Aug. 8, 1933. E. A. REED 1,921,701

DRILL CUTTER

Filed Aug. 15, 1928

Fig. 1.

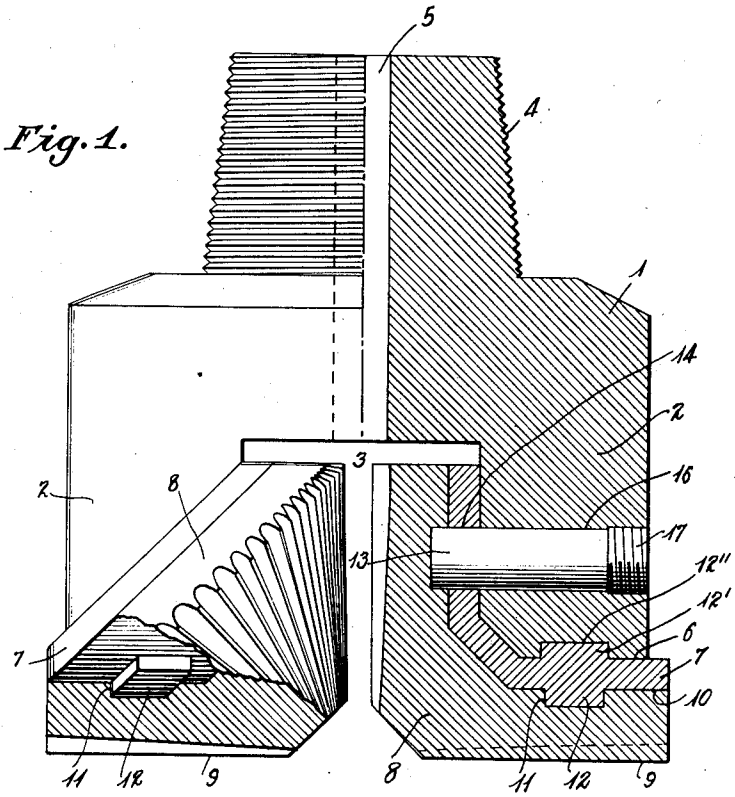


Fig. 2.

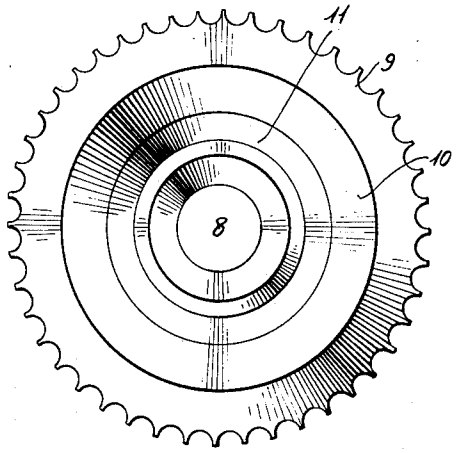


Fig. 3.

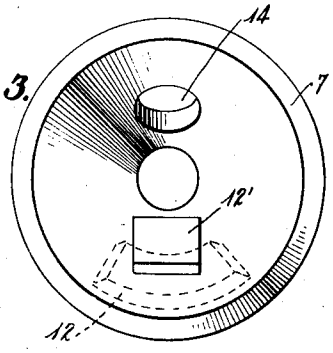
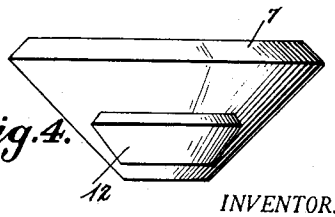


Fig. 4.



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DRILL CUTTER

Earl A. Reed, Tulsa, Okla.

Application August 15, 1928. Serial No. 299,855

11 Claims. (Cl. 255—71)

This invention relates to improvements in earth boring drills, and constitutes an improvement upon the structure shown in my copending application Serial No. 194,315, filed May 26, 1927. The present invention relates more particularly to the frusto-conical type of cutter and the manner of mounting the same upon a bit head.

It is an object of my invention to provide a mounting for frusto-conical cutters which will afford a maximum bearing surface area and which at the same time will facilitate the removal and substitution of both the cutter and bearing elements.

Further objects relate to the construction and design of the parts with a view to simplifying and effecting economies in the manufacture and use thereof, as will more definitely appear from the following description and accompanying drawing.

Referring now to the several views of the drawing,

Fig. 1 is a view partly in vertical section of a bit head having a pair of frusto-conical roller cutters mounted thereon in accordance with the present invention,

Fig. 2 is a top plan view of the cutter,

Fig. 3 is a top plan view of the frusto-conical bushing, and

Fig. 4 is a view of the bushing in side elevation.

