

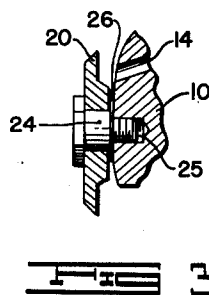
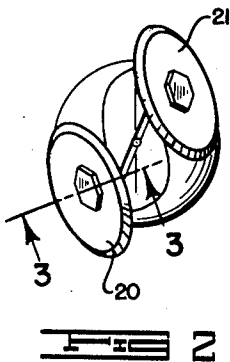
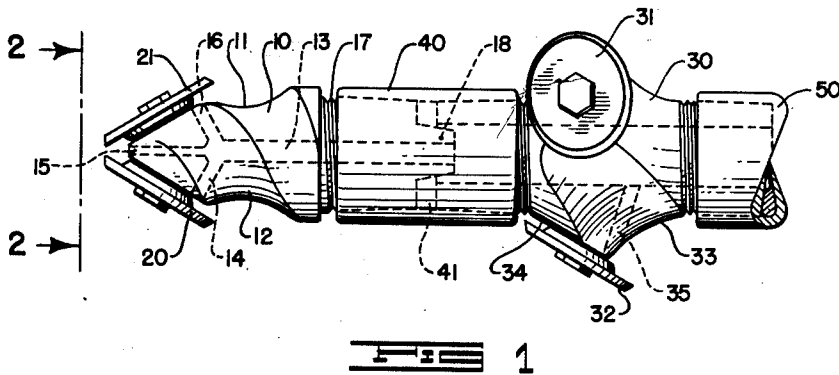
May 5, 1953

E. C. HOWELL

2,637,529

CUTTING TOOL

Filed Oct. 27, 1947



INVENTOR.
EVERETT C. HOWELL

BY

Lyon & Lyon
ATTORNEYS

UNITED STATES PATENT OFFICE

2,637,529

CUTTING TOOL

Everett C. Howell, Riverside, Calif.

Application October 27, 1947, Serial No. 782,278

4 Claims. (Cl. 255—71)

1

The present invention relates to cutters especially useful in drilling horizontal holes through the ground under hard surfaced roads and streets, although not specifically limited thereto.

In drilling holes through soil of various types, it has been common practice to mount a pair of rotary cutters on a bit. These rotary cutters wear rapidly and unevenly so that the periphery of the rotary cutters frequently becomes flattened or egg-shaped either due to its lack of rotation or to intermittent rotation. One of the reasons for such undesirable operation of the cutters is that an undue great burden is placed on the cutters, the cutters are not maintained clean, and the cuttings are not properly and efficiently disposed of. While a bit may operate satisfactorily when relatively new, the bit may become rusty or corroded, in which case the rust impedes the movement of cuttings past the bit in which case the cuttings back up against the cutters to tend and to sometimes restrict their normal desired rotary movement. It is therefore an object of the present invention to provide an improved cutting bit arranged to assure the unimpeded movement of cuttings from the cutter elements when the bit is new and also after it has been operated for a considerable period of time wherein it might otherwise corrode or rust. To this end, an important feature of the present invention is the provision of flutes in the body of the drill bit which is of nonferrous metal. Not only does the nonferrous metal not corrode or rust, but is also of such nature as to allow easy casting of the flutes or helical grooves therein.

An object of the present invention is to provide an improved cutter arrangement of the type specified arranged to reduce abrasion to a minimum with a cutter of maximum strength.

Another object of the present invention is to provide an improved cutter structure of the type specified having rotary cutters thereon in spiral flutes arranged on the periphery of the body, the flutes being arranged to strengthen the body of the bit or cutter, to carry cuttings back from such cutters mounted thereon with water of pressure in the range found in households, and to feed the tool into the soil when a horizontal hole is being drilled without the supporting weight of a string as is present when drilling a vertical hole.

Still another object of the present invention is to provide an improved cutting tool or bit in which the flutes remain polished for best performance, the bit being for that purpose of nonferrous metal on which the flutes may be formed in a casting operation.

2

Still another object of the present invention is to provide an improved bit having rotary cutters thereon with water apertures disposed in the bit to direct a stream of water onto the rotary cutters in a most advantageous manner.

Still a further object of the present invention is to provide an improved cutter through which water is fed in a cutting operation with the elements thereof being coupled in a novel manner to form a silt trap to thereby obviate possibility of the water path becoming clogged.

