Oct. 6, 1936. G. G. HARRINGTON 2,056,320

ROLLER BIT

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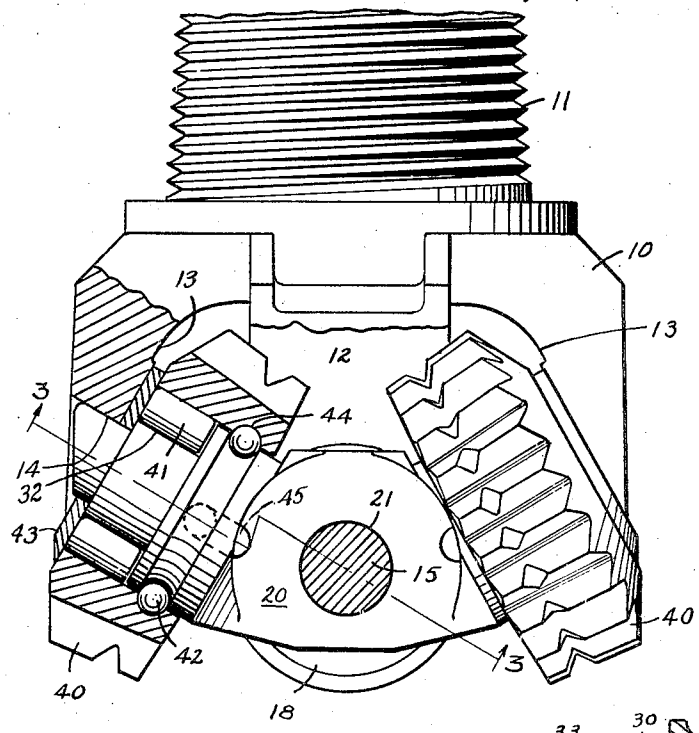


Fig. 1.

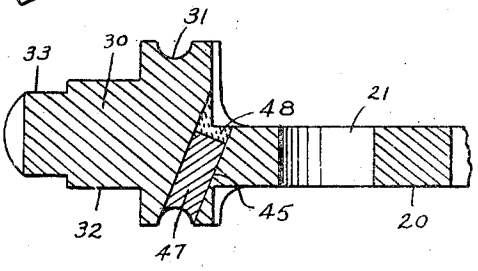


Fig. 3.

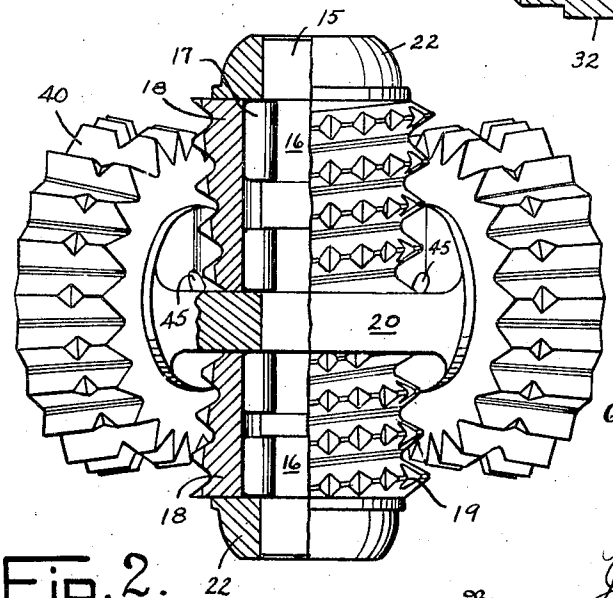


Fig. 2.

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ROLLER BIT

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12 Claims. (Cl. 255—71)

This invention relates to roller bits for cutting hard or soft formations, and more particularly to an improved arrangement of mounting the cutters.

In the conventional bits of the cross roller type having side cutters on either side of the cross rollers, the hole in boring exerts an inward pressure to force the lower end of the side cutters inwardly, resulting in a relatively rapid destruction of the bearings, and a change in the position of the cutters so that the size of the bore hole is reduced. This is caused by the cutters tilting on their axes after the bearings have begun to wear.

One object of this invention is to provide a bearing arrangement which will take the normal inward thrusts on the side cutters, and which will also be able to carry the occasional outward thrusts which occur.

Another object resides in the provision of a bearing to take the thrusts referred to, including rolling bearings to hold the cutter against longitudinal movement on its axis, and new and improved means to permit the insertion of such bearings through the cutter spindle, interrupting only the bottom of the spindle raceway and without appreciably weakening the associated parts of the bit.

Other objects and advantages will appear from the following description.

Fig. 1 is an elevation showing an improved bit construction, some of the parts being in section. Fig. 2 is a bottom plan view showing the cross cutters partially in section, and the bridge member partly in section. Fig. 3 is an enlarged detail view on line 3—3 of Fig. 1, showing the bridge member and the means for inserting and locking the bearings.

I have illustrated a roller bit comprising a head with a threaded portion for connection to the drill stem, and having a downwardly opening cutter recess in which are mounted centrally arranged cross roller cutters and a bridge member carrying side roller cutters.

Referring first to the conventional elements of the bit 10, the numeral 11 indicates a threaded shank by which the bit may be connected to the drill stem (not shown). The downwardly opening cutter recess 12 is provided with downwardly and outwardly sloping side walls 13 having slots in side walls 14. A cross cutter pin 15 extends diametrically across the cutter recess and may be provided with a plurality of grooves 16 for the reception of roller bearings 17, upon which are the cross roller cutters 18 which may have spiral cutting teeth 19.

