Nov. 3, 1959 H. M. CAMERON ET AL 2,911,196

DIAMOND DRILL BIT

Filed May 3, 1957

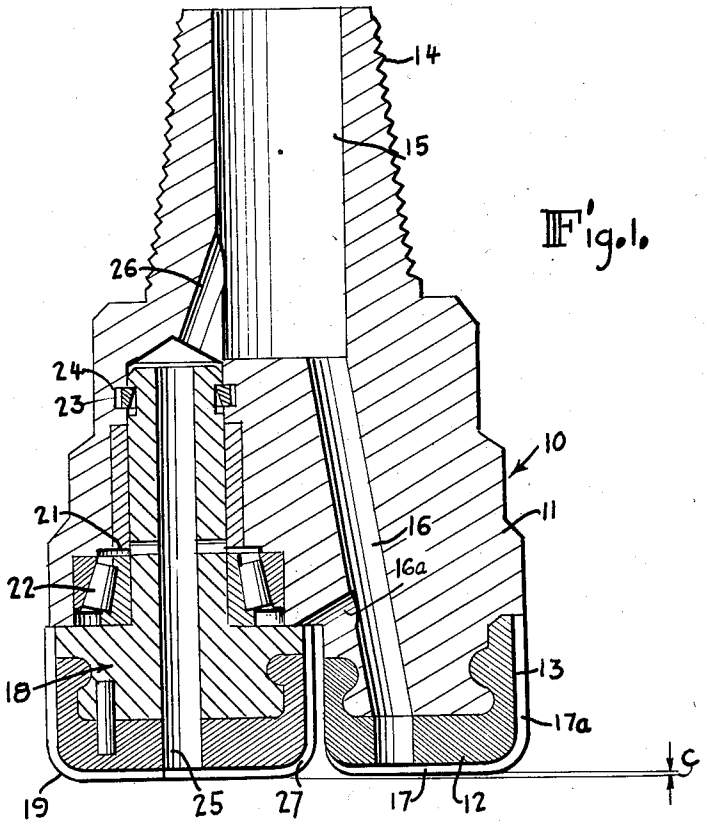

Fig. 1.

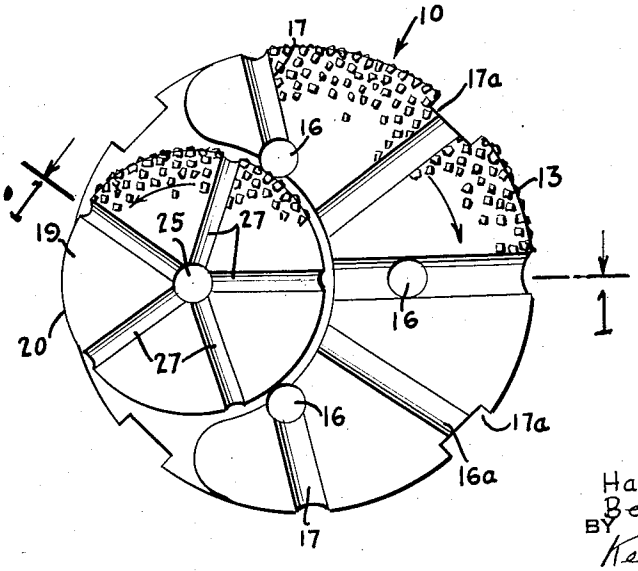

Fig. 2.

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United States Patent Office

2,911,196

Patented Nov. 3, 1959

2,911,196
DIAMOND DRILL BIT

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Application May 3, 1957, Serial No. 656,964

1 Claim. (Cl. 255—301)

This invention relates to rock drill bits and more particularly to diamond drill bits of this character intended to provide substantial velocity to all of the abrading surfaces with respect to the rock surfaces they are intended to cut.

In conventional drill bits, the cutting velocity of each diamond in the drilling surface is directly proportional to the radius at which it is positioned so that at zero radius, normally the axis of the drill, the velocity is also zero.

Objects and features of this invention are the provision of drill bit construction intended to provide substantial cutting velocities to diamonds at all radial positions relative to the main drill axis.

In an embodiment of the invention as herein contemplated, this is accomplished by incorporating an auxiliary freely rotatable drill bit with diameter somewhat greater than the radius of the main drill bit and which is positioned relative to the face of the main drill so that it extends beyond the axis or geometrical center of the main bit and so that its periphery is either tangent to or extends slightly beyond that of the main bit. With such arrangement forces for rotating the auxiliary bit are produced by the friction of the rock particles acting both on the auxiliary bit periphery and on its drilling surfaces and the direction of rotation of the auxiliary bit is opposite to that of the main drill bit.

