(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 345 096 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **89305634.1**

(22) Date of filing: **05.06.89**

(51) Int. Cl.4: **E 21 B 10/56**
E 21 B 10/38

(30) Priority: **03.06.88 ZA 883939**

(43) Date of publication of application:
06.12.89 Bulletin 89/49

(84) Designated Contracting States: **DE FR SE**

(71) Applicant: **Boart International Limited**
Boart Place Fredman Drive Oxford Park
Sandton 2199 (ZA)

(72) Inventor: **Tyler, Vincent Cunningham**
168 Nigel Road Selcourt
Springs Transvaal Province (ZA)

(74) Representative: **Hughes, Brian Patrick et al**
Graham Watt & Co. Riverhead
Sevenoaks, Kent TN13 2BN (GB)

(54) Drill bit.

(57) This invention relates to a drill bit which comprises a shank (2) which has a thread (18) down the centre and a head (3), the shape of which is defined by a flat central front face (4) and a chamferred peripheral surface (5). The front face has at least one eccentrically located face button approximately 8mm in diameter, and the peripheral surface has at least six gauge buttons, approximately 10mm in diameter, spaced typically at radial angles of 54° and 66°. The drill bit also has typically two flushing holes, the first extending from a flushing chamber (16) to an eccentrically located opening (15) at the front face and the second extending from the flushing chamber and opening at the peripheral surface. Also associated with the peripheral surface are flushing flutes which extend along the axis of the head.

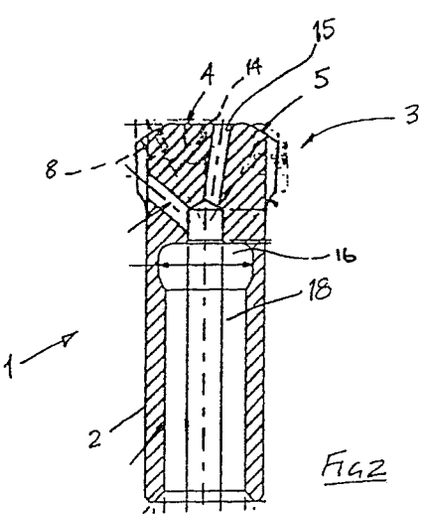

Fig2

EP 0 345 096 A1

Description

DRILL BIT

This invention relates to improvements in button drill bits.

BACKGROUND OF THE INVENTION

Button drill bits are used extensively in the mining industry and are obtainable in various gauge diameters.

Sintered cemented tungsten carbide buttons are used to provide hard rock breaking elements on the head of the drill bit. In general terms the larger and more numerous the buttons in relation to the head surface area the more efficient will be the drill bit. The cemented carbide buttons are generally grouped in particular patterns and those around the periphery are referred to as 'gauge' buttons, and those in the middle as 'face' buttons.

One method of decreasing gauge wear is to increase the number of gauge buttons, which requires reduction of the diameter of the buttons for a fixed size bit. Another method is to increase the diameter of the buttons, resulting in fewer gauge buttons that can be fitted to a bit. For drill bits with gauge diameters in the most popular range of 41mm to 51mm, it becomes difficult to insert more gauge buttons of a reasonable diameter. It is a rule of thumb that the pitch circle spacing between the bases of the buttons should not be less than 2mm.

A further constraint is that the head of the drill bit has to be flushed with water to remove broken rock, which is achieved by pumping water through flushing holes that open out at the head of the drill bit. The resulting sludge is ejected through flushing flutes that run along the side of the drill body. The need for flushing flutes places a constraint on the buttons in that the larger the button diameter and the greater the number of buttons, the more difficult it is to achieve good flushing characteristics from flushing holes and flutes.

OBJECT OF THE INVENTION

It is an object of this invention to provide an efficient drill bit by introducing more cemented tungsten carbide gauge buttons than has previously been possible.

SUMMARY OF THE INVENTION

Acording to this invention there is provided a drill bit comprising a shank, and a head having a gauge diameter ranging from 41mm to 51mm and fitted with at least six gauge buttons, each at least 10mm in diameter, and at least one face button.

Preferably the gauge buttons are alternately spaced at radial angles of typically 54° and 66°.

At least one flushing hole extends from a flushing chamber and opening out at a location eccentrically of the centre of a front end surface of the head of the bit, and at least one flushing hole extends from the flushing chamber and opening out at the periphery of the head.

Additionally the buttons may be of sintered tungsten cemented carbide, with a male or female thread down the centre.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention are described below by way of example only and with reference to the accompanying drawings, in which:

Fig. 1 is a plan view of the invention; and,

Fig. 2 is a section along lines B-B of Fig. 1.

DETAILED DESCRIPTION OF THE DRAWINGS

As illustrated a drill bit 1 has a cylindrical shank 2 and head 3. The shape of the head 3 is defined by a central front face 4 and a peripheral surface 5. The front face 4 is a disc shaped flat surface which is circumscribed by an annular chamferred portion forming the peripheral surface 5. The normals to the flat surface 4 and the peripheral surface 5 are inclined to each other at angles ranging from 30° to 45°.

