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2,865,607

DRILL BIT

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3 Claims. (Cl. 255—63)

The present invention relates to drills in general and particularly to a percussion drill or drill bit of the type adapted to accomplish its drilling function primarily as a result of longitudinal reciprocation and percussive impact against the material being drilled. More specifically, the invention comprises an improved reciprocatory percussion drill bit in which improved means are provided to feed the cuttings and chips from the hole being drilled.

Drilling operations in rock, stone, concrete and the like are usually accomplished by the use of drills actuated either pneumatically or electrically. In one preferred type of drilling the drill is rotated and the drilling action results from the abrasion of the material being drilled by teeth or cutting elements which are of great hardness and which wear away the drilled material so that it can be displaced from the hole. Rotary drills for such drilling are commonly provided exteriorly with encircling spiral grooves and in certain forms with central bores. A second preferred type of drilling is that in which the drill performs its cutting action by longitudinal reciprocation and percussive impact and in which rotation, while it may be present, is providing primarily to accomplish the displacement of the teeth or cutting elements so that they are provided with new points of attack in the material being drilled. It is to drills primarily intended for such operation that the present invention is directed. Such drills are reciprocated at high speed and perform a chipping or cutting function at their working end. The displaced material must be displaced and the invention provides improved means for that displacement.

It is an object of the present invention to provide an improved percussion drill bit in which improved means are present to convey the displaced material from the hole being drilled to the exterior.

Another object of the invention is to provide a new and improved percussion-type drill bit in which chips and cuttings are displaced longitudinally of the drill through longitudinal exterior channels and also centrally through the drill.

These and other more specific objects will appear upon reading the following specification and claims, and upon considering in connection therewith the attached drawing to which the relate.

Referring now to the drawing in which preferred embodiments of the invention are illustrated:

Figure 1 is a side view of the drill bit constructed in accordance with the present invention showing the intersection of the end of the central inclined bore with a longitudinally extending exterior channel of the body;

Figure 2 is a transverse section upon the line 2—2 of Figure 1;

Figure 3 is an end view of the drill shown in Figures 1 and 2.

Referring again to the drawing, the preferred embodiment of the invention as illustrated is seen to comprise a drill body, indicated generally by the reference charac-

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ter 10, which includes an operative head or end, indicated generally at 11, and a shank 12 which in the form illustrated is integral with the body 10. Shank 12 may be of any preferred type and may have a Morse taper at its end, if desired, for attachment to an actuating apparatus. Drills of this type are made in various sizes and lengths, and are preferably made of carbon steel.

Drill body 10, which is normally cylindrical, is provided with circumferentially-spaced, longitudinally-extending channels or grooves 13 between which the normal curvature of the body 10 forms arcuate lands 14. Channels 13 are shown as extending axially of the drill and this is a preferred form, but it is to be understood that a very slight inclination or slope would not have an appreciable effect. In a drill of this type no advantage is to be obtained from winding the grooves 13 around the body spiral; in fact, if the slope of the spiral is sufficient to produce any material spiraling movement of traversing cuttings, then to that extent the presence of the spiral is a disadvantage.

The head 11 is formed with radially-extending slots 16 which are preferably inclined to the axis of the drill and which function as seats for cutting teeth or elements 17 which preferably are made of tungsten carbide. These cutting elements are shaped and ground so that their forward extremities slope to provide cutting edges adapted simultaneously to abut a planar surface against which the drill is positioned.

Drill body 10 is provided with a longitudinally-extended slanting bore 19, the inlet or mouth 21 of which opens centrally at the face of head 11 and which from that inlet is inclined with respect to the longitudinal axis of the drill body so that its upper end intersects the side of the body. In the form illustrated in Figures 1, 2 and 3, bore 19 intersects that body at the upper end of a channel 13 at an outlet opening 22 which also intersects the shoulder 23 between the drill body proper 10 and the shank 12. The cutting teeth 17 are seen to extend radially into the inlet 21 of bore 19 in a preferred arrangement.