My present invention is shown in connection with a one piece drill head construction indicated generally by the reference character 1. This drill head is formed with a pair of spaced, depending spindles or legs 2 on which the respective rotary cutters are mounted. The space 3 between the two spindles is just sufficient to accommodate the two rotary cutters in substantially abutting relation. The drill head is provided at its upper end with the usual threaded portion 4 which constitutes one part of a coupling member. The head is also provided with the usual water duct indicated at 5.

The two cutters and their mountings are identical, and I will therefore describe the details of but one thereof. The spindle 2 is formed with a frusto-conical surface which in transverse section presents two surface elements substantially at right angles to one another and the lower one of which is intended to lie substantially horizontally when the drill is in operation. The lower horizontal surface of the spindle is formed with a substantially rectangular recess 12'', the purpose of which will be hereinafter pointed out. A bushing 7 is formed with an internal frusto-conical surface of such size as to snugly fit the frusto-conical surface of the spindle. This bushing also has a similarly formed external bearing surface with which the international frusto-conical surface of the roller cutter has bearing engagement. The internal surface of the cutter is formed as shown in Figure 2 with an annular groove or channel 11 and the external surface of the bushing is provided with a substantially rectangular lug for engagement with said channel. The internal surface of the bushing is also provided with a substantially rectangular lug 12' for engagement in the aforesaid recess 12'' in the spindle 2. Thus, it will be seen that the bushing is interlocked with the spindle by means of the lug 12' and recess 12'' and that the cutter is rotatably mounted on the bushing by virtue of lug 12 of the bushing engaging in the annular groove 11 of the cutter.

In order to lock the parts in the assembled relation thus described, I provide a locking pin 13 seated within a transverse bore 16 in the spindle and adapted to be projected through an aperture 14 in bushing 7 and into engagement with the annular recesss 11 of the cutter. The outer end of the pin 13 is provided with screw threads as indicated at 17, which threads coact with corresponding threads in the outer end of bore 16 for the purpose of securing the pin in place. It will readily be appreciated that with pin 13 in operative position as shown, the cutter, bushing and spindle elements will be securely locked in assembled relation and that by merely withdrawing the pin in a lateral direction, these elements may be readily disassembled.

An important characteristic of the present invention is the right angular relation of the surface elements of the frusto-conical spindle. This is clearly represented in Fig. 1 wherein an axial section through the spindle discloses truly vertical and horizontal surfaces. One advantage of this construction, which is common to this application and the application hereinabove referred to, is that the spindle supports the loads imposed upon it in operation substantially entirely along vertical lines, thus subjecting the spindle only to compression stresses and substantially eliminating all leverage stresses. This construction possesses an important added advantage in connection with the present invention in that it permits the use of a bushing of unitary construction. It should be apparent

that it would be practically impossible to assemble a structure such as is herein shown if the surface elements of the various frusto-conical members were not disposed in substantially right angular relation. However, by virtue of this right angular relationship of surface elements, it is a simple matter to assemble the cutter and bushing with the spindle and integral locking pin by merely moving the cutter and bushing toward the spindle with the surfaces diametrically opposite the pin and aperture respectively, in sliding engagement. Thus, it is possible to use a bushing of unitary construction and to receive the advantages of such construction.

The construction as thus described is of particular utility in connection with drill heads and cutters of relatively small sizes since it affords a maximum bearing surface area and yet retains all of the advantages of mountings adapted more particularly for larger drills, such for example as that shown in my copending application above referred to. However, the present invention may be utilized in connection with cutters and drill heads of any desired size.

It is to be understood that the present invention is susceptible of some modification and is not necessarily limited to the precise details of construction herein shown and described. Therefore, it is my intention that the scope of my invention be unrestricted other than by the appended claims.

I claim:

1. In a device of the character described, the combination with a drill head having a substantially frusto-conical cutter supporting spindle, of a bearing member having substantially frusto-conical external and internal bearing surfaces, the latter surface being adapted to engage the frusto conical surface of said spindle, a roller cutter having an internal frusto-conical surface adapted for engagement with the external surface of said bearing member and means carried by said bearing member and engaging said spindle and cutter, said means serving to lock said bearing and spindle against relative rotation while permitting relative rotation of said bearing and cutter and means carried by said spindle and engaging said cutter and bearing and serving in conjunction with the aforesaid means to lock said cutter, bearing and spindle in assembled relation.

