April 5, 1932. E. A. REED 1,852,478

DRILL CUTTER MOUNTING

Filed April 16, 1929

Fig. 2.

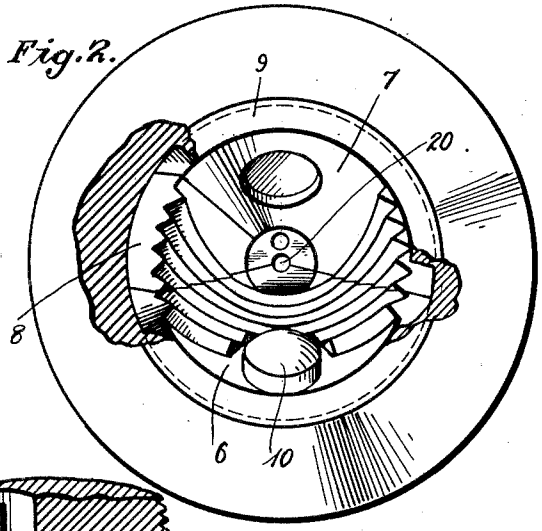


Fig. 3.

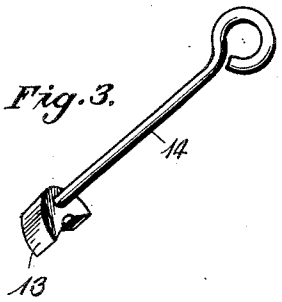
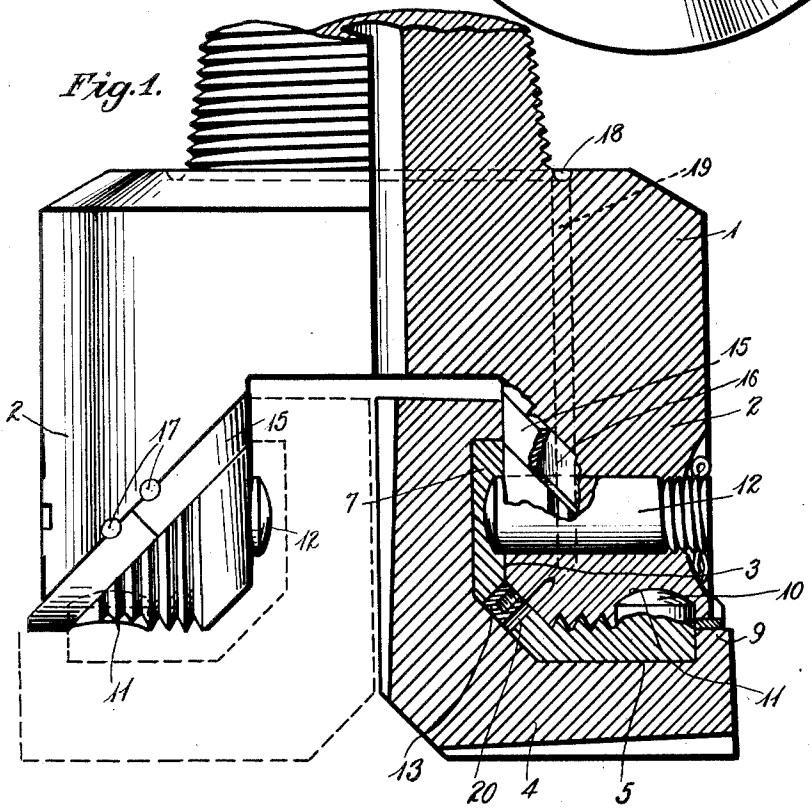


Fig. 1.



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DRILL CUTTER MOUNTING

Application filed April 16, 1929. Serial No. 355,558.

The present invention relates to earth boring drills and is more particularly concerned with certain improvements upon and refinements of the drill structure disclosed in my copending application Serial No. 194,315, filed May 26, 1927.

In general, the structure disclosed in the above mentioned copending application consists of a drill head having a plurality of depending legs or spindles, each of which is provided with a substantially frusto-conical surface whose surface elements are substantially at right angles to each other and arranged parallel and at right angles respectively to the vertical axis of the drill head. In connection with this frusto-conical spindle surface there is employed a segmental bushing assembly which when assembled presents an internal frusto-conical surface substantially fitting the surface of the spindle and an external frusto-conical surface for the reception of a conical roller cutter having an internal frusto-conical bearing surface. The rotary cutter is of integral construction and embodies an annular overhanging peripheral flange for maintaining the segmental bushing in assembled relation and for affording an inseparable relation between the cutter and bushing. Suitable means is provided for locking the bushing both against rotation and axial separation with respect to the drill head spindle. This is the general structure to which the improvements forming the substance of my present invention are applied.

