

- [54] **CORE DRILL**
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- [73] **Assignee:** Tri-M Tool Corporation, Bay Village, Ohio
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- [21] **Appl. No.:** 443,409

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Related U.S. Application Data

- [63] Continuation-in-part of Ser. No. 379,184, July 13, 1973, abandoned.
- [52] **U.S. Cl.** 175/394; 175/323; 175/394
- [51] **Int. Cl.**... E21b 9/16; E21b 17/046; E21c 13/02
- [58] **Field of Search** 175/403, 405, 394, 323, 175/330, 380, 382, 383, 412, 413; 285/33, 402, 396, 316, 317

[57] **ABSTRACT**

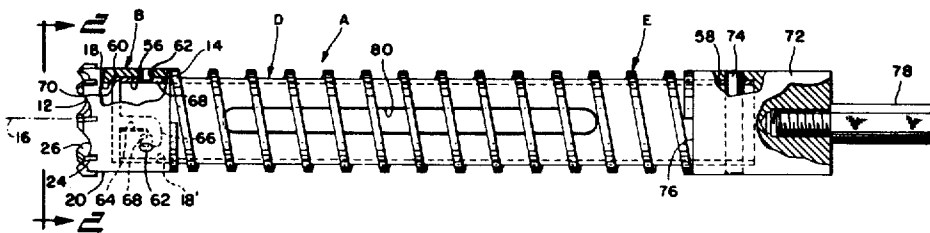
A core drill bit defined by a hollow cylindrical member having a cutting end includes releasable attaching means for releasably attaching the bit to a hollow cylindrical sleeve for easy replacement of the bit. The releasable attachment between the bit and sleeve includes provision for lost motion of the bit relative to the sleeve. A coil spring surrounds the sleeve for normally biasing the bit away from the sleeve and is spiralled in a direction for carrying the drilled material out of the drilled hole when the sleeve, spring and bit are rotated in a cutting direction. The sleeve has a longitudinal slot in its peripheral wall through which drilled material may pass.

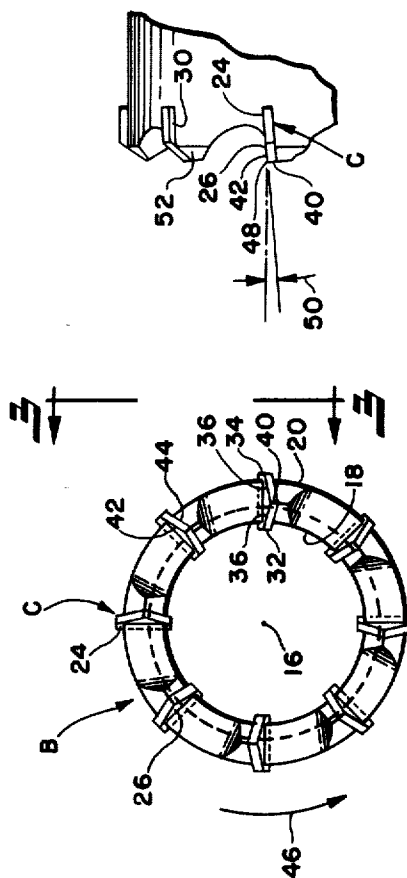
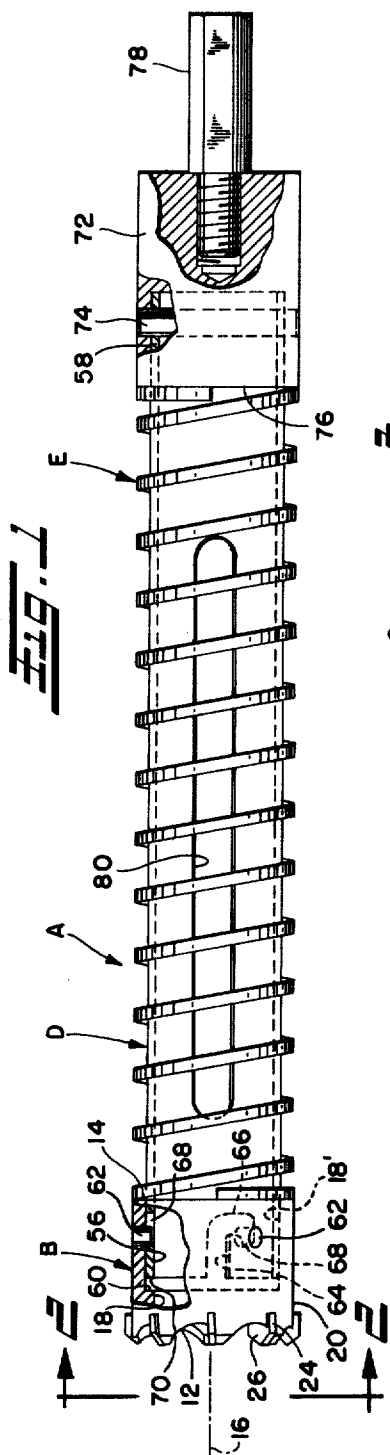
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6 Claims, 3 Drawing Figures





CORE DRILL

BACKGROUND OF THE INVENTION

This application is a continuation-in-part of U.S. Pat. application Ser. No. 379,184, filed July 13, 1973, now abandoned.

