United States Patent [19]

Stanley

[11] **3,866,698**

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[54] **RAISE DRILLING BIT**

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[73] Assignee: **Reed Tool Company,** Houston, Tex.

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[52] **U.S. Cl.** **175/53,** 175/61

[51] **Int. Cl.** **E21c 23/00**

[58] **Field of Search** 175/53, 61, 74, 263

[56] **References Cited**

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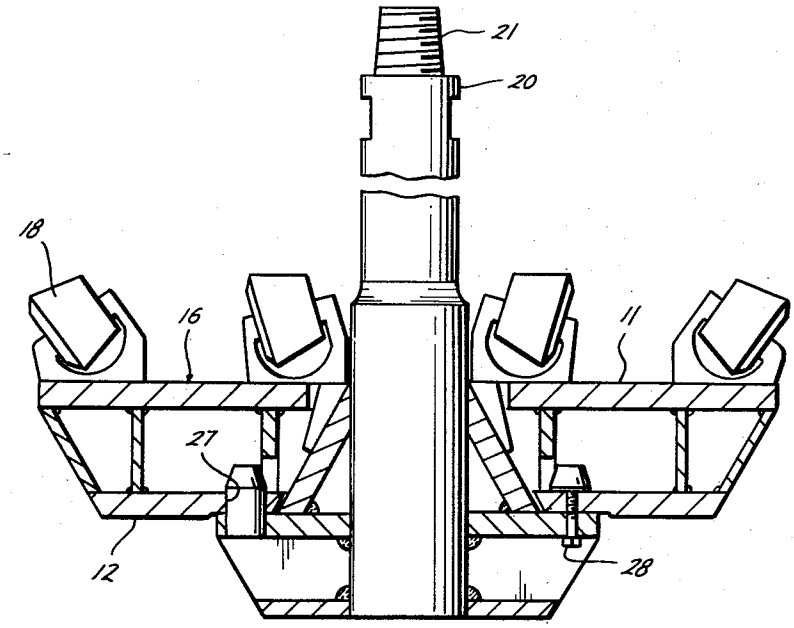
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Assistant Examiner—Richard E. Favreau
Attorney, Agent, or Firm—C. M. Kucera

[57] **ABSTRACT**

A rotary drill bit for producing a raise bore about a pilot hole including a drill head having an upper surface for mounting cutter assemblies. A lower surface spaced from said upper surface and having a drive stem attached thereto. The drive stem being adapted for limited or floating movement with respect to said upper mounting surface.

