

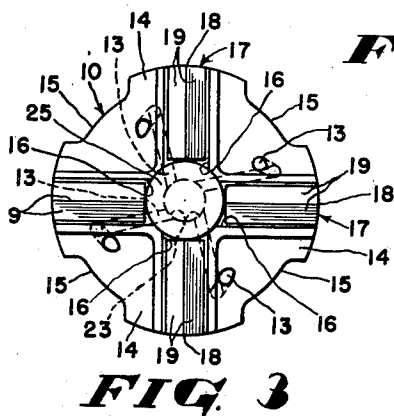
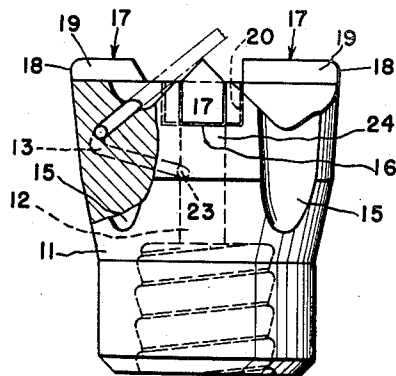
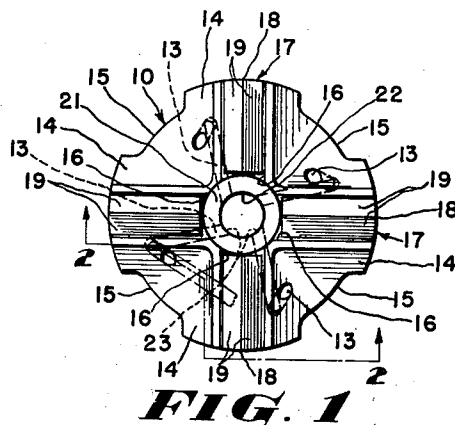
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ROCK DRILLING TOOL

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ROCK DRILLING TOOL

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4 Claims. (Cl. 255—64)

This invention relates to cutting implements, and more particularly to a rock drilling tool having cleansing fluid passages therein arranged to direct the flow of cleansing fluid radially outward along the cutting edge of the tool.

Conventional drilling tools of the type to which this invention appertains are normally provided with a centrally located cleansing fluid passage arranged in such a manner as to direct the flow of cleansing fluid longitudinally away from the cutting face of the tool. The fluid thus directed impinges on the surface of the rock being drilled and is deflected radially outward and washes rock cuttings back along the drill hole between the boundaries of the hole and the periphery of the tool. With this type of cleansing, maximum cleansing occurs at the central portion of the tool and is reduced proportionately in a radially outward direction. This cleansing distribution is satisfactory when the rock being drilled is relatively soft, however when the rock being drilled is relatively hard, then a reverse distribution is desirable—that is, maximum cleansing should occur at the periphery of the tool. This is so because in such rock, fine rock particles or cuttings between the side surface of the tool and the surface of the drill hole act as an abrasive compound which grinds away the peripheral surface of the tool thereby reducing the gauge of the tool.

It is accordingly one object of this invention to eliminate excessive wear of the gauge surfaces of a drilling tool by insuring continued cleansing of these surfaces of rock cuttings.

A further object is to construct a rock drilling tool provided with cleansing fluid passages terminating in and off-center of the cutting face of the tool and arranged to direct cleansing fluid along a path leading forwardly along the cutting surface of the tool and also toward the peripheral surface of the tool.

Further objects of this invention will become apparent from the following specification and drawings in which

Figure 1 is an end view of a drilling tool constructed in accordance with the practice of this invention,

Fig. 2 is a side view of Figure 1, partly in section, taken along the line 2—2 looking in the direction of the arrows, and

Fig. 3 is an end view of a modified form of the invention.

Referring to the drawings and at first to the form of the invention shown in Figures 1 and 2, the numeral 10 designates a drilling tool constructed in accordance with the practice of the invention and comprising a body 11 of frusto-conical shape that may be an integral portion of a drill rod or a separate member (as shown) adapted for attachment to a drill rod in a well known manner. Formed within the body 11 is a centrally located passage 12 for conducting a cleansing fluid to the cutting face of the tool 10 for washing cuttings from the surface of the rock being drilled. In furtherance to this end, the passage 12 is provided with branch passages 13 which terminate in the cutting face of the tool at points radially displaced from the center of the body 11 and having

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their outlet ends positioned to direct the flow of cleansing fluid along the cutting surface of the tool and toward the front end and the periphery of the tool 10. With this arrangement the cleansing fluid is directed at the gauge surfaces at the periphery of the tool thereby keeping these surface areas relatively clean and preventing excessive wear at such areas.

The drilling tool shown by way of illustration only is of the four-point type and accordingly the body 11 is provided with four equi-angularly spaced wings 14 that are separated by grooves 15 extending longitudinally of the body for the escape of cuttings from the surface of the rock being drilled. Formed in the wings 14 are diametric slots 16 that lie at right angles to each other and extend along the wings to the periphery of the body 11. The slots 16 are of uniform width throughout their lengths and their opposed side surfaces lie at right angles to the bottom surfaces. Positioned within the slots 16 are hard metal inserts serving as cutters.

