

Nov. 24, 1936.

R. R. CRUM

2,061,933

STRUCTURE FOR ROLLER BITS

Filed March 18, 1935

2 Sheets-Sheet 1

Fig. 1

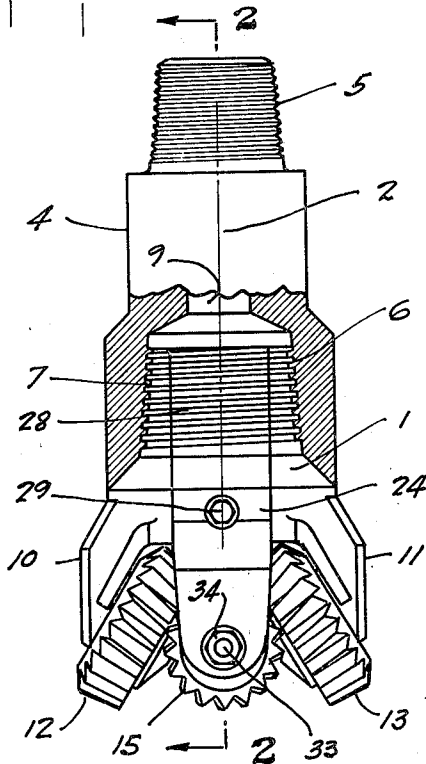


Fig. 2

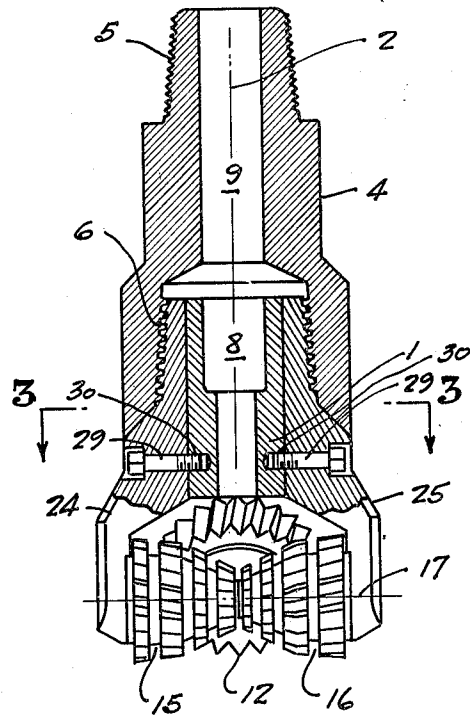
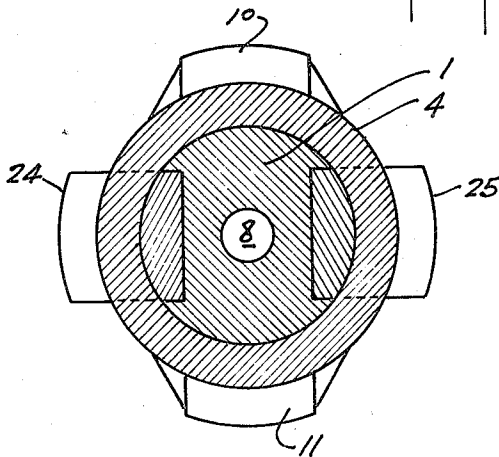


