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ROTARY DRILL BIT

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FIG. 1

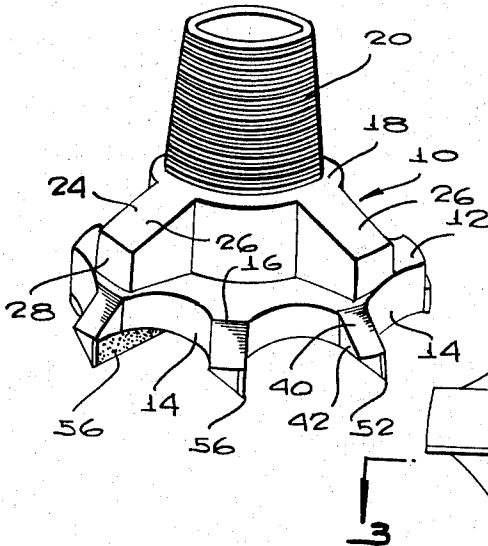


FIG. 2

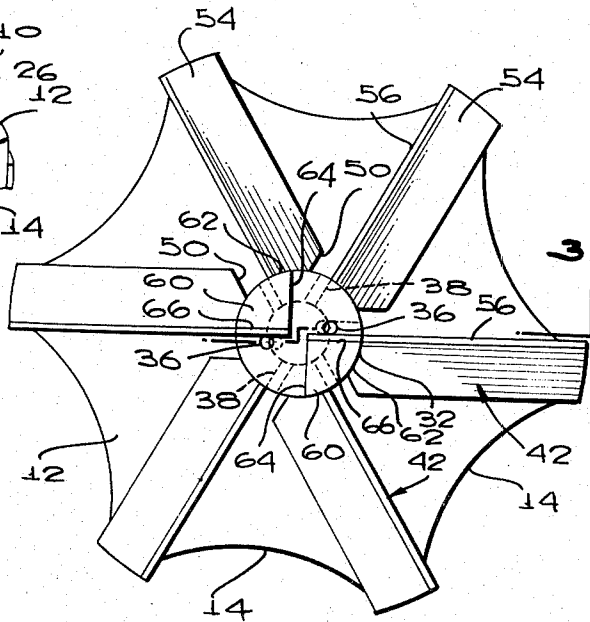


FIG. 3

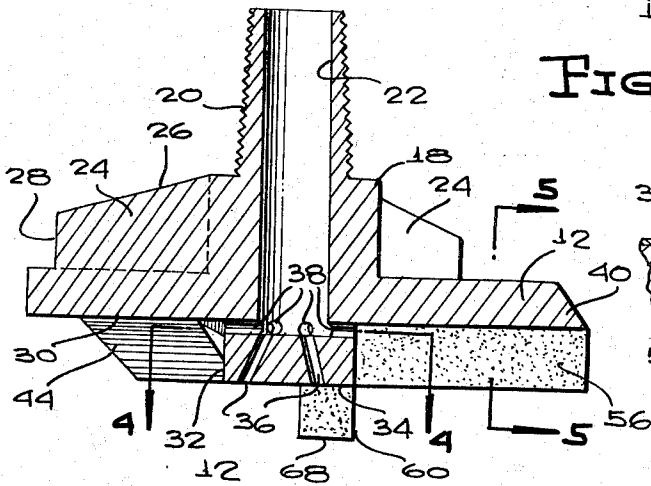


FIG. 4

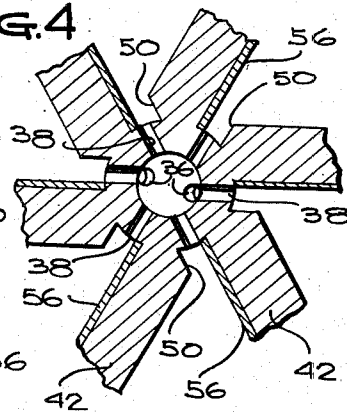
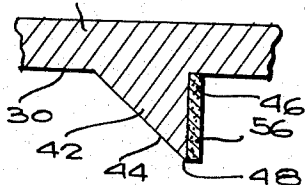


FIG. 5



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ROTARY DRILL BIT

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6 Claims. (Cl. 255—61)

This invention relates to an improved self-cleaning drill bit for use in drilling wells having both hard and soft formations.

The primary object of the invention is to provide a more efficient, reliable and desirable drill bit of this kind which has water courses arranged relative to its blades so that clogging of the blades during operation of the bit is eliminated.

