

[54] **ROCK BIT WITH ONE PIECE BODY AND
DEPENDING ARMS**
[75] Inventor: **Robert William McQueen, Houston,
Tex.**

[73] Assignee: **Dresser Industries, Inc., Dallas, Tex.**

[22] Filed: **Sept. 21, 1973**

[21] Appl. No.: **399,579**

[52] U.S. Cl. **175/228, 175/339, 175/356,
175/375**

[51] Int. Cl. **E21b 9/10**

[58] Field of Search **175/227-229,
175/337, 339, 340, 342, 356-359, 366-368,
371, 372, 375**

References Cited

UNITED STATES PATENTS

1,708,288	4/1929	Wadsworth.....	175/227 X
1,762,504	6/1930	Bull.....	175/340 X
1,764,854	6/1930	Reed.....	175/227
1,992,992	3/1935	Collins.....	175/366 X

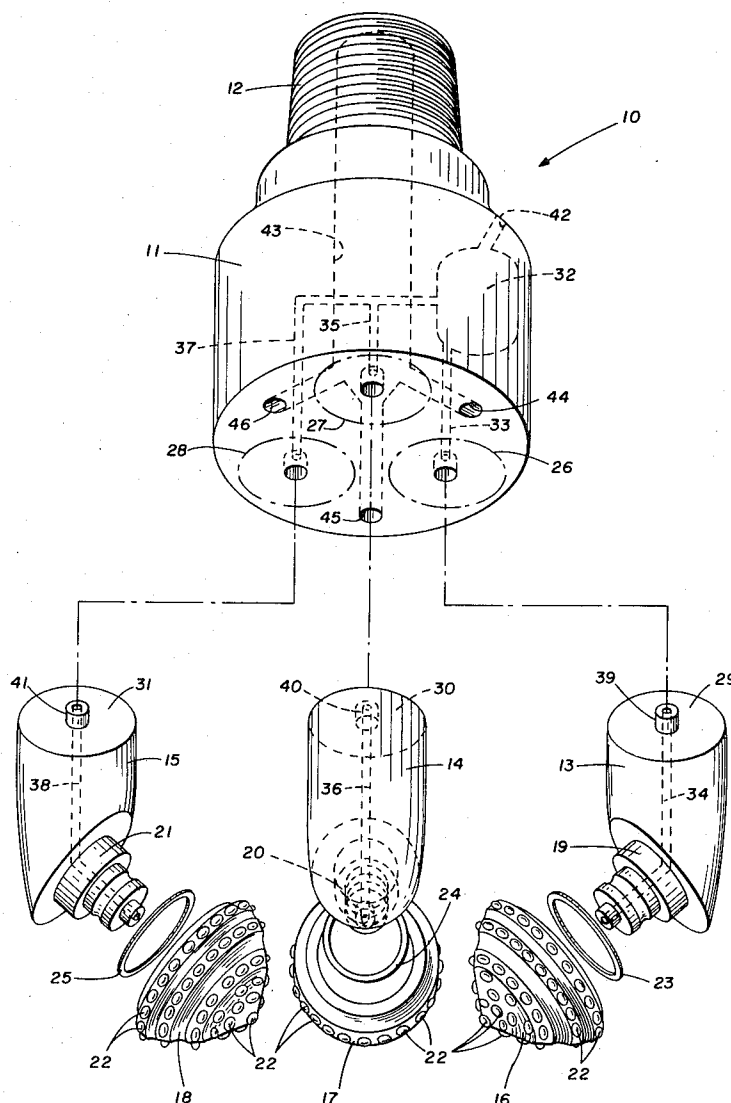
2,076,845	4/1937	Howard et al.	175/340
2,526,838	10/1950	Akeyson	175/339
2,648,526	8/1953	Lanchester	175/340
3,784,264	1/1974	Jackson	175/227 X