Fig. 3



INVENTOR
Roland R. Crum
BY John Flann
ATTORNEY

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Fig. 4

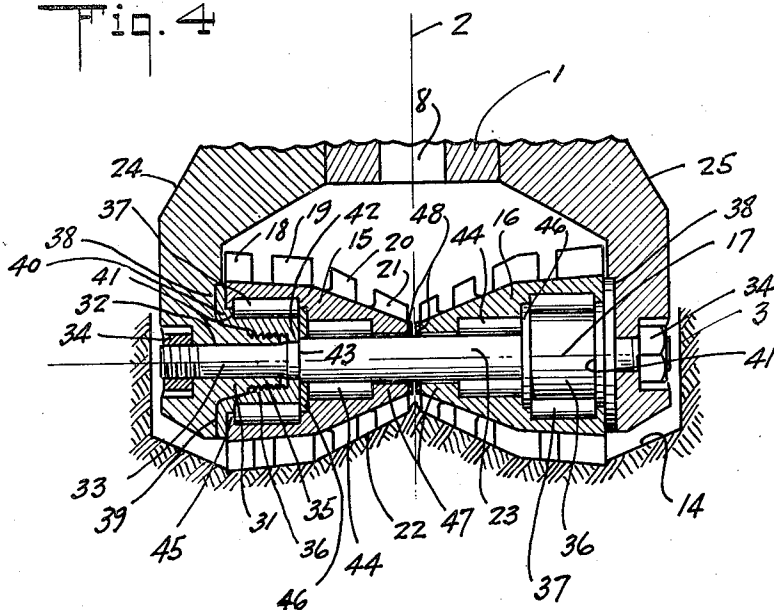


Fig. 5

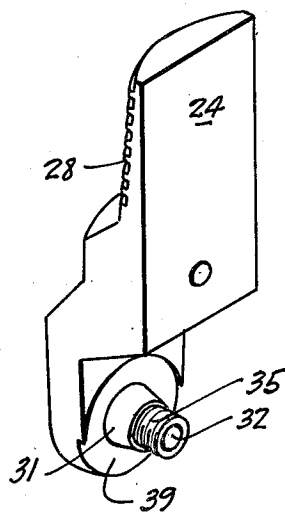
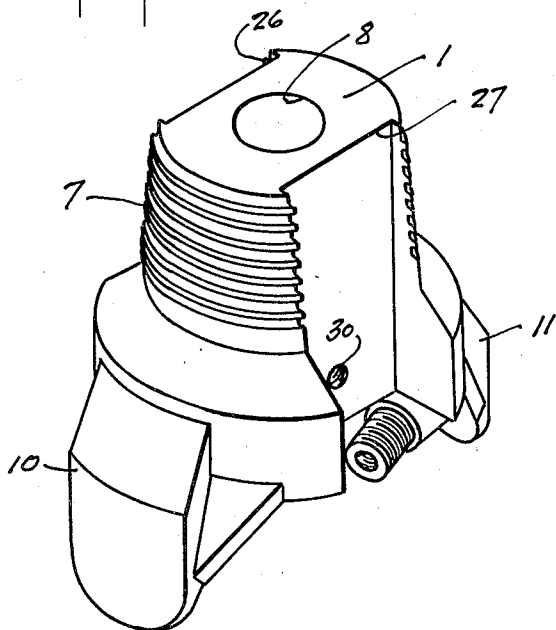


Fig. 6



INVENTOR
Roland R. Crum
BY *John Flamm*
ATTORNEY

UNITED STATES PATENT OFFICE

2,061,933

STRUCTURE FOR ROLLER BITS

Roland R. Crum, Whittier, Calif., assignor of one-fourth to Edwin A. Perkins and three-eighths to Frank W. Brainard, both of Whittier, Calif.

Application March 18, 1935, Serial No. 11,652

10 Claims. (Cl. 255—71)

This invention relates to roller bit structures, and more particularly to a structure whereby the roller bit members can be sturdily and effectively supported on a bit frame.

5 This application is a continuation in part of a prior application, Serial No. 715,504, filed March 14, 1934, for "Roller bit" in the name of Roland R. Crum.

10 It is one of the objects of this invention to provide a simple and strong roller bit structure, that can be easily assembled and taken apart.

It is another object of the invention to improve the structure of the cutter supports.

15 In such bit structures, the bit frame is arranged to be rotated about an axis corresponding to the direction of drilling, and the roller or disc cutters are rotatably supported on axes transverse to the frame axis. Arms are provided for supporting transverse pins or shafts. It is another object of this invention to provide a simple and sturdy structure for the cutter supporting elements.

20 This invention possesses many other advantages, and has other objects which may be made more easily apparent from a consideration of one embodiment of the invention. For this purpose there are shown a few forms in the drawings accompanying and forming part of the present specification. These forms shall now be described in detail, illustrating the general principles of the invention; but it is to be understood that this detailed description is not to be taken in a limiting sense, since the scope of the invention is best defined by the appended claims.