Another object of the invention is to provide a drill bit of this kind which has radially extending and radially elongated and reinforced horizontal cutting blades, and central vertical boring blades, which are diamond-inlaid on their cutting sides so as to substantially reduce wear thereon and to prolong the life and efficiency of the drill bit, the diamond inlays extending effectively to the cutting edges of the blades, and the trailing sides of the blades being reduced to eliminate non-functioning and unnecessary portions of the blades, so as to eliminate wear which would otherwise occur thereat, the blade being generally triangular in cross section.

A further object of the invention is to provide a drill bit of the character indicated above which can be made in well-finished, rugged, and serviceable forms at relatively low cost.

Other objects and advantageous features of the invention will be apparent from the following description and the accompanying drawings, wherein, for purposes of illustration only, a specific form of the invention is set forth in detail.

In the drawings:

Figure 1 is a perspective view of a drill bit of the invention;

Figure 2 is an enlarged bottom plan view of Figure 1;

Figure 3 is a central vertical transverse section, taken on the line 3—3 of Figure 2;

Figure 4 is a fragmentary horizontal section taken on the line 4—4 of Figure 3; and

Figure 5 is an enlarged vertical transverse section, taken on the line 5—5 of Figure 4.

Referring in detail to the drawings, wherein like numerals designate like parts throughout the several views, the illustrated well drill bit comprises a relatively flat or short conical body 10 comprising a flat circular disc portion 12 having in its peripheral edge closely and uniformly circumferentially spaced scallops or arcuate indentations 14 of equal length, which define therebetween unindented peripheral edge portions 16. On the upper side of the disc portion 12, and preferably integral therewith, is a reduced diameter central hub 18 of relatively small height, which is surmounted by a conical and externally threaded tool joint 20. An axial water passage or chamber 22 extends through the disc portion 12, the hub 18, and the tool joint 20.

Radiating from the hub 18 and secured to the disc portion are equally circumferentially spaced, radially elongated reinforcing spokes 24, which have radially outwardly declining upper surfaces 26, and squared outer

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ends 28 which terminate at scallops 14 or at peripheral edge portions 16 of the disc portion 12.

The disc portion 12 has a flat plain underside 30, as shown in Figure 3, on which is a relatively small diameter, depending cylindrical axial boss 32 having an underside 34. The boss 32 is provided with circumferentially spaced, inwardly inclining vertical water passages or courses 36 which extend from the underside 34 to the lower end of the axial water chamber 22; and with circumferentially spaced horizontal water passages or courses 38 which extend from the periphery of the boss 32 into the axial water chamber 22, with some of the passages 36 and 38 being aligned or registered with each other, as shown in Figure 4.

Preferably formed integral with the underside 30 of the disc portion 12, and with and having brace portions 40 at and extending radially beyond the peripheral edge portions 16 of the disc portion 12, are radially elongated cutting blades 42, which radiate from the boss 32 and have substantially the same vertical dimension as the boss 32, as shown in Figure 3. As shown in Figures 1 and 5, the blades 42 are triangular in cross section and have angular reduced trailing sides 44 and right angular or perpendicular leading or working sides 46, and these sides intersect in relatively sharp lower or cutting edges 48 which are preferably flush with the underside of the boss 32. As shown in Figure 4, the trailing sides 44 are cut away at their radially inward ends, to define entrances 50 which open to related water passages or courses 36 and 38. The radially outward ends of the blades are sharpened by bevels 52, and are concentrically rounded or concaved, as indicated at 54 in Figure 2.

Secured in any suitable manner to and covering the leading sides 46 of the blades 42 from the boss 32 to the outer ends 54 and from the underside 30 of the disc portion 12 to the lower edges 48 of the blades 42 are plates or inlays 56 of diamond-containing wear-resisting composition, which serve to virtually eliminate wear upon and distortion of the working sides 46 and of the lower edges 48 of the blades 42, when the drill bit is rotated in a direction to present the working sides 46 to material in a well in a drilling operation.

Because of the described forms of and cooperative arrangements of the horizontal and vertical water passages 36 and 38, respectively, accumulation and lodging of material between adjacent blades during operation of the drill bit is eliminated or reduced, so that clogging of the drill bit to an extent requiring pulling thereof from a well being drilled is eliminated.

Adequate rigidity and strength of the drill bit despite its relatively flat or vertically foreshortened form are obtained by means of the bracing spokes 24 and the braces 40 extending over and along the portions of the blades 42 which reach beyond the peripheral edge of the disc portion 12.