Other objects and features of the invention are the provision of combined main and auxiliary drill bits in a unitary structure that is simple in structure, installation and operation.

Further objects and features of the invention are the provision of appropriate distributing passages for water to both the main and auxiliary bit drilling surfaces to promote efficient chip removal and heat dissipation.

Other objects and features will become apparent from the following specification and the accompanying drawing, wherein:

Figure 1 is a longitudinal section taken along line 1—1 of Figure 2; and

Figure 2 is a bottom plan view of the device embodying the invention.

Referring to the drawing, the reference character **10** generally denotes a rock drill bit embodying the invention. This bit **10** includes a main drill body **11** that is provided with diamond abrading lower and peripheral surface portions **12** and **13** in any conventional manner adjacent one end of the body. The opposite end of the body **11** is threaded at **14** as usual for attachment to the drill string (not shown). A main longitudinally extending water passage **15** is provided in the main drill body **11** and branch passages **16** and **16***a* connect this main passage respectively with distributing channels **17** and grooves **17***a* provided in the abrading portions **12** and **13** of the drill body **11**. These passages **16** and **16***a* and channels **17** and grooves **17***a* serve to distribute water over the abrading surfaces to promote efficient chip removal and heat dissipation.

An auxiliary drill bit body **18** whose diameter at its abrading surface portions **19** is somewhat greater than the radius of the main drill bit at its abrading surfaces **12** and **13** is adapted to be supported in freely rotatable manner within the main drill bit body **11**. Abrading

surfaces **19** are applied to the bit body **18** in the same way as surface portions **12** and **13** are applied to bit body **11**. The auxiliary bit body **18** is positioned so that its abrading surface **19** lies substantially in co-planar relationship with abrading surface **12** or projects a small amount *c* below the latter and so that its peripheral abrading surface **20** extends beyond the geometrical center or axis of the main drill bit **11** and so that its peripheral surface **20** is substantially tangent to or extends slightly beyond the periphery of the main drill abrading surface **13**.

The auxiliary bit body **18** is supported rotatably within the main drill body **11** by a combination radial and thrust bearing **21**, which may be either a journal bearing or anti-friction roller bearings **22** as shown. The auxiliary bit body **18** is maintained in position within body **11** as by a spring retainer ring **23** located in an annular groove **24** in said body. This ring **23** also serves to resist hung-up forces from pulling the auxiliary bit body **18** out during removal of the bits from the hole drilled by them.

An axial passage **25** in the auxiliary bit body **18** communicates with the main water channel **15** in the main bit body **11** as by a passage **26** and with channels **27** in the face of bit body **18** to promote efficient chip removal and heat dissipation.

In operation, the main drill body **11** is attached to the lowermost end of the drill string (not shown) and lowered into the hole for drilling. On rotary drive of the drill string and bit body **11**, the forces tending to rotate the auxiliary bit body **18** are produced by the friction of the rock particles acting on its abrading periphery **20** and on its lower drill surface **19**. Its direction of rotation is opposite to the direction of rotation of the main drill bit. Since the auxiliary bit has a diameter in excess of the radius of the main bit, positive drilling is effected at the geometric center of the main drill bit by the drilling surface **19** of the auxiliary drill bit **18** which thus has a substantial velocity over the rock surface that it is intended to cut.

While a specific embodiment of the invention has been shown and described, variations in structure within the scope of the appended claim are possible and are contemplated. There is no intention, therefore, of limitation to the exact details herein shown and described.

What is claimed is:

In combination, a main drill bit having an abrading surface and having a generally longitudinal recess eccentric of its longitudinal axis, a freely rotatable auxiliary drill bit having an abrading surface and being carried by said main drill bit within said recess so that its periphery overlaps the geometric center of said main drill bit, combination radial and thrust bearing means within said recess for rotatably supporting said auxiliary drill bit within said recess so that the said two abrading surfaces lie in substantially co-planar relationship, and retaining ring means interior of said recess for preventing separation of said auxiliary drill bit from said main drill bit during their extraction from a hole drilled by them, the said main drill bit having a main passage and branch passages in communication therewith and the said auxiliary drill bit having an axial passage therein communicating with said main passage for distribution of drilling fluid to the said abrading surfaces during a drilling operation.

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