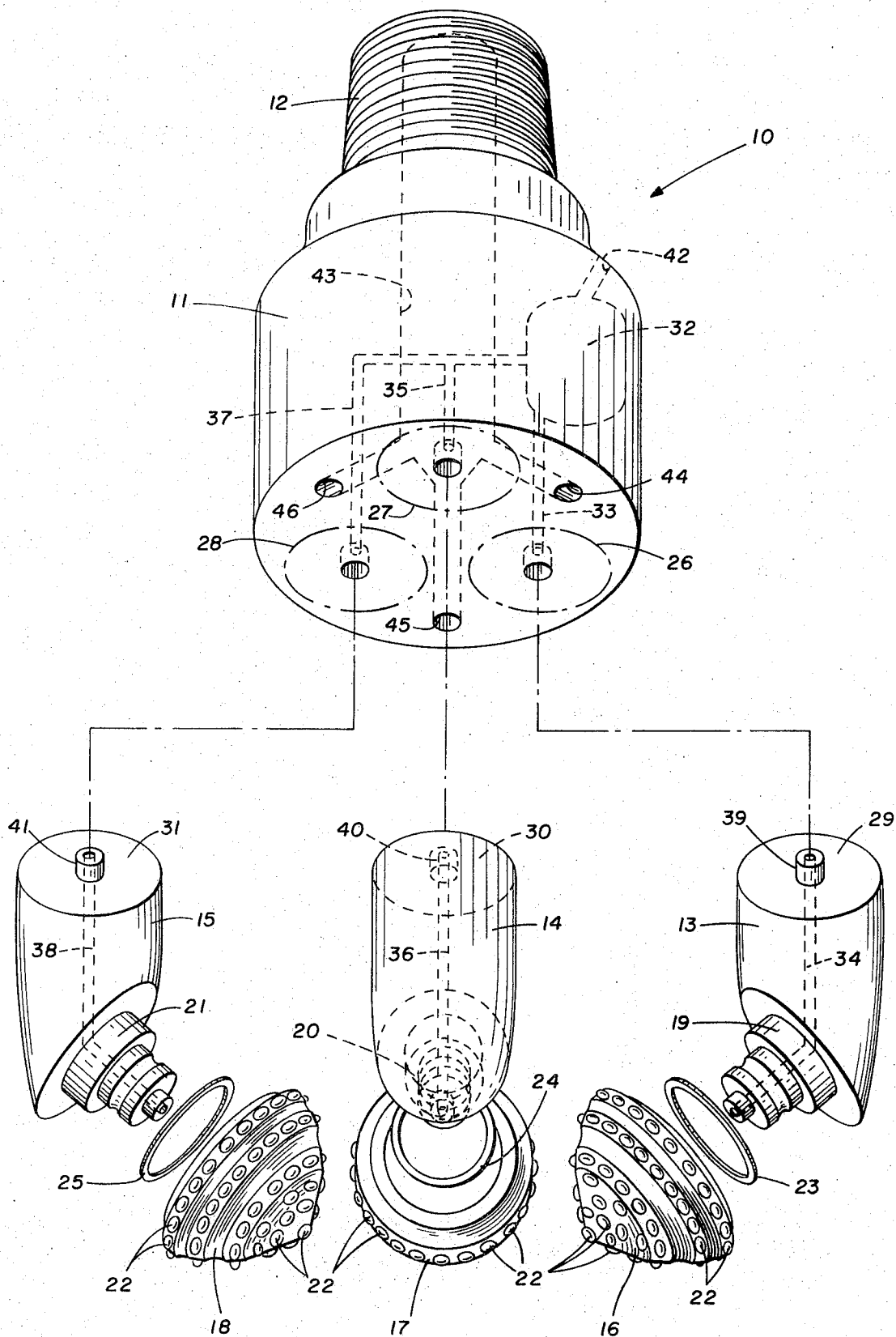
Primary Examiner—David H. Brown
Attorney, Agent, or Firm—Eddie E. Scott

[57] ABSTRACT

A rotary rock bit is formed from a multiplicity of individual segments. At least one depending arm body is positioned in abutting relationship to a one piece bit body and welded thereto. A rotatable cutter is mounted upon the arm body and bearings are provided between the arm body and the cutter. A lubricant reservoir in the one piece body contains lubricant that is applied to the bearings between the cutter and the bearing pin. Passages extend from the lubricant reservoir through the arm body to the bearing area. A drilling fluid passage extends through the one piece body to allow a drilling fluid to be circulated through the bit during the drilling operation.

5 Claims, 1 Drawing Figure





ROCK BIT WITH ONE PIECE BODY AND DEPENDING ARMS

BACKGROUND OF THE INVENTION

The present invention relates to the art of earth boring and more particularly to a rock bit having a one piece body and at least one depending arm body.

Rotary rock bits are conventionally constructed in a multiplicity of sections. The sections are positioned together longitudinally with a weld groove between sections. The sections are welded together by filling the longitudinal weld groove with a weld deposit. The longitudinal welds have developed holes in the prior art rock bits because they develop leaks which wash holes in the bit body during the drilling operation. Drilling fluid is transmitted through a central passage in the prior art rock bit body and the uneven connections between the segments results in erosion of the rock bit body.