Substantially centrally of the pin and cutter is positioned a bridge member 20. The bridge member has an opening 21 for the reception of the cross roller pin 15. The cross rollers are retained in position and locked to the head by suitable fastening means, the lower end of which comprises the socket portion 22.

Referring now to the improvements provided by my invention, the bridge member 20 is provided at either side with upwardly and outwardly extending spindles or bearing portions 30 which contain a ball race 31 for the reception of ball bearings, a roller race 32 for roller bearings, and a reduced extension portion 33 arranged to be positioned in the slot 14 of the bit head, and to be fastened therein by welding or other suitable means.

Side cutters 40 are mounted upon the bearing portions 30 and are rotatably supported thereon by the rolling bearings comprising roller bearings 41 and ball bearings 42. The roller bearings 41 are first spaced between the cutter 40 and the roller raceway 32 and then the balls 42 are inserted into the space between the outer race 44 and the inner race 31, to rotatably lock the cutter against longitudinal movement on the spindle 30. After the balls have been inserted a plug 47 is placed in the passageway 45 to seal the balls in place and give an uninterrupted raceway. The plug 47 may be fastened by welding 48.

The outer sides of the cutters 40 and the roller bearings 41 are now covered by the wear plate 43.

The bridge member 20 with its cutters and rollers together with the pin 15 and its cutters and rollers are inserted into the head as a unit, the ends 33 fitting into the slots 14. The radial load on the side cutters 40 is taken by the roller bearings 41 and a combination of radial load and axial thrust is taken by the ball bearings 42. This axial thrust is caused by the normal inward thrust created by the walls of the hole acting on the lower outer portions of the cutter.

In occasional instances the thrust just referred to is outward due to certain conditions of operation, and the balls also sustain this occasional outward thrust.

The arrangement for the insertion of the balls through the bridge member is such that a minimum weakening of this member occurs.

Although a preferred embodiment of the improved roller bit construction has been illustrated and described, modifications within the

true spirit and scope of the same are intended to be covered by the hereto appended claims.

I claim:

1. In a roller bit; a head having a recess in the bottom thereof and slots in the walls of said recess; a bridge member for said recess, extending across the same, having upwardly and outwardly extending bearing portions thereon and reduced end portions slidable in said slots; and side roller cutters rotatably locked by rolling bearings on said bearing portions.

2. In a roller bit; a head having a recess in the bottom thereof with slots in its side walls; a bridge member for said recess, extending across the same, having upwardly and outwardly extending bearing portions containing an annular ball raceway, and reduced end portions slidable in said slots; side roller cutters having interior ball raceways supported on said bridge member bearing portions by rolling bearings, and rotatably locked thereon by ball bearings in said raceways.

3. In a roller bit; a head having a recess in the bottom thereof and slots in the walls of said recess; a bridge member for said recess, extending across the same, having upwardly and outwardly extending bearing portions thereon and reduced end portions slidable in said slots; and side roller cutters on said bearing portions, being supported thereon by roller bearings adjacent the outer side of the cutter and ball bearings adjacent the inner side of the cutter.

4. In a roller bit; a head having a recess in the bottom thereof and slots in the walls of said recess; a bridge member for said recess, extending across the same, having upwardly and outwardly extending bearing portions thereon and reduced end portions slidable in said slots; and side roller cutters on said bearing portions, being supported thereon by roller bearings adjacent the outer side of the cutter and ball bearings adjacent the inner side of the cutter, said ball bearings rotatably locking the cutters on the bearing portions.

5. In a roller bit; a head having a recess in the bottom thereof with slots in its side walls; a bridge member for said recess, extending across the same, having upwardly and outwardly extending bearing portions containing an annular ball raceway, and reduced end portions slidable in said slots; side roller cutters having interior ball raceways supported on said bridge member bearing portions by rolling bearings, and rotatably locked thereon by ball bearings in said raceways, and a passageway in said bridge member extending into said raceway for the insertion of the balls.

6. A bit comprising a head having a downwardly opening recess therein; a pin in said recess having cross roller cutters thereon; side roller cutters; a bridge member having oppositely extending bearing portions; and rolling bearings locking said side cutters on the bearing portions of said bridge.

7. A bit comprising a head having a downwardly opening recess therein; a pin in said recess having cross roller cutters thereon; side roller cutters; a bridge member having oppositely extending bearing portions; and ball bearings locking said side cutters on the bearing portions of said bridge.

8. A bit comprising a head having a downwardly opening recess and having cross and side roller cutters therein; and rolling bearings locking said side cutters onto said head.

9. A roller bit comprising a head; cross roller cutters rotatable on a substantially diametrical axis; a bridge member extending between said cutters, having bearing spindles that project upwardly and outwardly from the longitudinal axis of said head; and roller cutters rotatably mounted on said spindles and rolling bearings locking the cutters on the spindles.

10. A roller bit having a downwardly facing recess; cross roller cutters mounted in said recess; side roller cutters at either side of the cross cutters; supports for said side cutters and rolling bearings supporting said side cutters on said supports; said bearings arranged to rotatably lock the cutters on the supports and to take the inward thrust on the cutters.

11. A bit comprising a head having a recess and slots therein; a pin extending across said recess; cross roller cutters on said pin; a bridge on said pin having upwardly, outwardly bearing portions containing a ball race and reduced portions for securement in said slots; side roller cutters having an interior ball race mounted on said bearing portions; and balls in said races rotatably locking said side cutters on the bearing portions.

12. In a rotary boring drill; a head; a bearing pin in said head; cross cutters and a bridge on said pin; bearing portions on said bridge having ball races; a ball passageway extending thru said bridge member to the ball races; side roller cutters having interior ball races on said bearings; balls in said races rotatably locking the side cutters on said bearing portions; and means sealing the passageways.

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