These improvements consist in a novel and convenient means for facilitating the assembly of the segmental bushing within the frusto-conical interior of the cutter and maintaining the same in assembled relation therewith while permitting the ready removal of the individual segments of the bushing when occasion requires.

A further improvement forming a part of the present invention resides in the provision of a replaceable sectional bearing ring adjacent the base of the frusto-conical surface of the spindle for receiving the wear from the annular retaining flange of the cutter. A further improvement which I contemplate applying to a structure of the type just described consists in providing a plurality of interlocking serrations on the frusto-conical surface of the spindle and on one or more of the segments of the bushing for resisting lateral thrust imposed upon the bushing during the operation of the cutter. Other improvements and refinements in the general structure set forth will be pointed out in connection with the following description of the drawings forming a part of this application and those improvements specifically enumerated will be more definitely described as to structure and their functions more clearly set forth.

In the drawings,

Figure 1 is a side elevation partly in section of my improved cutter mounting;

Figure 2 is a top plan view partly in section of one of the cutter and bushing assemblies;

Figure 3 is a perspective view of the locking disk for the segmental bushing assembly.

The drill head indicated by the reference numeral 1 is provided with a pair of vertically arranged depending cutter supporting spindles 2, each of which is formed with a substantially frusto-conical surface 3 for receiving a cutter assembly. These frusto-conical surfaces are designed in accordance with the disclosure of the above mentioned copending application to provide right angularly disposed surface elements which are parallel and at right angles respectively, to the vertical axis of the drill head. The purpose of this peculiar formation is to provide a cutter mounting in which all operating thrusts are vertically directed, thus eliminating any tendency to twist or bend the spindles in such a way as to impair or stop the operation of the drill.

The cutter assembly to be associated with the frusto-conical supporting spindles includes a frusto-conical roller cutter 4 of integral construction formed with an interior frusto-conical surface 5. It includes also a sectional bushing made up of three unequal sections 6, 7 and 8 which are adapted to be received into the frusto-conical surface 5. The cutter 4 is provided with an overhanging flange 9 which serves to retain the assembled bushing segments in position and serving to nor-

mally prevent axial separation of the cutter and bushing. It will be observed that the lower segment 6 of the bushing is provided with an upstanding lug 10 which is adapted to be seated within a correspondingly formed recess 11 in the lower horizontal surface of the spindle. The purpose of this interlocking relation between the bushing segment and the spindle is to prevent relative rotary movement between the spindle and bushing. A second locking element in the form of a plug 12 extending horizontally through the spindle and engaging a recess in the bushing further serves to prevent relative rotary movement of the spindle and bushing and also to prevent axial separation of the bushing with respect to the spindle. The plug 12 is screw threaded for a portion of its length and may be adjustably positioned within the horizontal bore of the spindle by engagement with screw threads formed in such bore. The end of this plug may be constructed in any suitable manner to facilitate the application of a tool thereto for the insertion or withdrawal of the plug. In order to facilitate the assembly and removal of the segments of the bushing with reference to the frusto-conical recess in the cutter, I provide a segmental locking disk 13 which is adapted to be placed within a centrally arranged recess of segmental circular form, which recess is constituted by cutting away the inner extremities of the bushing segments 7 and 8 along an arc concentric with the axis of the cutter. This locking disk is provided with a screw threaded recess for the reception of any suitable tool, such for example as the tool indicated at 14 in Figure 3, for the purpose of removing the disk and thereby permitting the ready removal of the bushing segments.

The frusto-conical surface of the spindle is provided with a series of serrations formed along vertically disposed elliptical lines. Corresponding serrations are formed on the sectional bushing assembly and these are adapted to engage and interlock with the serrations of the spindle for the purpose of effectively resisting such lateral thrust as may be imposed upon the bushing during operation of the drill. It is apparent that these interlocking serrations may assume a variety of different forms but I have found that the particular form herein shown and described is probably the most advantageous one.

