March 24, 1964 P. W. SCHUMACHER, JR 3,126,067

ROLLER BIT WITH INSERTS

Filed March 12, 1959 2 Sheets-Sheet 1

Fig. 1

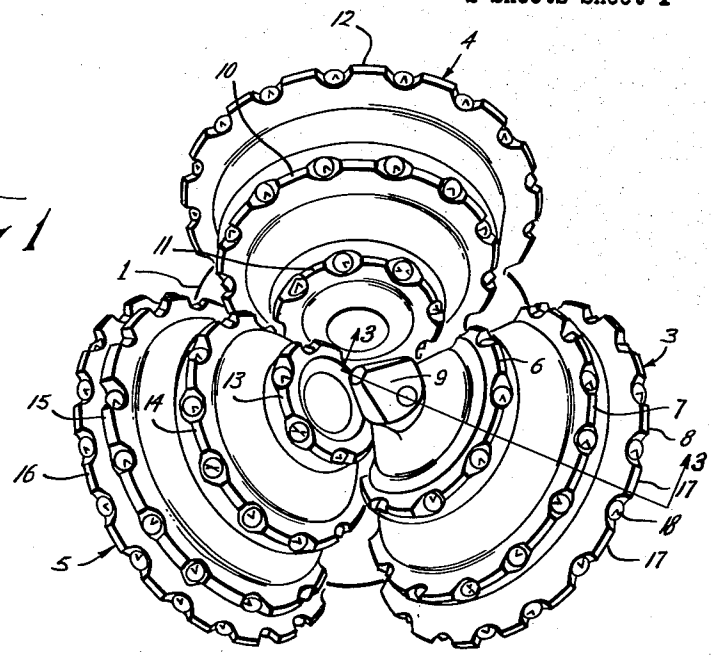
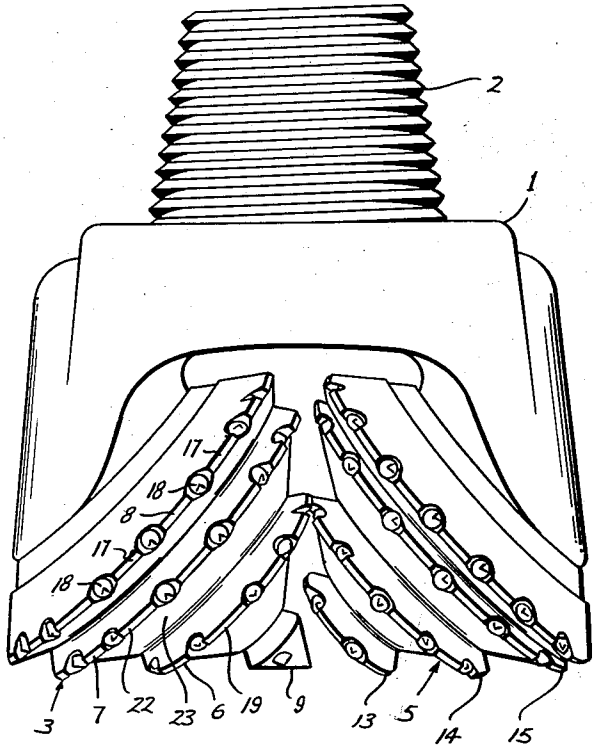