The chamferred surface 5 has recesses 8 to accommodate cemented carbide buttons 9. The carbide buttons 9 have a generally cylindrical body with an outer wear end which is hemispherically shaped and an opposite root end, which is secured in an recess 8. The recesses 8, extend normally into the chamferred surface 5, so that the centre axis of the recess makes an angle with the normal to the front surface 4. The wear end of the buttons protrude above the chamferred surface.

The root of a centre button 13 of some 8mm diameter is inserted in a recess 14 in the front surface 4. The position of the centre button 13 is slightly offset to facilitate rock breaking at the bit face and allow room for the outlet of a flushing hole 15, which extends from a flushing chamber 16.

The gauge buttons are 10mm in diameter and are located in three sets of two pairs, with each button of a pair being spaced apart from each other by an angular pitch circle distance of typically 54°, and each set being spaced apart by an angular pitch circle distance of typically 66°.

A further flushing hole extends from the flushing chamber and opens out in a flushing flute in the shank wall 17. Three major flushing flutes 17 extend axially along the shank wall through the periphery 5 of the head 3 and are located one between each set of gauge buttons.

The shank 2 has a threaded recess 18 to accommodate an end of an extension drill rod.

It will be appreciated that the above description covers a range of embodiments having normals to the flat surface 4 and the peripheral surface 5 inclined to each other at angles ranging between 30° and 45°.

Field trials for two of these embodiments have been carried out and the results of these trials are set out in three examples given below at different drilling sites:-

Example 1

Design Description	Angle Between Normals	Penetration (metres)
6 Gauge (or heelrow) buttons	30°	114.8 ave.
5 Gauge (or heelrow) buttons (standard)		86.5 ave.
Prior art design		50.0 ave.

In this example an improvement in performance of 129.6% is shown over the prior art and 32.7% over a standard design.

Example 2

6 Gauge (or heelrow) buttons	30°	133.0 ave.
6 Gauge (or heelrow) buttons	37.5°	123.4 ave.
5 Gauge (or heelrow) buttons (standard)	30°	114.0 ave.

This shows an improvement in performance of 16.6% over the standard design.

Example 3

6 Gauge (or heelrow) buttons	30°	327.7 ave.
6 Gauge (or heelrow) buttons	37.5°	221.9 ave.
5 Gauge (or heelrow) buttons (standard)	30°	231.7 ave.

This shows an improvement of 41.4% over the standard design.

These results show that the bits provided by this invention, having 6 gauge buttons give a longer life than those using 5 gauge buttons and example 1 shows a far superior performance than the prior art design.

Claims

1. A drill bit comprising a shank, and a head having a gauge diameter ranging from 41mm to 51mm and fitted with at least six gauge buttons, each at least 10mm in diameter, and at least one face button.

2. A drill bit as claimed in claim 1 in which the gauge buttons are alternately spaced at radial angles of typically 54° and 66°.

3. A drill bit as claimed in claim 1 or claim 2 having at least one flushing hole extending from a flushing chamber and opening out at locations eccentrically of the centre of the front end surface of the head of the bit and/or opening out at the periphery of the head.