Problems have been encountered with prior art systems for supplying lubricant to the bearings between the bearing pins and the cutters because of the relatively long life time of modern bits and the limited amount of space available for storing the lubricant that will be supplied to the bearings. The prior art rotary rock bits have included a lubricant reservoir in each of the arms. If a seal between one of the cutters and the bearing pin upon which it is mounted allows lubricant to escape, the supply of lubricant in the small reservoir in the arm is soon exhausted and the bearing fails.

DESCRIPTION OF PRIOR ART

In U.S. Pat. No. 2,807,444 to W. H. Reifschneider, patented Sept. 24, 1957, a rotary earth boring drill is shown in which the bit head is formed of a plurality of arcuate segments, each of said segments being asymmetric and comprising a body portion having a downwardly extending leg and a downwardly extending hollow boss in side-by-side relation thereon, there being a passage communicating between the interior of the bit head and the bores of the bosses.

In U.S. Pat. No. 2,831,661 to G. R. Brown, patented Apr. 22, 1958, a drill bit consisting of three segmental elements which are adapted to fit together to constitute a bit is shown. After forging, the segmental elements are machined to afford accurately meeting surfaces when the elements are assembled together. The margins, which represent the meeting of the segments, are given a chamfer for providing a weld groove. The three segmental elements are assembled in a jig and welding is carried out along the groove.

In U.S. Pat. No. 3,424,258 to Yoshihiro Nakayama patented Jan. 28, 1969, a rotary bit for use in rotary drilling is shown. The bit disclosed comprises a plurality of spaced-cutting edges formed in a plurality of parallel rows on a semi-spherical convex rotary member rotatably mounted on an inclined supporting shaft provided within the body of said rotary drill equipped with scraping members on the lower end of the leg of said body for producing a raised core of rock for being cut by said cutting edges, said rows being disposed perpendicular to the same diameter of said convex rotary member, each cutting edge of one row being disposed substantially parallel to the adjacent edges of the adjacent rows.

SUMMARY OF THE INVENTION

The present invention provides a rotary rock bit having a one piece body and at least one arm body connected to said one piece body with a cutter rotatably mounted upon a bearing pin extending from said arm body. This allows a smooth bore to be provided in the one piece body and reduces erosion normally created during the passage of drilling fluid through the bit body. The bit body does not contain the conventional longitudinal welds between separate segments found in the prior art bits. A relatively large lubricant reservoir is provided in the one piece body for supplying lubricant to the bearings between the cutter and the bearing pin. Economies and efficiencies may be obtained in the manufacture of the bit of the present invention and the bit will operate for an extended period of time before the bearing fails because of lack of lubricant. The above and other features and advantages of the present invention will become apparent from a consideration of the following detailed description of the invention when taken in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The single FIGURE illustrates an embodiment of a rotary rock bit constructed in accordance with the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings, a rotary rock bit generally designated by the reference number 10 is shown. The rotary rock bit consists of a one piece bit body 11 adapted to be connected to a rotary drill string (not shown) by a threaded connection 12. The bit body 11 may be made from barstock rather than by forging. This results in a simpler manufacturing operation and a better bit.

Three individual depending arm bodies 13, 14, and 15 are adapted to be affixed to the one piece bit body 11. Rotatable cone cutters 16, 17, and 18 are rotatably mounted upon bearing pins 19, 20, and 21 extending from the arm bodies 13, 14, and 15. Each of the cutters 16, 17, and 18 includes a multiplicity of tungsten carbide inserts 22 for contacting and disintegrating the formations as the bit 10 is rotated and moved through the formations. Flexible seals 23, 24, and 25 are positioned between the arm bodies 13, 14, and 15 and the cone cutters 16, 17, and 18.

The bit body 11 includes three individual parting faces 26, 27, and 28 that are adapted to mate with parting faces 29, 30 and 31 on the arm bodies 13, 14, and 15. Parting faces 29, 30, and 31 are positioned in abutting relationship to the parting faces 26, 27, and 28 on the bit body 11 and the arm bodies 13, 14, and 15 are welded to the bit body 11.

