Aug. 21, 1956 R. G. PETER 2,759,706

DRILL BIT

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Fig. 1

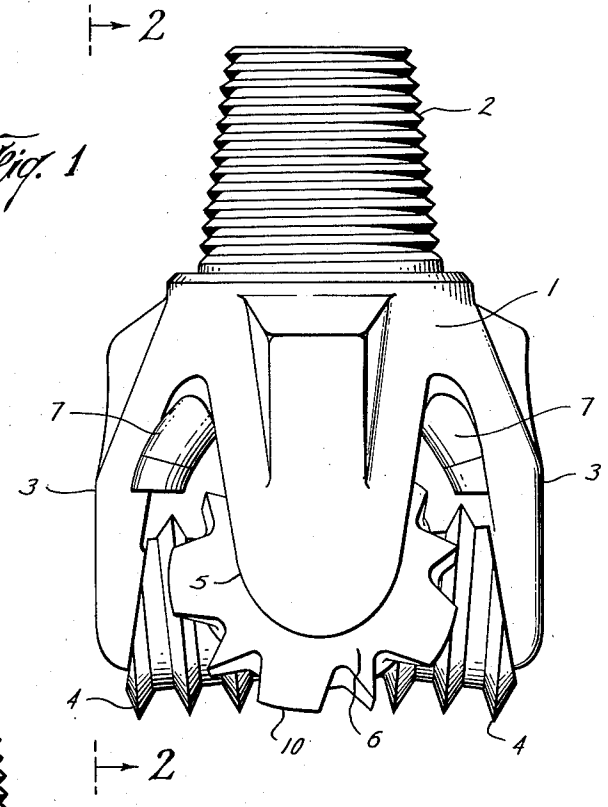
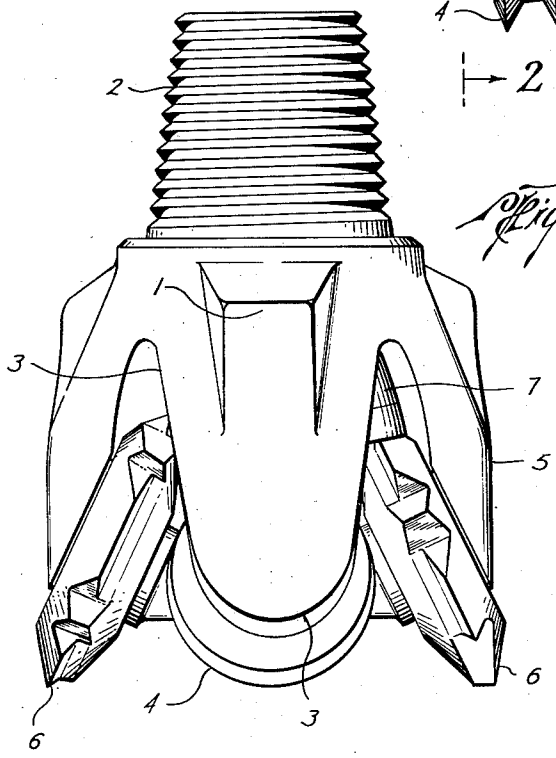


Fig. 2



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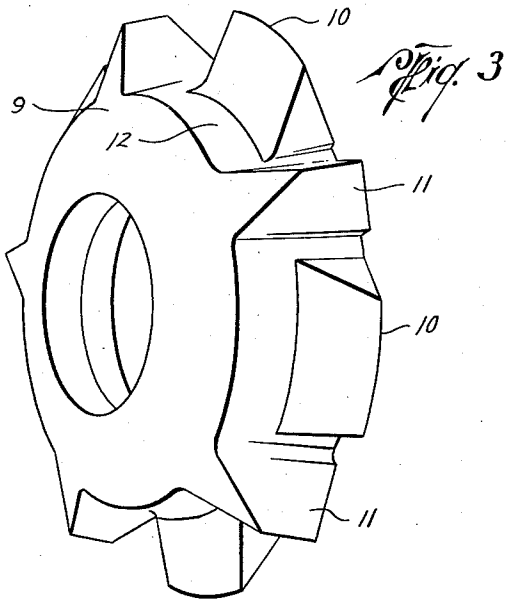