Still a further object of the present invention is to provide an improved cutter structure having rotary cutter elements thereon and through which water is projected in a novel manner against the rotary cutters and also against the uncut portion of the bore whereby the entering water serves not only in conditioning the bore for subsequent entrance of the cutters but also serves to maintain the cutter elements clean.

Still another object of the present invention is to provide an improved bit arranged to bore a hole through dirt, sand and rock more efficiently and with less likelihood of trouble than is presently possible.

A still further object of the present invention is to provide an improved drill bit which operates efficiently and satisfactorily with water passing therethrough at a pressure in the range of 20 lb. to 100 lb. per sq. inch.

The features of the present invention which are believed to be novel are set forth with particularity in the appended claims. This invention itself, both as to its organization and manner of operation, together with further objects and advantages thereof, may be best understood by reference to the following description taken in connection with the accompanying drawings in which:

Figure 1 is a view in side elevation of a drill bit connected by means of a coupling to a reamer string embodying features of the present invention.

Figure 2 is a view taken substantially in the direction 2—2 in Figure 1 showing the front end of the drill bit embodying the present invention.

Figure 3 is a sectional view taken substantially on the line 3—3 of Figure 2.

While I have shown both a cutter or drill bit and a reamer on the drill string shown in Figure 1, the cutter or drill bit and reamer, both of which embody features of the present invention, may be used independently of one another.

For example, the cutter only may be mounted on the drill string to cut a hole, and then subse-

quently the cutter withdrawn and the reamer on a separate drill string may be passed through the hole drilled by the cutter or bit.

The drill bit is of nonferrous metal which may be easily cast in the precise shape shown in Figure 1 with the flutes 11 and 12 on the outer surface thereof, terminating at the front end of the reduced cross section, and with a main water channel 13, branching off into water channels 14, 15 and 16 therein.

The back end of the bit has an external screw threaded portion 17 thereon, together with an annular flange 18 of reduced diameter for a purpose described later.

Rotary cutters 20 and 21, respectively, are mounted on the bit 10 in the flutes 11 and 12, respectively. The manner in which these cutters are mounted is shown in detail in Figure 3 wherein the cutter 20 is rotatably mounted on the axle 24 having an external screw threaded end 25 threaded into the body of the bit 10 with lock washer means 26 interposed therebetween to prevent loosening and rotation of the axle 24 on the body 10.

The water channels 13 and 15 extend centrally and axially of the drill bit 10 so as to cause the projection of a stream of water into the bore between the two cutters 20 and 21 while the other two channels 14 and 16 are arranged to project a stream of water against the back faces of the rotary cutter elements 20 and 21 to thereby prevent the accumulation or backing of cuttings between such cutters and the bit body 10. For this purpose, as shown in Figure 3, the peripheral cutting edges of the cutters 20 are spaced from the drill bit body 10 by the inner enlarged portion of the cutter, as well as by the lock washer means 26.

The reamer 30 is of substantially the same construction as the drill bit 10 except that its rotary cutter elements 31 and 32 are at a greater distance from the rotational axis of the drill string, and the reamer is open at both ends on which are provided external threaded portions for the passage of water therethrough. The individual cutters 31 and 32 are mounted centrally and at the lowest point in the flutes at 33, 34, respectively, in the same manner as are the cutters 20 and 21; and, in the same fashion, water channels 35 serve to direct a stream of water against the other side of the cutters 31 and 32.

The drill bit and reamer 30 may be joined together by conventional type of coupling 40 with the tapered inner flange 18 along the drill body entering the hollow portion of the reamer 30 to thereby provide a silt and dirt trap at 41. The other end of the reamer 30 may be coupled to a rod or tube 50 of the stem to which rotary movement is imparted in a conventional manner.

It is noted that drill bit 10 and reamer 30 each have a number of spiral flutes thereon corresponding to the number of cutters mounted thereon, the rotational axis of each cutter passing centrally through the lowest point of the flute.

It is noted that the rotary cutters 20 and 21 have their planes of rotation inclined forwardly in the direction of the drilling. This is also true of the cutters 31 and 32 on the reamer 30, but the reamer cutters 31 and 32 are inclined at substantially the same inclination.

While I have shown two cutters and two flutes, it is within the province of the present invention to use more than two cutter wheels and in such case preferably there are as many flutes as there are cutting wheels. Also, in such case there is a water channel behind each one of such cutters to

project a stream of water against back face of each of such cutters.