This application pertains to the art of drills, and more particularly to core drills. The invention is particularly applicable to core drills for drilling concrete and similar hard pulverulent materials and will be particularly described with reference thereto. However, it will be appreciated that the invention has broader applications and may be used for other types of drills.

It is common to drill large holes in material by the use of a core drill which cuts only around its outer periphery and not in its center area. This reduces the amount of material which must be cut away and increases the drilling speed. The use of peripheral cutting teeth also makes the core drill less expensive to manufacture and replace because no teeth are required in the central area of the hole being drilled.

In previous core drills, the cutting end has been an integral part of a drill sleeve or is secured to such sleeve in a manner which prevents easy replacement of the cutting end. Core drill bits used on hard pulverulent material wear quite rapidly and it is desirable that the bit be easily replaceable on a job without requiring time consuming work or shipment of the sleeve and cutting end to a shop for brazing new teeth onto the cutting end.

SUMMARY OF THE INVENTION

In accordance with the present invention, a core drill bit includes releasable attaching means for releasably attaching the bit to a drill sleeve for easy replacement of the bit.

In accordance with another aspect of the invention, the drill bit is used with a hollow cylindrical sleeve having a drill bit mounting end portion and a driving end portion. Cooperating releasable attaching means are provided on the drill bit and drill bit mounting end portion of the sleeve for releasably attaching the bit to the sleeve.

In one arrangement, the releasable attaching means includes a plurality of circumferentially-spaced pins on the cylindrical member of the drill bit extending substantially radially inward therefrom and receivable in generally L-shape slots in the drill bit mounting end portion of the sleeve. The generally L-shaped slots in the sleeve include circumferentially extending leg portions which are elongated longitudinally of the sleeve to have a length somewhat greater than the diameter of the pins and allow some axial lost motion of the cylindrical member relative to the sleeve.

A coil spring surrounding the sleeve bears against an abutment on the sleeve driving end portion and against the cylindrical member for normally biasing the cylindrical member away from the sleeve. This provides a resilient shock absorbing action to minimize chattering of the drill bit. The coil spring is coiled in a direction for carrying drilled material toward the driving end portion of the sleeve.

It is a principal object of the present invention to provide a core drill having a relatively inexpensive and easily replaceable bit.

It is a further object of the present invention to provide a core drill assembly which includes a core drill bit releasably attached to a drill sleeve.

It is a further object of the present invention to provide a core drill with spring absorbing action for the drill bit.

It is another object of the present invention to provide a core drill assembly which includes a coil spring spiralled for carrying drilled material away from a hole being drilled.

Other objects and advantages will appear from the ensuing description.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of a core drill assembly constructed in accordance with the present invention, and with portions cut away for clarity of illustration;

FIG. 2 is an end elevational view looking generally in the direction of arrows 2—2 of FIG. 1; and

FIG. 3 is a partial side elevational view looking generally in the direction of arrows 3—3 of FIG. 2.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring now to the drawings, wherein the showings are for purposes of illustrating a preferred embodiment of the invention only and not for purposes of limiting same, FIG. 1 shows a core drill assembly A constructed in accordance with the present invention.

Core drill assembly A includes a core drill bit B defined by a hollow cylindrical member having a cutting end 12, opposite end 14, longitudinal axis 16, and inner and outer peripheral surfaces 18 and 20. Cutting end 12 has a plurality of equi-distant circumferentially spaced slots 24 therein extending between inner and outer peripheral surfaces 18 and 20. Each slot 24 receives a hardened cutting tooth C having substantially parallel leading and trailing opposite flat faces 26 and 30, opposite inner and outer side surfaces 32 and 34 extending outward from peripheral surfaces 18 and 20, and sloping outer surfaces 36 which converge from opposite side surfaces 32 and 34 to intersect at a peak 40. Outer surfaces 36 extend substantially perpendicular to opposite faces 26 and 30, and intersect the opposite faces at a leading cutting edge 42 and a trailing edge 44. Peak 40 completely spans edges 42 and 44, and is centrally located between inner and outer peripheral surfaces 18 and 20.