Fig. 3

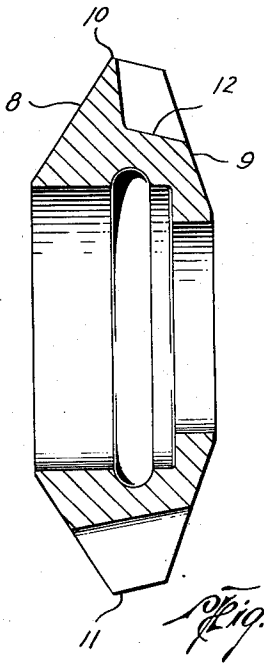

Fig. 5

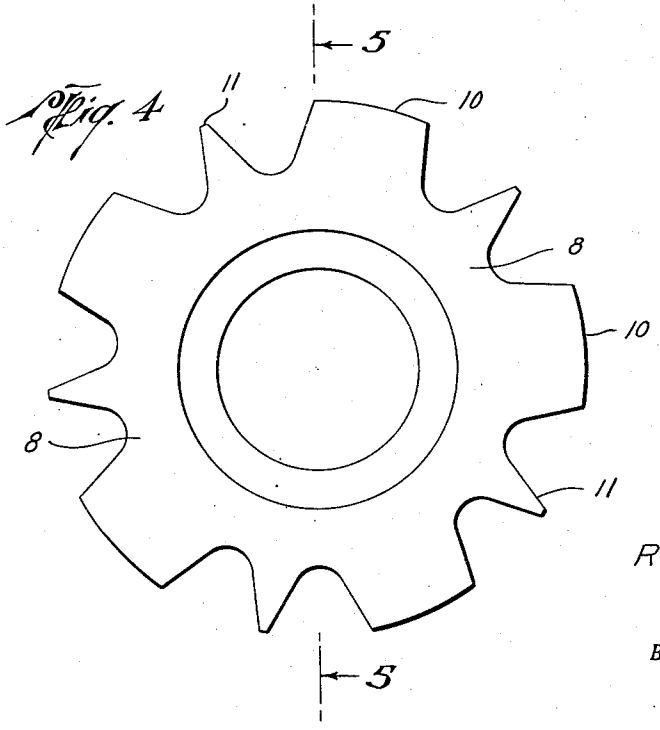

Fig. 4

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DRILL BIT

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Application September 12, 1952, Serial No. 309,259

2 Claims. (Cl. 255—345)

This invention relates generally to drill bits and more particularly to rotary drill bit rollers.

A general object of this invention is to provide a rotary drill bit adapted to drill earth formations faster and more efficiently.

It is an object of this invention to provide a new and improved rotary drill bit roller having teeth thereon which are relatively widely spaced and arranged in such a manner to provide good rolling action of the roller on the bottom of the hole being drilled by the drill bit.

Another object is to provide a new and improved rotary drill bit roller having teeth thereon which are relatively widely spaced and arranged to provide adequate tooth area to remove efficiently the formation from the outer gage portion of the bore hole being drilled.

Another object is to provide a new and improved drill bit roller that will not readily pack or "ball up" with cuttings dislodged during the drilling operation.

Another object is to provide a new and improved drill bit roller that may be readily cleaned, of cuttings adhering thereto, by the flushing action of drilling fluid customarily circulated during the drilling operation.

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

In the drawings:

Fig. 1 is a side elevation view of a cross roller type drill bit.

Fig. 2 is a side elevation view taken on line 2—2 of Fig. 1.

Fig. 3 is an isometric view of a side roller showing the arrangement of the teeth thereon.

Fig. 4 is a detail view of a side roller showing the arrangement of the teeth thereon.

Fig. 5 is a sectional view taken on line 5—5 of Fig. 4.

Referring to Figs. 1 and 2, the bit head is indicated at 1. It may be provided with the usual threaded shank 2 for attachment to a drill stem (not shown). The head 1 has a pair of oppositely disposed depending cross roller bearing extensions 3 on which are rotatably mounted cross rollers 4. The head 1 also has a pair of oppositely disposed depending side roller bearing extensions 5 on which are rotatably mounted side rollers 6. The head 1 also has disposed therein a drilling fluid nozzle 7 so that drilling fluid pumped downwardly through the drill stem (not shown) may pass through the nozzle 7 to be discharged toward the bottom of the hole in the usual manner.

Rotary drill bits now in common use may embody a bit head having frusto-conical cross rollers and side, or gage rollers rotatably mounted in the lower portion thereof. The bit head may be connected to the end of a drill stem and lowered to the bottom of the hole being drilled. The drill stem is rotated to cause the rollers to roll upon the bottom of the hole and thereby cut or crush the formation being drilled. A drilling fluid is pumped downwardly through the drill stem and through a drilling fluid nozzle in the bit head, and rises upwardly in the space between the drill stem and the wall of the hole to the surface of the earth. One of the most important desired functions of the drilling fluid thus circulating is to remove quickly the cut or crushed particles of formation from the bottom of the hole and from the rollers and adjacent parts of the bit. This function is not always efficiently performed, because in some formations, particularly in the relatively soft, sticky shale formations, the particles and cuttings may adhere to and pack between the roller teeth and adjacent parts of the bit; as a result, the penetration of the roller teeth into the formation may be impeded and the roller bit may become so packed or "balled up" that the rollers may not rotate properly and may be worn by skidding upon the bottom of the hole, thereby reducing the useful life of the bit.