4. A drill bit as claimed in any of the preceding claims, having buttons of cemented tungsten carbide.

5. A drill bit as claimed in any of the preceding claims, having a male or female thread down the centre.

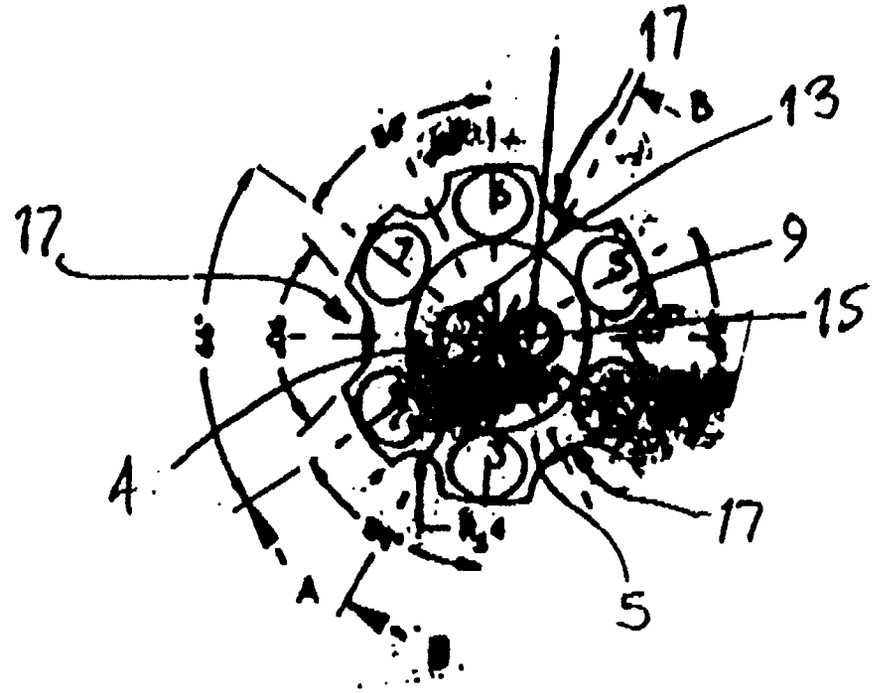

FIG 1

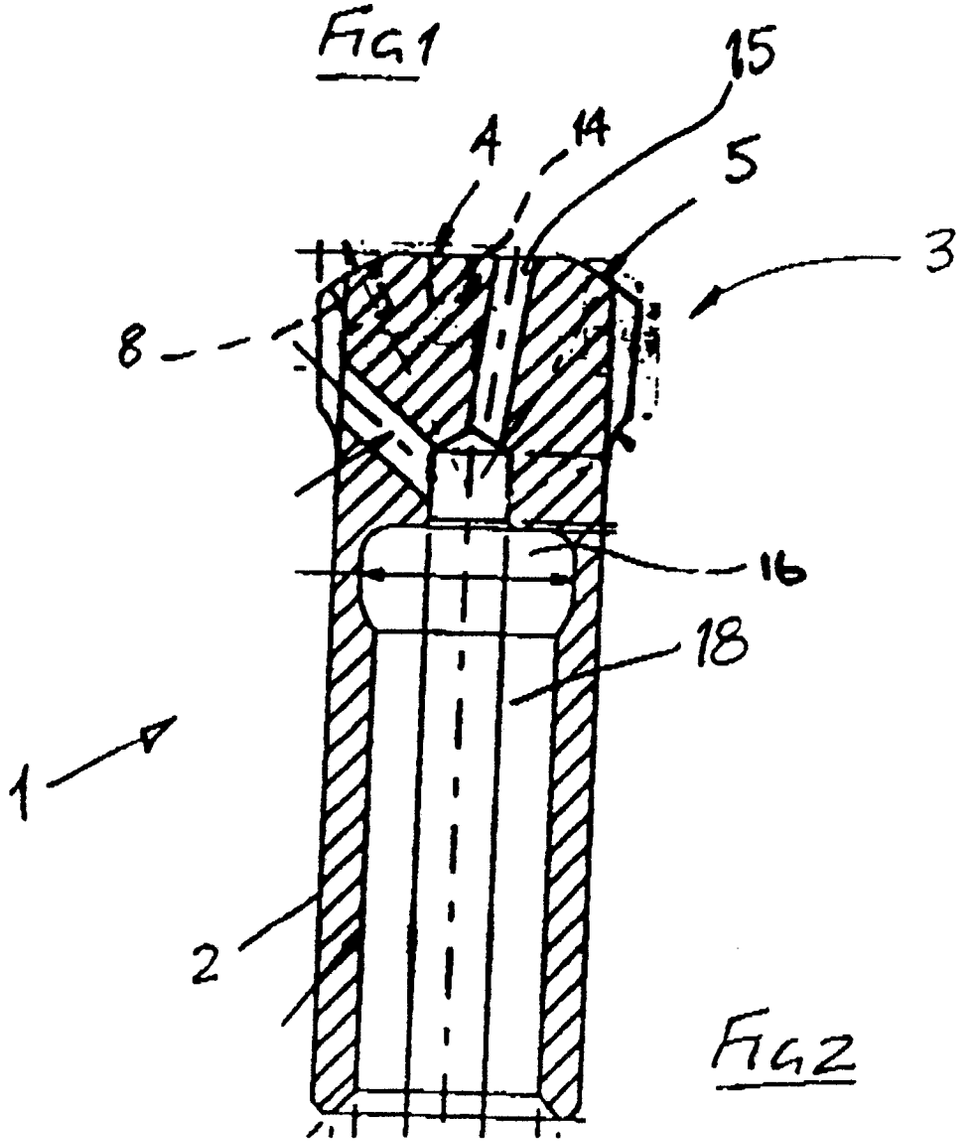

FIG 2

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 89 30 5634

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	FR-A- 983 901 (JOY MANUFACTURING) * Figures 8-12; page 1, lines 9-15 *	1,4,5	E 21 B 10/56 E 21 B 10/38
X	EP-A-0 140 849 (SANTRADA LTD) * Abstract; figures 5-8 *	1,3,4	
A	US-A-4 730 682 (DITZIG) * Abstract; figures *	1-5	
A	US-A-4 296 825 (LARSSON) * Abstract; figures *	1-5	
A	US-A-4 304 312 (LARSSON) * Abstract; figures *	1-5	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

E 21 B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	05-09-1989	WEIAND T.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P0401)