Drill bit B rotates in a predetermined cutting direction as indicated by arrow 46 in FIG. 2. Slots 24 extend generally radially from longitudinal axis 16 and are inclined backwardly from predetermined cutting direction of rotation 46 at an acute angle. With this arrangement, leading face 24 of each cutting tooth C lies in a plane intersecting longitudinal axis 16 at the same acute angle. Therefore, the intersection between peak 40 and leading cutting edge 42 defines a sharp point 48 as shown in FIG. 3. That is, points 48 lie in a plane extending perpendicular to longitudinal axis 16, while peaks 40 are inclined to the same plane at the same acute angle as teeth C are inclined backward. The angle of inclination of each tooth C is indicated at 50 in FIG. 3. Brazing material generally indicated at 52 is deposited on end 12 of bit B against trailing faces 30 to provide solid support against substantially the entire area of trailing faces 30 and to hold teeth C in slots 24. The build up of brazing material 52 slopes downward

toward a next adjacent tooth so that a substantial portion of leading face 26 is exposed for optimum cutting action of cutting edge 42.

Core drill bit B is releasably attachable to an elongated hollow cylindrical sleeve D having a drill bit mounting end portion 56 and an opposite driving end portion 58. In one arrangement, the internal peripheral surface 18 of core drill bit B is stepped to provide an internal circumferential shoulder 60 between internal peripheral surface 18 and larger diameter peripheral surface 18'. Cooperating releasable attaching means is provided on drill bit B and drill bit mounting end portion 56 of sleeve D, and such a releasable attaching means may take many forms. Preferably, the releasable attaching means is of the non-threaded type because threads tend to become immovably secured together by the pulverulent material or rust together, and such threads on the drill sleeve become damaged so bits can no longer be releasably secured thereto.

In one arrangement, the releasable attaching means includes a plurality of circumferentially-spaced pins 62 on core drill bit B extending substantially radially inward from inner peripheral surface 18'. Drill bit mounting end portion 56 of sleeve D includes a plurality of circumferentially spaced generally L-shaped slots 64 for receiving pins 62. Generally L-shaped slots 64 include circumferentially-extending leg portions 66 which extend backward from the predetermined cutting direction of rotation for bit B. Leg portions 66 terminate at axially elongated portions 68 having a length somewhat greater than the diameter of pins 62 for providing relative lost motion between bit B and sleeve D and for securely locking pins 62 against accidental dislodgement from such portions 68 when the rotational direction of the drill assembly is reversed for withdrawing it from a hole. Preferably, such portions 68 extend parallel to slots 64 a distance at least as great as one-half the diameter of pins 62, and most preferably a distance approaching the diameter of pins 62. This prevents pins 62 from being cammed axially out of portions 68. Portions 68 may also terminate at detents extending back toward slots 64 parallel to circumferential portions 66 for additionally insuring against axial displacement of pins 62.

For removing a drill bit, axial force is applied to such bit for shifting it axially relative to the drill sleeve until sleeve end 70 substantially abuts shoulder 60 so that pins 62 will be aligned with circumferential portions 66. The bit is then rotated to align pins 62 with slots 64 and the bit can be removed. Placement of a new bit on the sleeve follows the reverse procedure. Circumferential portions 66 are preferably sufficiently large axially of sleeve D for allowing end 70 to abut shoulder 60 when axial force is applied to such sleeve during drilling before pins 62 engage the upper edges of portions 66. This insures good uniform axial support between bit B and sleeve D.

Driving end portion 58 of sleeve D has a drive member 72 fixed thereto as by a pin 74 and includes an abutment surface 76. A shank 78 may be fixed to drive member 72 for reception in a chuck.

A coil spring E surrounds sleeve D, and has its opposite end portions bearing against end 14 of drill bit B and abutment surface 76 on drive member 72. Spring E normally biases bit B away from sleeve D. During initial starting of a hole, spring E provides absorbing action for minimizing chattering of bit B. This also allows

an operator to apply substantially uniform pressure during drilling simply by feeling whether end 70 is bottomed out against shoulder 60.

Sleeve D has an elongated longitudinally-extending slot 80 through the peripheral wall thereof. Material cut and pulverized by operation of bit B travels through the hollow interior of sleeve B and exits through slot 80. Spring E has a substantially rectangular cross-sectional configuration and is spiralled in a direction to define a screw conveyor for conveying material toward driving portion 58 of sleeve D when drill assembly A is rotated in its predetermined cutting direction. Such material is then thrown outwardly by centrifical force away from the hole being drilled.