It will be apparent that if the roller teeth were widely spaced, the tendency of the cuttings to pack and adhere between the roller teeth would be alleviated; however, merely to reduce the number of teeth on a conventional type roller may not be practical since the teeth may become too widely spaced angularly, and the roller may skid rather than turn about its axis as the drill bit is rotated on the bottom of the bore hole. Also, as the teeth become more widely spaced around a side or gage roller, there is a corresponding reduction in the tooth area at the outer or gage portion of the roller. The function of the gage portion of the roller is to maintain a full gage bore hole so that subsequent drill bits will not have to ream the bore hole to reach the bottom thereof; therefore, it is important to provide adequate gage cutting tooth area on side rollers to maintain the gage of the hole being drilled. In my invention, I provide a new and improved drill bit roller having relatively widely spaced teeth, to alleviate the packing thereof with cuttings dislodged during the drilling operation. The roller also has adequate tooth area to drill the outer or gage portion of the hole being drilled, and has good rolling action on the bottom of the bore hole.

In Figs. 3, 4 and 5 the tooth arrangement on the side, or gage, roller 6 may be clearly seen. The roller 6 has an outer gage portion 8 and an inner end 9. The roller 6 has a plurality of circumferential, or annular, gage cutting teeth 10 disposed along the outer gage portion 8, and a plurality of axial, or longitudinally extending, teeth 11 disposed between the circumferential teeth 10, and extending from the outer gage portion 8 to the inner end 9 of the roller 6. The teeth 10 and 11 are disposed upon a peripheral tooth bearing portion as shown in Figure 3. The teeth 10 occupy only that portion of the transverse portion of the tooth bearing portion between the inner and outer gage portions which is adjacent to the outer gage portions 8, thereby leaving that portion 12 of said transverse portion adjacent to the said inner end portion 9 unoccupied by teeth. This tooth arrangement affords the wide area 12 between the teeth thus reducing the possibility of cuttings packing therebetween, and affords better cleaning of the roller 6 by the flushing action of the drilling fluid being circulated as above described.

The circumferential teeth 10 are along, and the outer ends of the teeth 11 extend to, the outer gage portion 8 of the roller 6, thereby providing adequate tooth area to drill the outer or gage portion of the bore hole.

The angular spacing between the circumferential teeth 10 and the axial teeth 11 at the outer gage portion 8 of the roller 6 is relatively close, thus affording good rolling action due to the teeth 11 of the roller on the bottom of the hole being drilled by the drill bit.

The foregoing disclosure and description is illustrative

of the invention, and is not to be 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 comprising a bit head, cross rollers and gage rollers rotatably mounted in the lower portion thereof, each of the said gage rollers being annular in form, the opposite spaced side faces thereof defining an inner end portion and an outer gage portion and a peripheral tooth bearing portion, said tooth bearing portion having circumferentially spaced teeth thereon, the cutting edges thereof being transverse to said tooth bearing portion and extending throughout the width thereof, and a row of circumferentially spaced teeth having the cutting edges thereof in the plane of the roller extending circularly of the roller and occupying only that portion of the transverse portion of the tooth bearing portion between the inner and outer gage portions which is adjacent to the said outer gage portion and alternating with said first mentioned teeth thereby leaving that portion of said transverse portion adjacent to the said inner end portion unoccupied by teeth, and adapted to drill only the outer gage portion of the formation of the bore hole being drilled.

2. A drill bit gage roller annular in form, the opposite spaced side faces thereof defining an inner end portion and an outer gage portion and a peripheral tooth bearing portion, said tooth bearing portion having circumferentially spaced teeth thereon, the cutting edges thereof being transverse to said tooth bearing portion and extending throughout the width thereof, and a row of circumferentially spaced teeth having the cutting edges thereof in the plane of the roller extending circularly of the roller and occupying only that portion of the transverse portion of the tooth bearing portion between the inner and outer gage portions which is adjacent to the said outer gage portion and alternating with said first mentioned teeth thereby leaving that portion of said transverse portion adjacent to the said inner end portion unoccupied by teeth.

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