July 31, 1956 A. MEUTSCH 2,756,967

ROCK-DRILL

Filed March 5, 1952

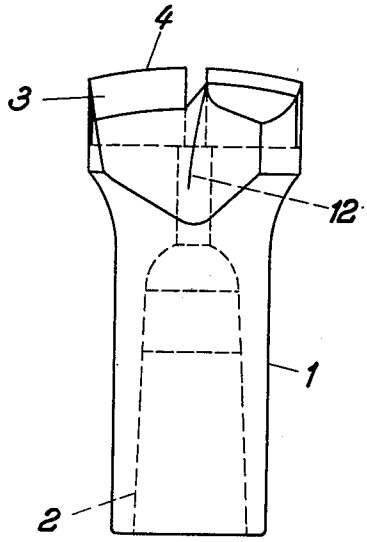


Fig. 1

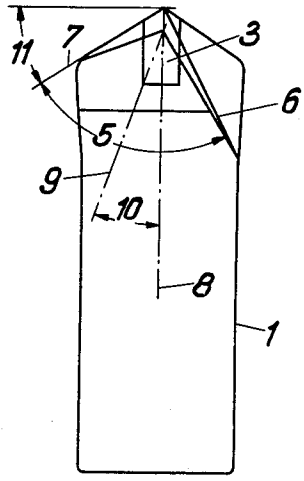


Fig. 2

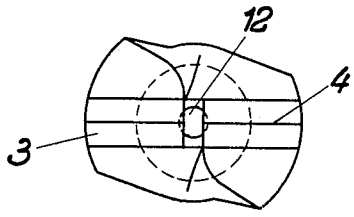


Fig. 3

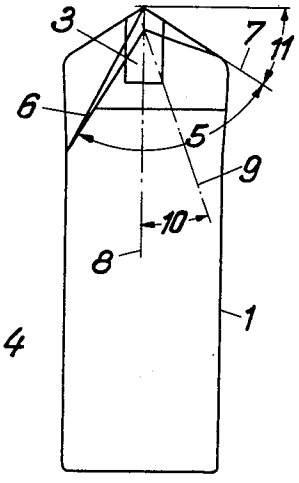


Fig. 4

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ROCK-DRILL

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4 Claims. (Cl. 255—63)

In the art of boring in rock, two types of apparatus are in use, one of which operates on the percussion method, i. e. it performs constantly percussion blows against the rock and is lifted off between the individual blows. After each blow has been struck the boring member will be rotated a slight degree. The boring work proper, therefore, is made by the blows, while the intermittent rotation moves the knife of the boring tool to the next striking place.

A second type of apparatus is of the rotary type in which a constant and not interrupted rotation takes place. In this type the boring tool remains constantly in contact with the rock and a pressure must be exerted against it for pressing it constantly against the rock.

Recently, a new kind of boring in rock has been suggested forming, so to say, a combination of the two types mentioned before. In this method, which may be called "rotary-percussion" method, the tool is pressed against the rock by an oscillating pressure e. g. by means of a vibrator. Hereby two motors are necessary, a rotating motor which rotates the tool and a percussion motor which places an oscillating pressure on the boring tool. The rotating motor operates constantly and independently of the percussion motor, and the latter also operates constantly and independently of the rotating motor.

In correspondence with these two working methods also different boring tools are used. In the rotary type, drilling tools are used, the cutting tips of which have a substantially vertical true rake running parallel to the axis of the tool along which true rake the chips flow, while in the percussion type, drilling tools are used, the two cutting edges of which are wedge-like formed and which—if insets of hard metal are provide—have a lip angle of 90°–115° arranged symmetrically to the axis of the tool.

With the mentioned "rotary-percussion" method in which the rotating drill is pressed against the rock by an oscillating pressure none of the mentioned two types of drills have proved successful.

The present invention relates to a boring tool or drill adapted to be used for the last mentioned method of boring and constructed so as to resist all stresses arising therewith. Tests have shown that for this purpose the lip angle of such tools must amount to less than 90° and must be arranged unsymmetrically with respect to the axis of the tool, so that the bisector of the lip angle forms with the axis of the tool an angle of about 5°–40°.

The cutting edges may be tipped with hard metal provided that the shank consists of a suitable steel. In such case the lip angle may be smaller. It is advantageous to produce the cutting edge by welding-on hard metal alloys as such welded tips are inseparably connected with the steel shank, in contradistinction to tips fastened on the shank by sodering. Preferably sintered hard metal is employed for being welded-on.