Inner peripheral surface 18' preferably has a diameter related to the external diameter of sleeve D so that end portion 56 of such sleeve is a close sliding fit within bit B. The inner diameter of sleeve D is preferably not smaller than the diameter of inner peripheral surface 18. Preferably, the wall thickness of sleeve D is substantially the same as the width or radial extent of shoulder 60.

It is preferable that the cooperating releasable attaching means includes deformable resilient biasing means for locking the bit in attached position on the sleeve, with such biasing means being deformable for releasing such bit from its locked condition for easy removal from the sleeve. In the particular arrangement described in this specification, spring E defines such a deformable resilient biasing means which holds pins 62 locked in slots 68 until such spring is deformed by being axially compressed to free pins 62 from their locked position in slots 68 whereupon bit B can be easily removed from sleeve D. In addition, the releasable attaching means is preferably of a type which includes at least some non-rotational axial movement of the bit for locking and unlocking the bit. This is in contrast to screw thread-type of connections wherein both rotational and axial movement are required, and the axial movement takes place only due to relative rotation between the threads.

Although the invention has been shown and described with respect to a preferred embodiment, it is obvious that equivalent alterations and modifications will occur to others skilled in the art upon the reading and understanding of this specification. The present invention includes all such equivalent alterations and modifications, and is limited only by the scope of the claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A core drill bit comprising: a hollow cylindrical member having a cutting end and an opposite end portion, an elongated hollow cylindrical drill sleeve having a bit mounting end portion receivable in said opposite end portion of said bit, releasable attaching means of a non-threaded type on said opposite end portion for releasably attaching such bit to said drill sleeve and cooperating releasable attaching means on said bit mounting end portion for cooperation with said releasable attaching means on said bit, said releasable attaching means on said bit and sleeve including lost motion means for providing limited relative axial movement between said bit and sleeve when said bit is releasably attached to said sleeve, said sleeve having an opposite driving end portion including an abutment, and further

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including a coil spring surrounding said sleeve and having opposite spring ends bearing against said abutment and said bit for normally biasing said bit outwardly relative to said sleeve.

2. The bit of claim 1 and including an inner circumferential shoulder on said bit intermediate said cutting end and said opposite end portion thereof for limiting movement of said bit and sleeve toward one another upon compression of said spring.

3. The bit of claim 2 wherein said sleeve has a peripheral sleeve wall and further including at least one elongated axially extending slot through said sleeve wall for passing drilled material from the interior of said sleeve to the exterior thereof, said coil spring being spiralled in a direction for conveying drilled material therealong in a direction toward said driving end portion of said sleeve when said sleeve, spring and cylindrical member are rotated in a predetermined cutting direction.

4. The bit of claim 3 wherein said releasable attaching means on said opposite end portion of said bit includes a plurality of circumferentially spaced pins extending substantially radially inward from said opposite end portion of said bit, and wherein said cooperating releasable attaching means includes a plurality of circumferentially spaced generally L-shaped slots in said bit mounting end portion of said sleeve, said L-shaped slots including generally circumferentially extending leg portions extending backward from said predetermined cutting direction and being axially elongated to a length greater than the diameter of said pins to define said lost motion means.

5. A core drill bit comprising; a hollow cylindrical member having a cutting end and an opposite end por-

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tion, an elongated hollow cylindrical drill sleeve having a bit mounting end portion receivable in said opposite end portion of said bit, releasable attaching means of a non-threaded type on said opposite end portion for releasably attaching such bit to said drill sleeve and cooperating releasable attaching means on said bit mounting end portion for cooperation with said releasable attaching means on said bit, said sleeve having an opposite driving end portion including an abutment, and further including a coil spring surrounding said sleeve and having opposite spring ends bearing against said abutment and said bit for normally biasing said bit outwardly relative to said sleeve.

6. A core drill bit comprising; a hollow cylindrical member having a cutting end and an opposite end portion, an elongated hollow cylindrical drill sleeve having a bit mounting end portion receivable in said opposite end portion of said bit, releasable attaching means of a non-threaded type on said opposite end portion for releasably attaching such bit to said drill sleeve and cooperating releasable attaching means on said bit mounting end portion for cooperation with said releasable attaching means on said bit, said bit including an inner circumferential shoulder intermediate said cutting end and opposite end portion thereof, said sleeve having a wall thickness substantially the same as the width of said shoulder, said sleeve having an opposite driving end portion including an abutment, and further including a coil surrounding said sleeve and having opposite spring ends bearing against said abutment and said bit for normally biasing said bit outwardly relative to said sleeve.

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