As viewed in Fig. 2 there is a vertical cutter and a horizontal cutter. Each cutter extends transversely of the bit having its axis on a line passing through the approximate center of rotation of the tool and is substantially straight along its longitudinal axis. In the particular form of the invention shown by way of illustration, each cutter is made up of two cutter sections 17 having their inner ends spaced apart. The forward marginal portions of the cutter sections 17 protrude from the slots 16 and are bounded by surfaces 19 inclined forwardly relative to each other and relative to the longitudinal axis of the bit to form a wear resisting cutting edge 18 at the intersection of such surfaces 19.

The cutter sections 17 are bonded to the body in any well known manner, as for example by brazing to secure the cutters fixedly to the body.

Means are provided for preventing the cutter sections 17 from being shifted endwise in the slots 16. To this end the body is provided with a recess 20 at the inner ends of the slots 16 and a rigid tubular abutment member 21 is positioned in the recess 20 abutting the inner ends of the cutters.

An opening 22 in the abutment member 21 is arranged coaxially with and forms an extension of the central cleansing fluid passage 12. The upstream ends 23 of the branch passages 13 are located at points upstream of the downstream end 24 of the central passage 12, and the downstream ends of the branch passages are located in the surface of the body 11 at points off-center from the central passage 12. In furtherance to the end that cleansing fluid emanating from the branch passages 13 serve to clean the cutting edges 18 and gauge surfaces (exposed ends) of the inserts, a branch passage 13 is provided for each insert, four in the form of the invention illustrated. Each passage 13 extends in a direction radially outward and frontwardly (relative to the body 11) from the passage 12 to a point near the periphery of the body then radially inward and frontwardly and at an angle, in the transverse plane, to the inlet portion, and terminating in the face of the body 11. The outlet, or terminal, ends of the passages 13 are arranged around the face of the tool such that a jet of cleansing fluid is directed at the leading inclined surface 19 of the cutters. For example, assuming clockwise rotation of the tool shown in Fig. 1, the mouth of the passage 13 associated with the lower leading end portion of the vertical cutter (the lowermost cutter section 17) is located adjacent the succeeding clockwise cutter section 17 (left horizontal). Thus cleansing fluid emanating from this particular branch passage is directed at the lower end portion of the lower left surface of the vertical cutter—i.e., the left inclined surface 19 of the lowermost cutter section 17, as viewed in Fig. 1. The reason for directing cleansing fluid along

the leading, rather than the trailing, cutting surface is that due to the sweeping action of the tool, and which is rotated by a rock drill between blows of its percussive element against the tool, the probability of a quantity of rock cuttings gathering at the leading inclined surface and causing excess wear of the inserts and impairing drilling is greater than the probability of such collection at the trailing inclined surface of the same insert.

In order to obtain maximum cleansing at the outer portions of the cutting edges of the cutters and the gauge surfaces of the cutters, the axes of the downstream end portions of the branch passages 13 are located in such a manner as to direct the cleansing fluid along a flow path which leads forwardly along an intermediate portion and inclined slightly toward the leading side surface 19 of the cutting edge (see dotted flow path Fig. 2) and so that such flow is directed both forwardly to the cutting end and toward the periphery of the tool (see dotted flow path Fig. 1). With the particular form of the invention illustrated in Figs. 1 and 2 cleansing fluid is conducted to the face of the tool through both central and side passages. Thus this tool is adapted for use in both hard and soft rock drilling. In drilling hard rock or similar rock formations only, it may be desirable to block off the central fluid passage 12 in order to increase the flow rate of cleansing fluid through the off-center passages 13. This construction is illustrated in Fig. 3 which is identical in all respects with the previously described form of the invention with the exception that a solid plug 25 replaces the tubular abutment member 21, which plug serves as an abutment member for the cutters and to block off flow through the central passage 12 to the face of the tool.

I claim:

1. A rotatable percussive type drilling tool having a body, a cutter mounted transversely on an end of the body and having its longitudinal axis on a line passing through the approximate center of rotation of the tool, said cutter having its forward marginal portion bounded by surfaces forwardly inclined toward each other and the longitudinal axis of said body to form a cutting edge at their intersection; a cleansing fluid passage extending longitudinally in the bit and terminating in said end thereof and displaced to the side of said cutter having a leading surface portion, relative to the direction of rotation of the tool; the terminating end portion of said passage being positioned to direct cleansing fluid on a flow path

leading forwardly along an intermediate section of such leading surface portion and directed outwardly along such surface portion.

2. The drilling tool claimed in claim 1 in which an additional cleansing fluid passage is provided in the body leading longitudinally therein and terminating in said end of the body at a point spaced from said cutter and having its terminating end portion positioned to direct cleansing fluid axially forward of said tool.

3. The drilling tool claimed in claim 1 in which said cutter is formed in two parts having their inner ends spaced apart at the approximate center of rotation of said body with a cleansing fluid passage provided for each part, and in which an additional cleansing fluid passage is provided terminating in said end of the body between the inner ends of said parts and having such terminating end portion formed to direct cleansing fluid axially of said tool.

4. A rotatable percussive type drilling tool having a body, at least one transverse cutter on one end of the body having portions located on opposite sides of the approximate center of rotation of the tool, such cutter portions having their forward margins bounded by inwardly inclined surfaces forming a cutting edge at their intersection; a longitudinal cleansing fluid passage in said body terminating in said end of the body at a point displaced from the cutter and having its terminating end portion formed to direct the flow of cleansing fluid along a flow path leading forwardly along the surface of an intermediate section of the end part of each inclined surface which leads, relative to the direction of rotation, the coterminal portion of the other part and directed radially outward toward the periphery of the body; there being one such passage for each such lead portion.

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