Fixed on and preferably integral with and depending from the underside 34 of the boss 32, are two substantially diametrically opposed boring blades 60, which are segmental or triangular in horizontal cross section, as shown in Figure 2. The outer sides 62 of the boring blades 60 are arcuate and coincide with the periphery of the boss 32. The flat trailing sides 64 of the blades 60 are in spaced parallel relation to each other; and the flat working sides 66 of the blades 60 are aligned with each other and with the working sides of two related blades 42, and have secured thereon extensions of the diamond-bearing plates 56 of these blades 42. The water passages 36 opening through the underside 34 of the boss at points near the working sides of the boring blades 60, and open into related water entrances 50. The boring blades have flat horizontal lower ends 68.

Although I have shown and described in detail herein

a specific embodiment of the invention, it is to be understood that any changes in the forms of and in the relative arrangements of components can be made within the scope of the invention or defined by the subjoined claims.

What is claimed:

1. In a well drill bit, a flat disc portion having an underside, a cylindrical axial boss depending from said underside disc portion, circumferentially spaced horizontally elongated radial cutting blades on the underside of said disc portion and radiating from said boss, said boss having an underside, and a pair of diametrically opposed segmental vertical boring blades on and depending from the underside of the boss, the horizontal cutting blades and the vertical boring blades having flat vertical working sides, the working sides of some of the cutting blades being aligned with each other across the bit and with working faces of the vertical boring blades.

2. In a well drill bit, a flat disc portion having an underside, a cylindrical axial boss depending from said underside disc portion, circumferentially spaced horizontally elongated radial cutting blades on the underside of said disc portion and radiating from said boss, said boss having an underside, and a pair of diametrically opposed segmental vertical boring blades on and depending from the underside of the boss, the horizontal cutting blades and the vertical boring blades having flat vertical working sides, the working sides of some of the cutting blades being aligned with each other across the bit and with working faces of the vertical boring blades, the working faces of the cutting blades and of the boring blades being covered by diamond-bearing wear-resisting inlays.

3. In a well drill bit, a flat disc portion having an underside, a cylindrical axial boss depending from said underside disc portion, circumferentially spaced horizontally elongated radial cutting blades on the underside of said disc portion and radiating from said boss, said boss having an underside, and a pair of diametrically opposed segments vertical boring blades on and depending from the underside of the boss, the horizontal cutting blades and the vertical boring blades having flat vertical working sides, the working sides of some of the cutting blades being aligned with each other across the bit and with working faces of the vertical boring blades, a vertical axial water chamber extending through said disc portion and into said boss and having a closed lower end on a level below the disc portion, and water passages leading from said chamber and traversing said boss below the disc portion and opening at the sides of the boss between adjacent cutting blades.

4. A well drill bit comprising a flat circular disc portion having a flat underside and a peripheral edge, an upstanding axial hub on said disc portion, a cylindrical axial boss on and depending from the underside of the disc portion, radial cutter blades on and depending from said underside and having inward ends meeting said boss, said boss having an underside and said cutting blades having lower edges on a level with the underside of the boss, a vertical water chamber formed in said

hub, said disc portion and in said boss and having a closed lower end within the boss and on a level below the underside of the disc portion, radial water passages formed in said boss and leading from said water chamber to the exterior of the boss and opening into the spaces between adjacent cutting blades at the inward ends of the cutting blades.

5. A well drill bit comprising a flat circular disc portion having a flat underside and a peripheral edge, an upstanding axial hub on said disc portion, a cylindrical axial boss on and depending from the underside of the disc portion, radial cutter blades on and depending from said underside and having inward ends meeting said boss, said boss having an underside and said cutting blades having lower edges on a level with the underside of the boss, a vertical water chamber formed in said hub, said disc portion and in said boss and having a closed lower end within the boss and on a level below the underside of the disc portion, radial water passages formed in said boss and leading from said water chamber to the exterior of the boss and opening into the spaces between adjacent cutting blades at the inward ends of the cutting blades, and a pair of diametrically opposed segmental boring blades fixed on and depending from the underside of the boss and having lower ends spaced below the cutting blades.

6. A well drill bit comprising a flat circular disc portion having a flat underside and a peripheral edge, an upstanding axial hub on said disc portion, a cylindrical axial boss on and depending from the underside of the disc portion, radial cutter blades on and depending from said underside and having inward ends meeting said boss, said boss having an underside and said cutting blades having lower edges on a level with the underside of the boss, a vertical water chamber formed in said hub, said disc portion and in said boss and having a closed lower end within the boss and on a level below the underside of the disc portion, radial water passages formed in said boss and leading from said water chamber to the exterior of the boss and opening into the spaces between adjacent cutting blades at the inward ends of the cutting blades, and a pair of diametrically opposed segmental boring blades fixed on and depending from the underside of the boss and having lower ends spaced below the cutting blades, said boring blades having working ends and said cutting blades having working sides, working sides of cutting blades being aligned with and parallel to working ends of boring blades.

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