25 Referring to the drawings:

Figure 1 is an elevation, partly in section, of a roller bit structure embodying the invention;

Fig. 2 is a partial sectional view, taken along plane 2—2 of Fig. 1;

30 Fig. 3 is an enlarged cross section, taken along plane 3—3 of Fig. 2;

Fig. 4 is an enlarged sectional view, showing the inside cutters of the bit in drilling position in a hole;

45 Fig. 5 is a pictorial view of one of the detachable arms used for supporting the transverse inside roller cutters; and

Fig. 6 is a pictorial view of the bit frame.

50 The bit structure includes a bit frame or body 1. This frame is adapted to be rotated about a longitudinal axis 2, as by any appropriate source of power applied at the top of the hole 3. The frame 1 is adapted to be connected to the end of a drill string extending into the hole 3. Such a drill string can be made up of a number of

connected lengths of pipe; the bottom of the string can be coupled as by coupling member 4 to the bit frame 1.

In the present instance, the member 4 is shown as having a tapered threaded end 5 by the aid of which it may be coupled to the drill string; as well as a tapered threaded socket 6 adapted to be tightened over the corresponding tapered threaded end 7 of the frame 1. Both of the members 1 and 4 are provided by axial openings 8, 9 to form a water course.

15 As in the prior application hereinbefore identified, the frame 1 is provided with a pair of arms 10 and 11 arranged in diametric relation and adapted to support the rotatable outside cutter discs 12, 13. Cutting teeth of any desired configuration can be provided on these discs. These discs are rotatable about axes converging toward the axis 2, and can be supported on bearing structures such for example as shown and claimed in an application filed concurrently herewith, in the name of Roland R. Crum, Serial No. 11,651, and entitled "Roller bit bearing structure". It is sufficient to state here that the roller cutters 12 and 13 are adapted to operate on the outer zone 14 (Fig. 4) of the hole bottom.

25 The inside cutters 15, 16 are arranged to rotate about an axis 17, arranged perpendicular to axis 2, and passing therethrough. Each of these cutters has a series of annular cutting teeth, such as 18, 19, 20, 21. The envelopes of these teeth can converge in general toward the axis 2, whereby a central raised area 22 at the hole bottom is formed by the operation of the cutters. Furthermore, the zones of operation of the teeth on the two rollers 15, 16 can overlap.

30 The manner in which the rollers 15, 16, are rotatably supported on axis 17 will now be described. A transverse pin or bearing support 23 extends across the bottom of the frame 1. The ends of this member 23 are supported in the detachable arms 24, 25. Each of these arms is arranged to be accommodated in a groove 26 or 27 formed longitudinally of frame 1. The upper ends of the arms carry portions of a helical tapered thread 28, forming with the top of frame 1, a complete tapered square thread projection over which coupling 4 can be threaded. The arms 24 and 25 are held in place by the threaded socket of coupling 4; but to hold the arms still more securely, and in assembled position prior to the insertion in coupling 4, bolts 29 can be used. These bolts pass through counterbored apertures transverse to arms 24, 25 and are threaded into tapped holes 30 in frame 1.

Since both arms 24 and 25 are similar, a description of one of them is sufficient. Thus arm 24 has an inwardly directed boss 31. This boss has a counterbored aperture 32, radial to axis 2, for accommodating the end 33 of the supporting member 23. This end 33 has a threaded extremity upon which a nut 34 is threaded.

The boss 31 also has a threaded inner end 35, upon which a cylindrical member 36 is supported. This member serves as one element forming a cylindrical inner race for rollers 37. Member 36 has an abrupt end surface 38 abutting a corresponding abrupt surface 39 on boss 31, whereby the spacing of the members 36 on opposite sides of the frame is rendered definite. Also, this surface 38 contacts the end surface of a flange member 40 telescoped over boss 31 and forming a continuation of member 36. The member 40 has an intermediate abrupt surface 41 for confining the rollers 37 against axial movement.

The member 36 has an end flange 42 against which an abrupt shoulder 43 of support 23 abuts. The cylindrical central surface of support 23 serves as the inner race of a set of rollers 44, this race being relatively of smaller diameter than the race for rollers 37.