In order to prevent undue wear upon the spindle at the point of engagement therewith of the flanges 9 of the frusto-conical cutters, I have provided this portion of the frusto-conical surface of the spindle with a replaceable segmental bearing ring 15. In order to accommodate the positioning of a bearing ring at this point I preferably form in the spindle an annular recess 16 of a depth corresponding to the thickness of the bearing ring which it is desired to use. The annular bearing ring 15 consists of two semi-circular sections which may be suitably secured to the spindle by means of dowel pins 17. Thus, it is apparent that the spindle is not subjected to wear at any point inasmuch as the bushing assembly and the sectional bearing ring furnish the entire bearing surface against which the rotary cutter may act. This arrangement results in a construction which is very economical in operation since it is merely necessary to replace small inexpensive parts when wear occurs and the major parts of the mechanism will last practically indefinitely.

For the purpose of lubricating the bearing surfaces between the cutter and bushing assembly I provide an annular lubricant channel 18 on the upper surface of the drill head, which channel communicates by means of a duct 19 extending downwardly around the plug 12 to an aperture 20 formed in part in the locking disk 13 and in part in the section 6 of the bushing. Thus, it is apparent that lubricant collected in the channel 18 is readily conveyed downwardly through the drill spindle and cutter assembly to a point where it may work between the bearing surfaces of the cutter and bushing.

It should be understood that the specific structure herein shown and described is susceptible of some variation within the scope of my invention and for this reason I desire that the invention be unrestricted other than by the appended claims and the state of the prior art.

Having thus described my invention what I claim is:

1. In a drill, the combination with a drill head, having a depending cutter supporting spindle, said spindle having a partly serrated frusto-conical surface, the serrations thereof being of other than circular form, of a bushing having exterior and interior frusto-conical surfaces, the latter being adapted for engagement with said spindle surface and having serrations adapted to engage and interlock with the serrations on said spindle surface, whereby to resist lateral thrust imposed upon said bushing, and a frusto-conical cutter rotatably mounted on said bushing.

2. In a drill, the combination with a drill head having a depending spindle, of a roller cutter having a substantially frusto-conical interior recess bounded by an annular flange, a plurality of bushing segments adapted to be positioned within said interior recess and forming a composite frusto-conical bushing when in assembled position, and means for locking said segments therein.

3. A cutter assembly comprising a substantially frusto-conical roller cutter having an interior recess of substantially frusto-conical form for the reception of a bushing,

said recess being bounded by an integral annular flange on said cutter, a plurality of bushing segments disposed within said recess, said segments being so formed as to incompletely fill said recess and forming a composite frusto-conical bushing when in assembled position, and a removable locking member associated with said segments to force the same into close engagement with the walls of said recess whereby said bushing is retained in assembled relation but may be readily removed by the removal of said locking member.

4. A cutter assembly comprising a roller cutter having a substantially frusto-conical recess bounded by an annular flange integral with the cutter, a frusto-conical bushing disposed within said recess and comprising a plurality of dissimilar sections, portions of which are cut away so that said sections incompletely fill said recess and a member adapted to be positioned in said recess adjacent said cut-away portions for forcing said sections into close engagement with the walls of the recess, said member being formed for the reception of a removing tool whereby the same may be removed, thus permitting the individual sections to be readily removed from the recess.

5. In a drill, the combination with a drill head, of a roller cutter assembly supporting spindle having a substantially frusto-conical supporting surface of which a part is serrated, a recess in the lower part of said spindle, a sectional, removable bushing having exterior and interior substantially frusto-conical surfaces, the latter being adapted for engagement with said spindle surface, and having serrations adapted to engage and interlock with the serrations on said spindle surface, a lug projecting upwardly from and integral with the lowermost segment of said bushing, and adapted to engage and interlock with the recess in the lower part of said spindle; and a frusto-conical roller cutter of known type mounted on said bushing.

6. In a drill, the combination with a drill head, of a spindle depending therefrom and having a substantially frusto-conical bearing surface, a bearing ring countersunk in said frusto-conical bearing surface and forming a continuation of said surface, a bushing having an inner surface shaped to the spindle bearing surface, interlocking means between the spindle and bushing, and and a roller cutter mounted to rotate on said bushing and abutting said bearing ring.

7. In a drill, the combination with a drill head, having a depending cutter supporting spindle, of a bushing having exterior and interior frusto-conical surfaces, the latter being adapted for engagement with said spindle surface, the frusto-conical spindle surface being formed with serrations which are non-circumferential with respect to the frusto-conical surface, and said interior frusto-conical bushing surface having serrations adapted to engage and interlock with the serrations on said spindle surface, and a frusto-conical cutter rotatably mounted on said bushing.

In testimony whereof I affix my signature.

EARL A. REED.