In order to insure continued rotation of the cutters 16, 17, and 18, lubricant is provided to the area between the cutters 16, 17, and 18 and the bearing pins 19, 20, and 21. A source of lubricant is provided in a common lubricant reservoir 32 positioned in the one piece body 11. Passage means are provided to transmit lubricant from the lubricant reservoir to the area between the cutters 16, 17, and 18 and the bearing pins 19, 20, and 21. The passage means includes individual passages 33 and 34 that provide a conduit from the lubricant reservoir 32 to the area between cutter 16 and bearing pin 19. Individual passages 35 and 36 provide

3

a conduit from the lubricant reservoir 32 to the area between cutter 17 and bearing pin 20 and individual passages 37 and 38 provide a conduit from the lubricant reservoir 32 to the area between cutter 18 and bearing pin 21. Hollow aligning pins 39, 40, and 41 project from arm bodies 13, 14, and 15. The hollow aligning pins are adapted to fit within the passages 33, 35, and 37 respectively. Lubricant may be added to the lubricant reservoir 32 through a passage 42 and the lubricant reservoir 32 may contain means for forcing the lubricant through the passages to the bearing area. For example, the lubricant reservoir 32 may contain a lubricant pump.

During the drilling operation, drilling fluid is circulated through the bit 10 to the bottom of the well bore and returned to the surface in the annulus between the drill string and the wall of the borehole (not shown). The drilling fluid enters a passage 43 in the bit body 11 and exits through three nozzles 44, 45, and 46 connected to the passage 43. The passages 43, 44, 45, and 46 are all entirely within the bit body 11.

The arm bodies 13, 14, and 15 are positioned so that parting faces 29, 30, and 31 are in abutting relationship to parting faces 26, 27, and 28 on the bit body 11. The hollow aligning pins 39, 40, and 41 project into the passages 33, 35, and 37 respectively. The cutters 16, 17, and 18 are aligned in the proper position for the final assembled bit. The arm bodies 13, 14, and 15 are welded to the bit body 11. A beam of high velocity electrons is used to fuse the arm bodies 13, 14, and 15 to the bit body 11. The beam of high velocity electrons is caused to move in the plane of the abutting parting faces 26, 27, 28, 29, 30, and 31 by relative movement between the electron beam and the bit 10. Because of the high intensity of the electron beam (10 KW/mm²) and its high power capacity (60 KW) the arm bodies 13, 14, and 15 are fused to the bit body 11 throughout substantially all of the parting faces 26, 27, 28, 29, 30, and 31. The bit 10 does not have the longitudinal weld seams found in the prior art rock bits. The drilling fluid passages 43, 44, 45, and 46 are smooth bores and do not contain the uneven connections between separate segments found in the prior art rock bits. The bit 10 will therefore not develop leaks and wash holes in the bit body. A much larger lubricant reservoir is provided in the bit 10 than was found in the prior art rock bits. The larger reservoir contains a greater volume of lubricant and the useful lifetime of bit 10 is extended.

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

4

1. A rotary rock bit, comprising:

a main body having a single main body parting face, said main body parting face having a planar main body surface;

at least one arm body having an arm body parting face, said arm body parting face having a planar arm body surface with said arm body parting face in abutting relationship with said main body parting face; and

a cutter rotatably mounted upon said arm body.

2. The rotary rock bit of claim 1 including bearing means between said cutter and said arm body, lubricant supply means in said main body for supplying lubricant to said bearing means and passage means in said arm body for transmitting lubricant from said lubricant supply means to said bearing means.

3. The rotary rock bit of claim 2 wherein said lubricant supply means is a lubricant reservoir.

4. A rotary rock bit, comprising:

a main body including a single horizontally extending parting face, said parting face having a horizontal planar surface;

at least one arm body including a horizontally extending arm body parting face, said arm body parting face having a horizontal planar surface with said arm body parting face in abutment with said at least one main body parting face;

means for connecting said at least arm body to said main body;

at least one cutter rotatably mounted upon said arm body;

bearing means between said cutter and said arm body;

seal means between said cutter and said arm body; lubricant source means in said main body for supplying lubricant to said bearing means;

lubricant passage means extending through said arm body for channeling lubricant from lubricant source means to said bearing means;

drilling fluid passage means extending through said main body;

an aligning pin projecting from said arm body into said drilling fluid passage means with said aligning pin having a passage therethrough connecting said lubricant passage means and said drilling fluid passage means; and

a connection on said main body.

5. The rotary rock bit of claim 4 wherein said lubricant source means is a lubricant reservoir.

* * * * *

55

60

65