The outer races for rollers 37 and 44 are formed by internal cylindrical surfaces in cutters 15, 16. In order to confine the rollers 37 and 44 as well as the cutters against axial movement, various abrupt surfaces are provided. Thus an overhanging end flange 45 is formed at the large end of each cutter, adapted to confine the rollers 37 against axial movement, and abutting the flange 40, and thus cooperates with the intermediate abrupt surface 41. The other ends of rollers 37 are confined by a flange or washer 46 abutting the flange 42, and having an outer edge extending radially outwardly in the path of the right hand ends of rollers 37. This confining surface is supplemented by an intermediate flange 47 inside of cutter 15.

The rollers 44 are confined in one direction by flange 46, and in the opposite direction by the overhanging edge 47 of the cutter 15. This edge has a running clearance over the support 23. Furthermore, the adjacent end surfaces of cutters 15, 16 can be overlaid, as by welding, with a layer 48 of wear-resisting material. In this way, the wear, due to friction when these roller cutters abut under the strain imposed during operation, is minimized.

The roller disc structure is in general similar to that disclosed and claimed in an application filed concurrently herewith, in the name of Roland R. Crum, Serial No. 11,650, and entitled "Roller bit structure".

One manner in which the roller cutters and the associated arms can be assembled can now be set forth. First flange 40 can be placed over boss 31; then member 36 can be screwed on the boss. Then cutters 15 and 16 can both be assembled with their respective rollers 37 and 44, as well as flange 46; then support 23 can be passed through both of the cutter assemblies, and its left hand end 33 passed through the boss 31, where it can be held in place by nut 34. Now the arm 25 can be assembled with its elements corresponding to parts 31 and 40, these parts can be passed into the right hand end of cutter 16; the right hand extremity of support 23 passes through the boss in arm 25, and can be held in place by the nut 34. The entire assembly can then be slipped into place in frame 1.

The roller bearings and their support serve as

a very effective device for sustaining the stresses and strains imposed on the cutters during drilling operation.

I claim:

1. In a roller bit structure, a bit frame, a pair of arms supported on the frame, each of said arms having an inwardly extending apertured boss having an axis radial to the axis of the frame, said apertures being in alignment, a supporting member passing transversely of the frame axis and supported in said apertures, said supporting member having a cylindrical surface intermediate the bosses, and forming inner roller races, a pair of means, one of said means extending over one of the bosses and the other of said means extending over the other of the bosses, said means forming inner roller races of larger diameter than those formed by the supporting member and providing an abrupt shoulder between the smaller and larger roller races, a pair of roller cutters, cooperating respectively with the pair of means that extend over the bosses each having a pair of internal cylindrical surfaces of different diameters cooperating respectively with the corresponding inner races, and rollers in said races.

2. In a roller bit structure, a bit frame, a pair of arms detachably connected to the frame, each of said arms having an inwardly extending apertured boss, the apertures in both arms being in radial alignment at opposite sides of the bit frame, a supporting member fastened at its extremities in the bosses and extending transversely of the axis of the frame, a pair of means, one of said means telescoping over one of the bosses and the other of said means telescoping over the other of the bosses, each of said means forming an abrupt surface at its inner end, for definitely spacing the supporting member between the two abrupt surfaces, the supporting member having a cylindrical surface ending at an abrupt shoulder at each end, and contacting with said two abrupt surfaces, each of said telescoping pair of means having a cylindrical external surface larger than the cylindrical surface of the supporting member, said external cylindrical surfaces forming inner roller races, a pair of roller cutters respectively associated with the pair of telescoping means, each cutter having a pair of internal cylindrical surfaces forming outer roller races, and rollers in said races.

3. In a roller bit structure, a bit frame, a pair of apertured arms detachably connected to the frame, each of said arms having an inwardly extending boss, the apertures in both arms being in radial alignment at opposite sides of the frame, each of said bosses having a threaded end, and a surface extending between the inner face of the corresponding arm and the threaded end, means forming an inner roller race supported on each boss, said means telescoping over the said extending surface of the boss, as well as threadedly engaging the boss, a supporting member extending through the bosses and having an intermediate cylindrical surface with its ends abutting the members threaded on the bosses, a pair of roller cutters, respectively associated with the bosses, each of said cutters having an internal cylindrical surface cooperating with the inner race to form an outer race, and roller bearings in the races.