In the operation of the drill constructed in accordance with this preferred embodiment of the invention, the drill is positioned against the surface to be drilled and is reciprocated at high speed and with force so that the cutting elements 17 contact and chip away the surface contacted. Some of the cuttings or chips, as the drill advances into the hole it forms, make their way outwardly through the longitudinally-extending channels 13. Those chips or cuttings removed centrally of the body pass through the inclined bore 19. The latter do not become impacted in the bore which is of the same diameter throughout its length and the action is such that as the material builds up within the drill it is forced outwardly therethrough by additional material entering the mouth 21 to join the material traveling in the channel 13 on the exterior of the drill. The drill body can be said to act in the manner of a plunger having cutting action. The cutting action provides a continuous source of new material to be displaced from the end of a hole in which the drill is positioned and the drill body forcing its way down into this new material drives it into the passages formed by the longitudinal channels 13 and the closely surrounding wall of the hole and also drives it into the central bore 19. Fresh material entering these passages simply forces along the material already advanced therein. The absence of turns and twists in the passages provided by the bore 19 and the channels 13 reduces to a minimum the resistance to material displacement.

While the particular device herein shown and disclosed in detail is fully capable of attaining the objects

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and providing the advantages hereinbefore stated, it is to be understood that it is merely illustrative of the presently preferred embodiments of the invention and that no limitations are intended to the details of construction or design herein shown other than as defined in the appended claims.

I claim:

1. A percussion drill for concrete and the like comprising a solid one-piece body having a forward end and from the opposite end of which extends a tool-connecting shank, straight longitudinal grooves extended the length of said body, a straight generally central bore extended from said head end and opening into the side wall of said body and into a groove at a point spaced from said forward end, the axis of said bore being inclined to the axis of said drill throughout the length thereof, said grooves being adapted to convey chips from said forward end toward said shank exteriorly of said body when positioned in a hole being drilled and said central bore being adapted to convey chips through said body toward said shank, and abrasion-resistant cutting elements fixed in the head end of said body adapted to disintegrate a body of material being drilled upon the percussive impact of said drill thereagainst.

2. A core type concrete and rock drill of the percussively actuated type adapted to be formed in one piece from a solid length of circular rod material, said core drill comprising an elongated main body of circular cross-section having a cutting end and a tapered shank end adapted to be frictionally seated in the chuck of a percussive power unit, said main body having on its exterior a plurality of open-ended shallow wide grooves extending parallel to one another and to the axis thereof, a straight bore of uniform diameter having an inlet end opening centrally through the cutting end of said body and extending through the drill body at a slight angle to its axis and opening into the bottom of one of said shallow grooves, a plurality of abrasive-resistant cutting teeth fixed to the cutting end of said drill body, and effective to cut an annular bore into concrete and the like as the drill is driven thereagainst percussively, said shallow grooves being effective to carry away the cuttings to the outer end of the annular bore, and said inclined bore being effective to disintegrate the hard

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core projecting through said annular bore and to discharge the pieces thereof into said one shallow groove.

3. A core type concrete and rock drill of the percussively actuated type comprising a solid one-piece body having a shank end provided with a Morse taper adapted to seat in a complementarily shaped chucking device of a percussive power unit, the opposite end of said body having a straight bore opening co-axially through the end of the body and inclined to the axis of the drill so as to open through the side wall of the body between the opposite ends thereof, a plurality of shallow grooves extending longitudinally of the drill body for conveying cuttings axially of the drill and outwardly away from the cutting end thereof to a point of discharge, at least one of said grooves opening into the outer end of said inclined bore, the end of said drill body opposite said shank having fixed therein a plurality of abrasive resistant cutting elements projecting beyond the end of said body and radially beyond the exterior wall of said body and the adjacent side wall portion of the bore inlet, said inclined bore being effective to disintegrate the core formed as said drill advances into material being drilled and to convey the particles so formed to the point of discharge, and said groove being effective to convey away cuttings from said cutting elements as said core drill is reciprocated percussively against the material being drilled.

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