Fig. 2



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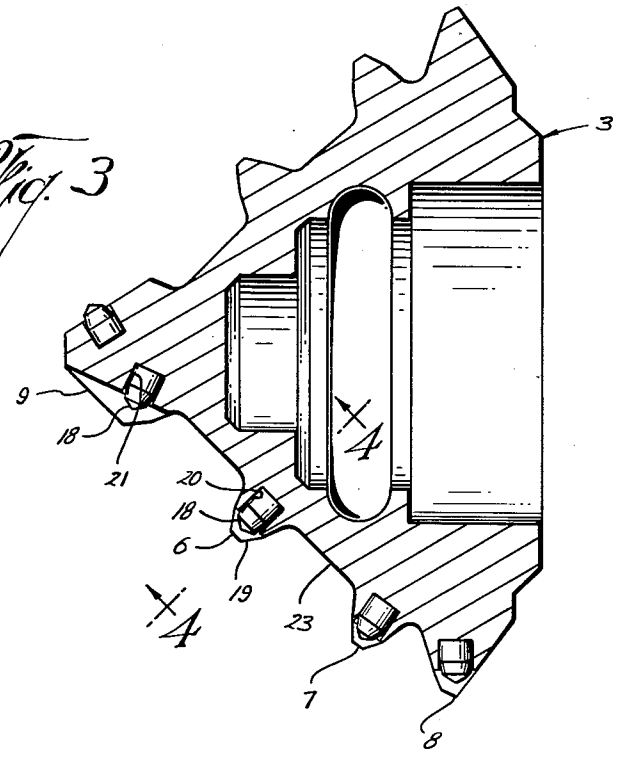
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Filed March 12, 1959 2 Sheets-Sheet 2

Fig. 3



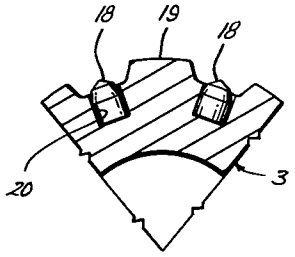


Fig. 4

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United States Patent Office 3,126,067 Patented Mar. 24, 1964

3,126,067

ROLLER BIT WITH INSERTS

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Filed Mar. 12, 1959, Ser. No. 799,041
4 Claims. (Cl. 175—374)

This invention relates generally to drill bits and more particularly to roller bits for deep well drilling.

One of the general objects of the invention is to provide a new and improved drill that will more efficiently drill hard and medium-hard formations.

Another object of the invention is to provide a new and improved roller cutter wherein the cutting elements thereon are particularly adapted in drilling formations containing hard streaks, non-uniform or unconsolidated formations.

Another object is to provide a drill bit roller having a unique arrangement of steel teeth and hard metal inserts.

Other objects and advantages of the invention will become apparent from the following description and the accompanying drawings wherein is set forth by way of example an embodiment of the invention.

FIG. 1 is a bottom plan view of a cone type bit embodying the invention.

FIG. 2 is a side elevation view of the bit shown in FIG. 1.

FIG. 3 is a sectional view taken on the line 3—3 of FIG. 1 through a cone type roller cutter embodying the invention.

FIG. 4 is a fragmentary sectional view taken along line 4—4 of FIG. 3.

Referring to FIGS. 1 and 2 a cone type roller bit is shown embodying a number of conventional parts and the new and improved roller cutters provided by the invention. In these figures, a bit head 1 has the usual hollow threaded shank 2 by which the bit may be secured to the lower end of a drill stem (not shown). The bit head 1 has rotatably mounted therein roller cutters 3, 4 and 5. The roller cutter 3 has intermediate rows of teeth, or cutting elements, 6 and 7, and a gage row of teeth 8. The cutter 3 also has a spear point 9 to drill the earth formation at and adjacent to the longitudinal axis of the bit.

The roller cutter 4 has intermediate rows of teeth or cutting elements, 10 and 11, and a gage row of teeth 12.

The roller cutter 5 has intermediate rows of teeth 13, 14 and 15, and a gage row of teeth 16.

The cutting elements of the cutters 3, 4 and 5 are constructed and arranged to cooperate in removing the formation from the entire bottom of the hole being drilled.

In operation, a drill bit is attached to the lower end of a drill stem (not shown), and rotated about the longitudinal axis of the drill bit upon the bottom of a bore hole. Thus, the cutters are caused to rotate, and as weight is applied to the bit by the weight of the drill stem, the teeth, or cutting elements, of the rollers will crush, chip or scrape the formation upon which the bit is rotated. The particles of formation thus dislodged will be carried out of the bore hole by drilling fluid which is pumped downwardly through the drill stem and bit head, returning to the surface of the earth in the space between the drill stem and the wall of the bore hole being drilled.