2. In a device of the character described, the combination with a drill head having a substantially frusto-conical cutter supporting spindle, of a bearing having substantially frusto conical external and internal bearing surfaces, the latter surface being adapted to engage the frusto-conical surface of said spindle, a roller cutter having an internal frusto-conical surface adapted for engagement with the external surface of said bearing, said cutter having an annular channel formed in the internal surface thereof, a projection on the external surface of said bearing adapted to engage in said channel whereby said cutter is permitted to rotate with respect to said bearing, interlocking means on said bearing and spindle whereby rotation of said bearing with respect to said spindle is prevented and means carried by said spindle and engaging said cutter and bearing and serving in conjunction with the aforesaid projection and interlocking means to prevent axial separation of said spindle, bearing and cutter.

3. In a drill, the combination with a drill head having a depending cutter supporting spindle formed with a substantially frusto-conical cutter supporting surface, of a bushing having substantially frusto-conical external and internal surfaces, the latter adapted to engage said spindle and a rotary cutter having an internal frusto-conical bearing surface adapted to have bearing engagement with the exterior of said bushing, the internal surface being formed with a continuous annular channel, a projection on the internal surface of said bushing entering a recess in the surface of said spindle, a second projection on the exterior surface of said bushing entering the said annular channel and means for locking the said parts in assembled relation, said means comprising a removable locking plug carried by said spindle and adapted to pass through an aperture in said bushing and enter the said annular channel.

4. In a drill, the combination with a bit head having a depending leg, of a frusto-conical roller cutter provided with a continuous interior groove, a bushing interposed between the bit head and the roller cutter, a projection from the interior of said bushing entering a recess in the depending leg of the bit head, a projection from the exterior of said bushing entering the continuous groove in the interior of the roller cutter, and means for locking the roller cutter rotatably to the bit head, comprising a removable locking plug carried by the bit head and adapted to pass through an aperture in said bushing and enter the continuous groove formed as a concentric ring in the roller cutter.

5. In a cutter assembly, a spindle having a frusto-conical surface formed with a recess, a bearing formed with an inner frusto-conical surface and non-rotatably mounted on the spindle, said bearing having a projecting lug extending into said recess, a cutter mounted on the bearing and being formed with an inner annular groove, the bearing having a projection on its outer surface which extends into said groove, and means coacting with the spindle, bearing, and cutter, to maintain them free from relative axial movement.

6. In a cutter assembly, a spindle having a frusto-conical surface which is formed with a recess, a bearing having an inner frusto-conical surface and an outer frusto-conical surface and being non-rotatably mounted on the spindle, a cutter having a frusto-conical inner surface and being formed with an annular groove in said surface, projections being formed on said bearing and extending respectively into the recess and the groove, and means coacting with the spindle, bearing, and cutter, to maintain them free from relative axial movement, said means comprising an element extending through said bearing and into engagement with said cutter.

7. As an article of manufacture, a bearing member having an internal frusto-conical surface formed with a projecting lug integral therewith and extending inwardly from said inner surface, the bearing member having an aperture formed through the frusto-conical surface, said aperture being spaced from the apex of said conical surfaces.

8. As an article of manufacture, a bearing member having internal and external frusto-conical surfaces tapering in the same direction, and being formed with projecting lugs integral therewith and extending from each of said

frusto-conical surfaces, the bearing member having an aperture formed through the frusto-conical surface, said aperture being spaced from the apexes of said frusto-conical surfaces.

9. In a cutter assembly, a spindle formed with a frusto-conical surface at its lower end, the lowermost element of which is disposed in substantially a horizontal plane, and the innermost element in substantially a vertical plane, a bearing member formed with an inner frusto-conical surface coinciding with the frusto-conical surface of the spindle, said bearing member having an element formed integral therewith and cooperating with the spindle to prevent relative rotation of the bearing member and spindle, a cutter rotatably mounted on the bearing, and means coacting with the spindle, bearing and cutter to maintain them free from relative axial movement.

10. The combination described in claim 9 in which all portions of the spindle are positioned in a direction axially of the drill head with respect to the base area of the spindle so as to transmit the thrusts encountered during the drilling operation in a vertical direction only whereby to eliminate leverage stresses.

11. As an article of manufacture, a bearing member having an internal frusto-conical surface, opposed elements of which are right angularly disposed, said member having a projecting lug integral therewith and extending inwardly from said surface, said member also having an external frusto-conical surface, opposed elements of which are right angularly disposed, and having a projection integral therewith extending outwardly from said external surface.

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