bit block for holding the cutter bit within the bore in said bit block while permitting rotation of the cutter bit within the bore in said bit block.

4. A machine according to claim 1 wherein said cutting tip is removable from said cutter bit.

5. A machine according to claim 4 wherein said cutter bit is provided with a slot therein and a receptacle for said cutting tip, the slot intersecting said receptacle, and bolts means for forcing the portions of said cutter bit on opposite sides of said slot into engagement with the cutting tip to hold it in the receptacle.

6. A machine according to claim 5 wherein said cutting tip has a forward essentially straight-line cutting edge.

7. A machine according to claim 6 in which the axis of said shank portion is substantially normal to the axis of movement of said cutter bit assembly toward said material.

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