10 Claims, 5 Drawing Figures



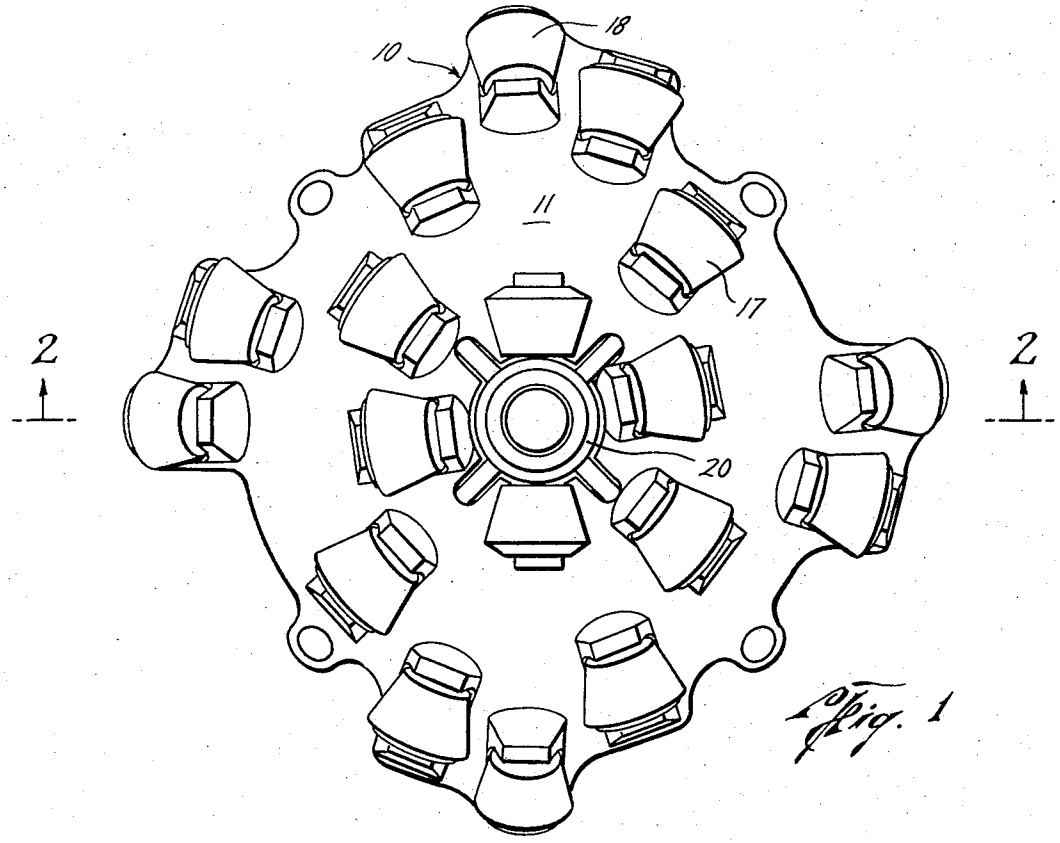


Fig. 1

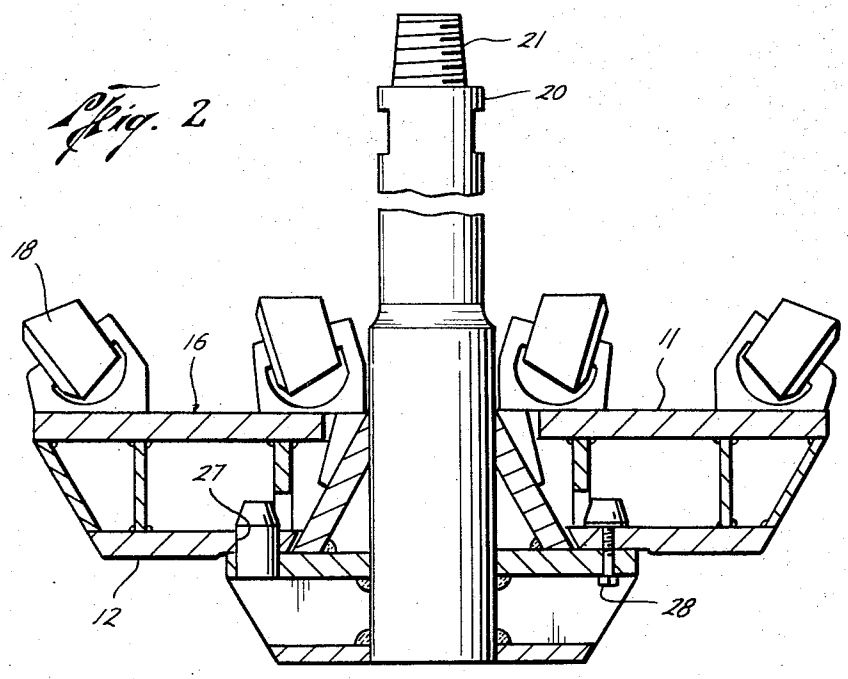


Fig. 2

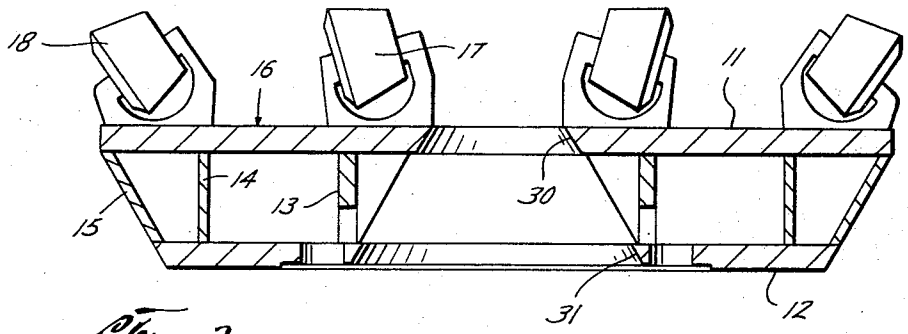


Fig. 3

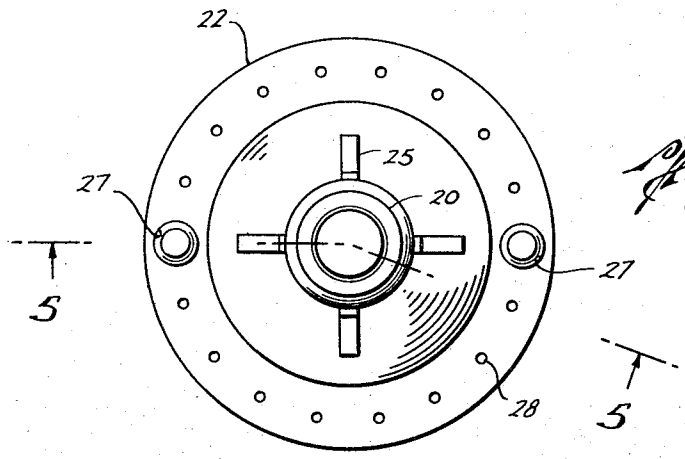


Fig. 4

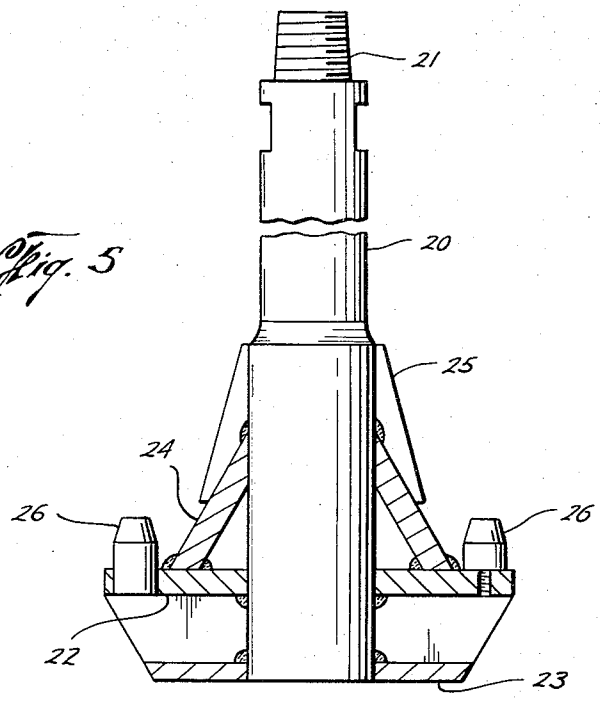


Fig. 5

RAISE DRILLING BIT

BACKGROUND

The present invention relates to earth boring rotary drill bits, and particularly to drill bits for the drilling of raises extending from mine galleries or shafts at one level to galleries or shafts at other levels. Raise drilling comprises the drilling of a relatively small diameter pilot hole followed by enlargement of the hole to a predetermined raise diameter by rotating and raising the drill along the pilot hole to form a raise bore between a lower level and an upper level, the drill being rotated from above by a drill stem and guided by the pilot hole. The cuttings produced during such drilling operation are allowed to fall to the lower level.

Raise bores are usually 36 inches in diameter or more and the pilot hole may have a diameter of 9 to 15 inches. Such drill may weigh 5,000 pounds or more. As the raise drilling operation is commenced by rotation of the drill stem by a drilling rig, the bit may be rotated approximately 10 to 40 R.P.M. while the rig exerts an upward pull on the bit of approximately 150,000 to 950,000 pounds. As drilling progresses, sections of the drill stem, which may comprise cylindrical or tubular members approximately 5 feet long, are progressively uncoupled at the upper level and the raise is completed by rotating and lifting the drill stem and the raise drill.

It will be appreciated that such drill bits, drill stems and the drive connections to the drill bits are subjected to severe wear and stresses whereby the cutters may have to be replaced, and at times the drive connection to the drill bit may fail, usually in fatigue. Thus it is desirable that the components may be readily replaceable for relative ease in handling in close places where otherwise the entire bit may be difficult to maneuver or transport.

SUMMARY

The present invention provides a new and improved raise drill bit wherein the components may be readily replaced.

An object of the invention is to provide a new and improved drive stem arrangement for a raise drill.

Another object is to provide a drive stem attachment for a raise drill which is adapted to minimize stress risers to alleviate fatigue failures of the drive stem.

Another object is to provide a new and improved raise drill which is economical to manufacture and efficient in operation.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of the raise drill.

FIG. 2 is a view taken along line 2 — 2 in FIG. 1.

FIG. 3 is a view similar to FIG. 2 but with the drive stem removed.

FIG. 4 is a plan view of the drive stem driving means.