It is apparent in the structure described that the abrasion on the drill bit or the reamer, as the case may be, is reduced to a minimum by the provision of the flutes which are of rust-proof, non-corrosive, non-ferrous material. The flutes serve also to impart strength to the bit or drill. In such case, satisfactory cutting may be obtained with low water pressure in the range of 20 lb. to 100 lb. per sq. inch.

While I prefer to produce the body of the drill bit and reamer by casting operation because of the simplicity and inexpensiveness, these elements may likewise be formed by machining operations.

While the particular embodiments of the present invention have been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made without departing from this invention in its broader aspects and, therefore, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of this invention.

I claim:

1. A drill bit of the character described, comprising an elongated tapered solid body of nonferrous material which does not corrode or rust and which allows easy casting, said material having helical grooves on its outer surface, rotary cutters mounted thereon with the axis of rotation of each cutter passing respectively through each one of said helical grooves at the forward end of the bit, with a portion thereof extending beyond said forward end and with its rotational axis at an acute angle with respect to the axis of the drill, the diameter of each of said cutters being greater than the width of the corresponding groove, with said cutters overhanging the forward tip of said body to minimize abrasion of said tip and to assure better cleaning of the space between said cutters and said body, said body having a water channel extending therethrough arranged to project a stream of water against the inside surfaces of said cutter, and a conduit at the tip of said tapered body in communication with said water channel arranged to direct a stream of water forwardly and along the axis of said body.

2. A reamer of the character described having a longitudinal opening therethrough for the passage of fluid, said reamer being of nonferrous material which does not corrode or rust and which allows easy casting, said material having helical grooves on its outer surface, and corresponding rotary cutters mounted thereon with the rotational axis of each cutter passing centrally in each one of said helical grooves, each of said rotary cutters having a diameter greater than the corresponding groove, with said cutters overhanging the forward tip of said body to minimize abrasion of said tip and to assure better cleaning of the space between said cutters and said body, lateral openings in communication with said longitudinal opening and terminating adjacent said cutters to direct the flow of fluid onto said cutters.

3. In a drill string of the character described, a drill bit releasably connected to a coupling, and a reamer releasably joined to said coupling, said drill bit and said reamer each being of nonferrous material which does not corrode or rust and which allows easy casting, said material having helical grooves on their outer surfaces, corre-

5

sponding cutters mounted thereon with the rotational axis of each cutter passing through each one of said helical grooves on said drill bit and said reamer, the diameter of the cutters on said drill bit being greater than the width of the corresponding groove, with said cutters overhanging the forward tip of said drill bit, to minimize abrasion of said tip and to assure better cleaning of the space between said cutters and said drill bit, said coupling being internally threaded and having an internal bore, said drill bit having an externally threaded portion arranged for cooperation with the internally threaded coupling, said externally threaded portion of said bit having extending therefrom an annular flange of diameter smaller than the diameter of the bore of said coupling and positioned to project therein when said bit is threaded into said coupling, said reamer having an externally threaded portion for cooperation with the threaded coupling, said reamer having a water channel extending centrally therethrough and said water channel being of size larger than the diameter of said flange to receive said flange when said bit and reamer are each screwed into said coupling, with the space between the ends of the threaded portions of said bit and said reamer and the adjacent in-

6

ternal wall of the coupling forming a dirt and silt trap.

4. The arrangement set forth in claim 3 in which each one of said cutters comprises a centrally apertured disc, the rim of the disc being of a thickness less than the thickness of its central portion, and the outer edge of the disc being bevelled inwardly towards the corresponding drill bit and reamer, respectively.

EVERETT C. HOWELL.

References Cited in the file of this patent UNITED STATES PATENTS

Number	Name	Date
893,950	Thomas	July 21, 1908
1,176,965	Hughes	Mar. 28, 1916
1,370,492	Smith et al.	Mar. 1, 1921
1,572,349	Chamberlin	Feb. 9, 1926
1,627,179	Hild	May 3, 1927
1,640,644	Bullum	Aug. 30, 1927
1,733,372	Hild	Oct. 29, 1929
1,747,908	Seifert	Feb. 18, 1930
1,780,447	Shows et al.	Nov. 4, 1930
1,826,059	Dunn et al.	Oct. 6, 1931
2,184,108	Akeyson	Dec. 19, 1939