4. In a roller bit structure, a bit frame, a pair of apertured arms detachably connected to the frame, each of said arms having an inwardly extending boss, the apertures in both arms being in

radial alinement at opposite sides of the frame, each of said bosses having a threaded end, and a surface extending between the inner face of the corresponding arm and the threaded end, means forming an inner roller race supported on each boss, said means telescoping over the said extending surface of the boss, as well as threadedly engaging the boss, a supporting member extending through the bosses and having an intermediate cylindrical surface with its ends abutting the members threaded on the bosses, a pair of roller cutters, respectively associated with the bosses, each of said cutters having a pair of internal cylindrical surfaces, one surface cooperating with the inner race to form an outer race, and the other surface cooperating with the intermediate cylindrical surface on the supporting member to form an outer race, and rollers in the races.

5. The combination as set forth in claim 4, with the addition of a flange at each end of the intermediate cylindrical surface and abutting the end surface of the member threaded on the boss, the roller cutter having a recess intermediate the two internal cylindrical surfaces for retaining the edge of said flange, said flange acting to confine the roller bearings in both races against axial movement.

6. In a roller bit structure, a bit frame, a pair of apertured arms detachably connected to the frame, each of said arms having an inwardly extending boss, the apertures in both arms being in radial alinement at opposite sides of the frame, each of said bosses having a threaded end, and a surface extending between the inner face of the corresponding arm and the threaded end, means forming an inner roller race supported on each boss, said means telescoping over the said extending surface of the boss, as well as threadedly engaging the boss, a supporting member extending through the bosses and having an intermediate cylindrical surface with its ends abutting the members threaded on the bosses, a pair of roller cutters, respectively associated with the bosses, each of said cutters having a pair of internal cylindrical surfaces of different diameters, said surfaces cooperating respectively with the means forming an inner roller race, and with the intermediate cylindrical surface of the supporting member, each of said roller cutters also having overhanging edges forming a confining flange for the races, and rollers in the races.

7. In a roller bit structure, a bit frame, a pair of apertured arms detachably connected to the frame, each of said arms having an inwardly extending boss, the apertures in both arms being in radial alinement at opposite sides of the frame, each of said bosses having a threaded end, and

a surface extending between the inner face of the corresponding arm and the threaded end, means forming an inner roller race supported on each boss, said means telescoping over the said extending surface of the boss, as well as threadedly engaging the boss, a supporting member extending through the bosses and having an intermediate cylindrical surface with its ends abutting the members threaded on the bosses, a pair of roller cutters, respectively associated with the bosses, each of said cutters having a pair of internal cylindrical surfaces of different diameters, said surfaces cooperating respectively with the means forming an inner roller race, and with the intermediate cylindrical surface of the supporting member, each of said roller cutters also having overhanging edges forming a confining flange for the races, rollers in the races, and additional confining means for the rollers, comprising a flange adjacent each end of the intermediate cylindrical surface of the supporting member, and having its outer edge disposed between the pairs of roller races in the corresponding cutter.

8. In a roller bit structure, a bit frame, a pair of arms detachably supported on the frame, a transverse support extending between the arms and supported solely thereby, and a pair of coaxial roller cutter members journaled on said support, said pair of cutter members respectively extending from substantially the axis of rotation of the bit frame to substantially the supporting arms.

9. In a roller bit structure, a bit frame, a pair of arms detachably supported on the frame, a transverse support extending between the arms and supported solely thereby, a pair of coaxial roller cutter members on the support, and rolling bearings interposed between the cutters and the support, said pair of cutter members respectively extending from substantially the axis of rotation of the bit frame to substantially the supporting arms.

10. In a roller bit structure, a bit frame, a pair of arms supported on the frame, each of said arms having an inwardly extending apertured boss having an axis radial to the axis of the frame, said apertures being in alinement, a supporting member transverse to the frame axis and supported in said apertures, said supporting member having a surface intermediate the bosses and forming an inner roller bearing race, a plurality of roller cutters between the arms, said cutters having internal surfaces forming outer roller bearing races, and rolling bearing members between the cutters and the bosses, as well as between the cutters and the intermediate surface.

ROLAND R. CRUM.