FIG. 5 is a view taken along line 5 — 5 in FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As shown in the drawings, the raise drill **10** includes an upper mounting member **11** and a lower attachment member **12.** Circular plates **13** and **14** and outer plate **15** may be secured as by welding to members **11** and **12** to form a drill head **16.** Roller cutter assemblies **17** and **18** may be secured to mounting member **11** by welding or in any other suitable manner. The roller cutter assemblies may be of a type which is well known in the industry and may comprise a style of roller cutter assembly similar to that shown in U.S. Pat. No. 3,385,385, issued May 28, 1968 to C. M. Kucera, et al.

Referring to FIGS. **2** and **5,** a drive stem **20** is shown having a threaded connection **21** adapted to be attached to the lower end of a drill stem (not shown). The drive stem **20** may have upper and lower flanges **22** and **23** secured thereto by welding or otherwise. Support **24** may be secured to the flange **22** and driver stem **20** and gussets **25** may be secured between support **24** and driver stem **20** to reinforce the connection between the driver stem **20** and the flange **22.** The flange **22** may have driving pins **26** adapted to fit into openings **27** in the lower attachment member **12** to provide means for rotatably driving the drill head **16** with the driver stem **20.** Cap screws **28** secure the flange **22** to member **12** of the drill head **16.**

Referring to FIG. **3,** the members **11** and **12** have openings **30** and **31** therethrough to accommodate the driver stem **20,** support **24** and gussets **25.** The opening **30** is such that there is a clearance between the driver stem **20** and the upper mounting member **11** to provide limited or floating movement of the driver stem **20** with respect to the upper mounting member **11.** This arrangement provides some flexibility of the stem **20** with respect to the drill head **16** and reduces stress concentrations in the driver stem **20** in the vicinity of the upper member **11** on which the cutter assemblies **17** and **18** are mounted.

The design of the present invention does not require mating tapered surfaces or exacting tolerances between the drive stem **20** and the drill head **16,** yet provides a rugged drill bit which is easily assembled or disassembled by means of the cap screws **28,** when replacement parts are required.

The provision of a raise drill bit having an upper surface for the mounting of roller cutter assemblies thereon, and having a lower surface, spaced from said upper surface, to accommodate a driving connection to the driver stem whereby the driver stem may float relative to the upper mounting surface, which has severe and irregular stresses imposed upon such surface by the cutter assemblies, results in a drilling bit which is less susceptible to fatigue failures, especially of the driver stem, during drilling operations.

The foregoing disclosure and description of the invention are illustrative and explanatory thereof, and various changes in the size, shape and materials as well as in the details of the illustrated construction, may be made within the scope of the appended claims without departing from the spirit of the invention.

What is claimed is:

1. A rotary drill bit for producing a raise bore by disintegrating the earth formation surrounding a pilot hole comprising:

a drill head having an upper mounting member and an attachment portion,

a plurality of cutters secured to said upper mounting member,

a drive stem,

said drive stem being fastened to said attachment portion and extending through said upper mounting member without force transmitting contact therewith thereby to be floating with respect to said upper mounting member.

2. A drill bit according to claim 1 wherein the upper mounting member is spaced from said attachment portion.

3. A drill bit according to claim 1 wherein the cutters are arranged to drill the raise bore in a single stage about the pilot hole.

4. A drill bit according to claim 1 wherein the cutters include rolling cutters.

5. In a rotary drill bit for producing raise bores by enlarging a pilot hole,

a drill head having an upper portion adapted to have secured thereon a plurality of cutters, and an attachment means,

a drive stem,

said drive stem being fastened to said attachment portion and extending through said upper mounting member without force transmitting contact therewith, thereby to be floating with respect to said upper portion.

6. A drill head according to claim 5 wherein said drive stem attachment means is spaced from said upper portion.

7. A drill head according to claim 5 wherein the cutters include rolling cutters.

8. A drill head according to claim 5 wherein the drive

stem is removably fastened to said attachment means.

9. A rotary drill bit for producing a raise bore by disintegrating the earth formation surrounding a pilot hole comprising:

a drill head having an upper mounting member and an attachment portion,

a plurality of cutters secured to said upper mounting member,

a drive stem,

said drive stem being fastened to said attachment portion and extending with clearance through said upper mounting member for limited floating movement with respect to said upper mounting member.

10. In a rotary drill bit for producing raise bores by enlarging a pilot hole,

a drill head having an upper portion adapted to have secured thereon a plurality of cutters, and an attachment means,

a drive stem,

said drive stem being fastened to said attachment means and extending with clearance through said upper portion for limited floating movement with respect to said upper portion.

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