The accompanying drawing shows by way of example two embodiments of the invention.

Fig. 1 illustrates a side view of a double-cutting solid drill,

Fig. 2 is a side view of Fig. 1,

Fig. 3 is a plan view of Fig. 1, and

Fig. 4 is a similar view as Fig. 2 showing a modified construction.

The shank **1** of the drill head is provided with a conical recess **2** by means of which it may be attached to the drill rod. Of course, instead of the hollow cone shown in the drawing any other means may be chosen for connecting the drill head with the drill rod, e. g. inner thread, a threaded bolt and so on. The wings of the drill are provided with hard metal tips **3** forming the cutting edges **4**.

According to the invention the lip angle **5** of the tip is less than 90° and is arranged in such a way that its two legs **6** and **7** are unsymmetrical with respect to a plane including the axis of the drill and the cutting edge. In other words, the two legs **6** and **7** of the lip angle lie at opposite sides of a plane including the drill axis, but are inclined relatively to this axis by different angles, i. e. they are unsymmetrical with respect to said axis, so that the bisector **9** of the lip angle forms an angle **10** of 5°–40° with the mentioned plane. The clearance angle **11** depends upon the hardness of the rock and amounts generally to 15°–35°.

The drill head is provided with one or a plurality of scavenging holes **12** and the resulting borings flow away through the recesses formed by the inclined position of the true rake corresponding to the leg **6** of the lip angle.

With drills of this kind considerable advantages are obtained over the drills known up to now. From a large series of tests in which bore holes having a total length of more than 10,000 metres have been bored with such tools the following boring outputs resulted:

Kind of rock	Working with rock drill hammer	Rotary boring on boring carriage	Rotary-percussion boring on boring carriage
Sand slate:			
Output, cm./min.	30–20	180–120	240–170
Blunt after, m.	24	36	220
Sandstone, fine-grained:			
Output, cm./min.	24–17	120–85	220–160
Blunt after, m.	8	12	140
Sandstone, hard:			
Output, cm./min.	18–12	30–20	160–110
Blunt after, m.	2	0.5	6

In this chart the letter *m* represents metres. All these tests have shown that substantially the same output may be attained if the drill according to Figs. 1–3 is used rotating in the usual way to the right or if a drill as shown in Fig. 4 is used when rotating in the reversed direction i. e. to the left. In the one case, i. e. if the drill according to Figs. 1–3 rotates to the right, the bisector of the lip angle includes with the plane including the axis of the drill and the cutting edge an angle of 5–40° extending from the vertex of the angle towards the direction of rotation and in the other case, i. e. if the drill according to Fig. 4 rotates to the left, the mentioned bisector extends from the vertex opposite to the direction of rotation of the drill.

Fig. 4 showing a drill designed to rotate to the left is substantially an image of Fig. 2 produced by a mirror, and as the same reference numerals are used, no further description of Fig. 4 seems to be necessary.

Further it has proved that also tools produced of steel and not provided with a hard metal tip have a considerable longer durability and a better output if the cutting edges are shaped in the manner described above, than drills of the usual form made of steel.

So far as tools are used, the cutting edges of which are

formed by hard metal tips, it is suitable to weld-on the hard metal alloys as such tips attach to the steel body inseparably. Such drills, therefore, work much better than drills having the tips soldered on. Also drills having hard metal tips welded-on are cheaper than those having the hard metal tip soldered on. The tips preferably consist of sintered hard metal.

The drills of the type described are suitable for all kinds of "rotary-percussion" boring, i. e. for rotary boring methods in which the drill, instead of being pressed against the rock with a high uniform pressure, is subject to an oscillating pressure like a percussion drill, independently of the means by which said oscillating pressure is produced.

What I claim is:

1. A rock drill having at least two equally spaced wings of equal shape, especially for the rotary-percussion method, in which the drill rotates and is pressed against the rock by an oscillating pressure, the wings having a lip angle amounting to less than 90° and a clearance angle of from 15° to 35° and having its legs arranged unsymmetrically at opposite sides of a plane including the axis of the drill and the cutting edge of the respective wing so that the bisector of the said lip angle and the said plane include an angle of about 5°–40°.

2. A rock drill as claimed in claim 1, the said bisector of lip angle extending from the vertex of the lip angle opposite the direction of rotation of the drill.

3. A rock drill as claimed in claim 1, said rock drill being provided with hard metal tips welded-on.

4. A rock drill as claimed in claim 1, said rock drill being provided with a tip consisting of sintered hard metal.

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