The roller cutters of the invention are similar in operation and construction, so that a description of one will describe the others.

Referring to FIG. 2, the roller cutter 3 has circumferential rows of cutting elements 6, 7 and 8 on the body portion 23, and a spear point 9. The rows of cutting elements are similarly constructed. For example, the gage

row of cutting elements 8 of the cutter 3 comprises spaced steel teeth 17 having circumferentially extending cutting crests. Substantially cylindrical hard metal inserts 18 are mounted in the cutter between adjacent ends of the teeth 17. The row of cutting elements 7 comprises spaced steel teeth 22 having circumferentially extending crests. Hard metal inserts 18 are mounted in the cutter between adjacent ends of the teeth 22.

Referring to FIGS. 3 and 4, the roller cutter 3 is shown with the rows of cutting elements 6, 7 and 8, and the spear point 9. The row of cutting elements 6 comprises spaced teeth 19 having circumferentially extending crests. The cutter 3 has sockets 20 between the adjacent ends of the teeth 19. Hard metal inserts 18 are pressed, or otherwise secured, in the sockets 20. The teeth 19 extend radially beyond the outer ends of the hard metal inserts 18 in the same row, as is shown in FIG. 4.

The spear point 9, which drills the formation at and near the center of the hole, has sockets 21 and hard metal inserts 18 secured therein.

In operation, the steel teeth 17, 19 and 22 will engage the formation first since they extend radially beyond the inserts 18 in the same rows. Thus, if the formation is susceptible of being drilled by the steel teeth 17, 19 and 22, the bit will progress in the usual manner. The steel of which the teeth are made may be the carburized steel commonly used in the teeth of rock bits. If the bit should encounter extremely hard and abrasive formations, the steel teeth 17, 19 and 22 would be abraded away, whereupon the hard metal inserts 18, which usually are made with sintered tungsten carbide or other wear-resistant materials, would then engage the hard formation to crush or chip the same. In other words, the bit of the invention will drill formations normally drilled with bits employing only steel teeth; however, if the steel teeth on the cutters of this invention should be abraded away by hard abrasive formations, the wear-resistant hard metal inserts will then be exposed to crush this hard formation as the bit is rotated.

In field use, this bit has found particular utility in areas where the formation structure is unknown or of uncertain composition and thickness, or in areas where alternate streaks or beds of formation of varying hardness and abrasiveness are encountered.

This invention is not limited to the embodiment shown. Various changes within the scope of the following claims will occur to those skilled in the art.

I claim:

1. A drill bit having a head and a plurality of substantially conical roller cutters rotatably mounted in said head, each of the said roller cutters having circumferential rows of cutting elements thereon, each of the said rows of cutting elements comprising spaced teeth having circumferentially extending cutting crests, and substantially cylindrical wear-resistant inserts mounted in each of the said rows between adjacent ends of the said cutting crests, the said cutting crests extending radially beyond the outer ends of the said inserts.

2. A roller cutter comprising a body, circumferential rows of teeth on the said body, each of the said rows comprising spaced teeth having circumferentially extending crests, and cylindrical hard metal inserts in said body between said spaced teeth, the said spaced teeth extending radially beyond the outer ends of the said hard metal inserts.

3. A roller cutter comprising a body, circumferential rows of cutting elements on said body, each of the said rows of cutting elements comprising spaced teeth having circumferentially extending crests, the said body having sockets between adjacent ends of said teeth, and cylindrical hard metal inserts secured in the said sockets, the

outer ends of the said hard metal inserts protruding from the said cutter body, and the said spaced teeth extending radially beyond the outer ends of the said hard metal inserts.

4. A roller cutter comprising a body, circumferential rows of teeth on the said body, each of the said rows comprising spaced teeth having circumferentially extending crests, and cylindrical wear-resistant inserts in said body between adjacent ends of the said spaced teeth, the said spaced teeth extending radially beyond the outer ends of the said wear-resistant inserts.

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