

[54] **DRILL BOOM**

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[58] Field of Search **248/2, 16; 173/38, 43**

[56] **References Cited**

UNITED STATES PATENTS

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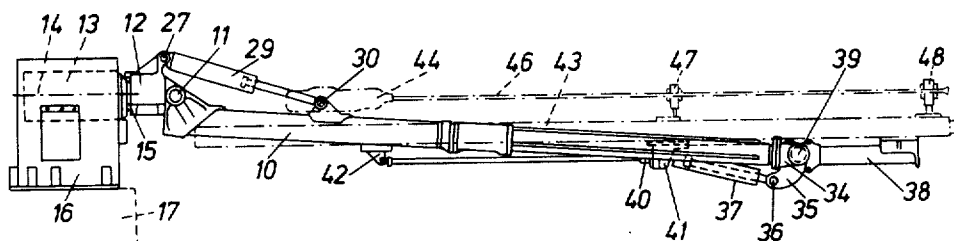
Primary Examiner—J. Franklin Foss

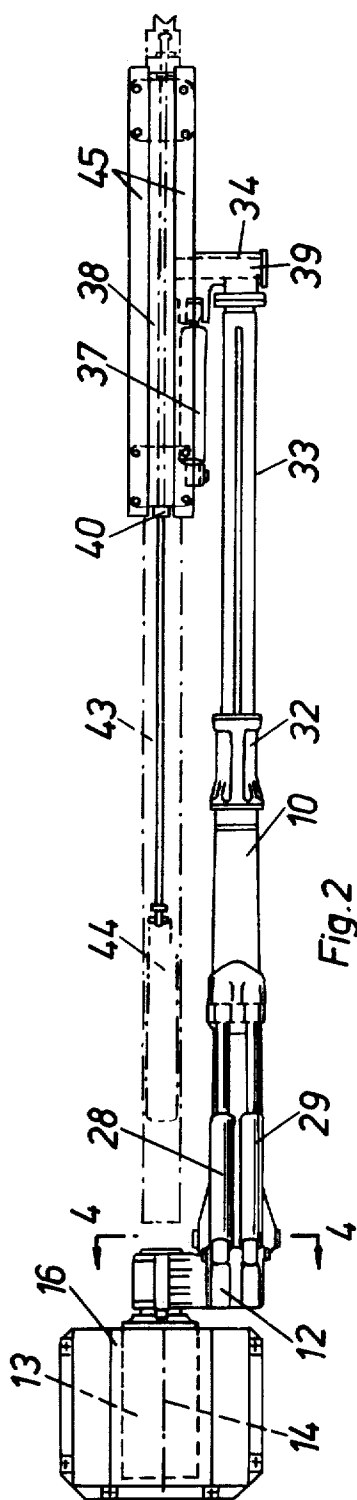
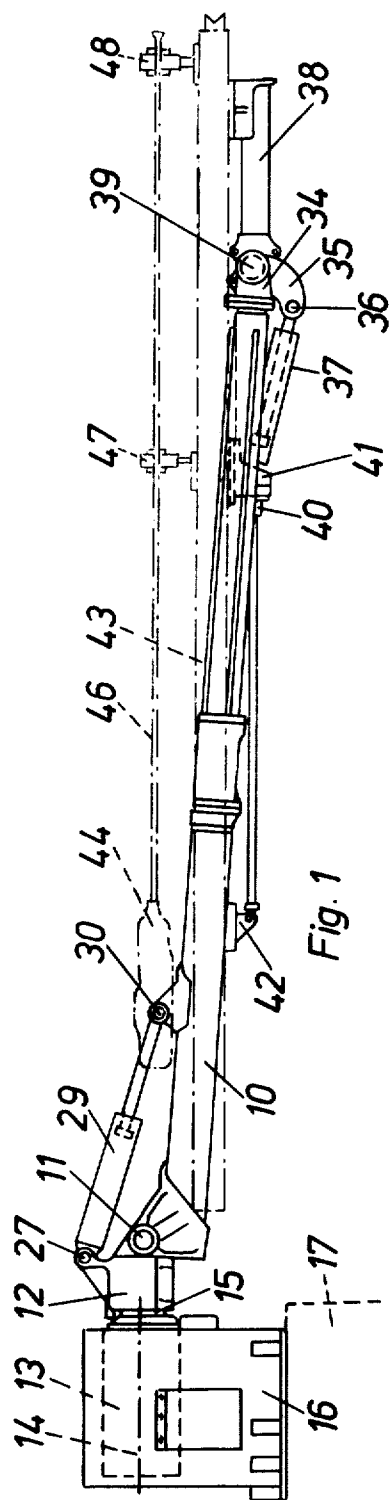
Attorney, Agent, or Firm—Flynn & Frishauf

[57] **ABSTRACT**

A rock drilling apparatus is positioned to different drilling positions with respect to a support by a drill boom. The drill boom is pivoted on cross shafts respectively to a boom bracket and a boom head carrying the rock drilling apparatus. The boom bracket is furthermore rotatably journaled on the support around a polar axis, which is disposed in a pivotal plane for the rock drilling apparatus normal to the cross shafts. The boom bracket supports the cross shafts and the drill boom in laterally spaced relation to the pivotal plane while the boom head carries the rock drilling apparatus pivotally in said plane with a free motion clearance relative to the drill boom.

10 Claims, 4 Drawing Figures





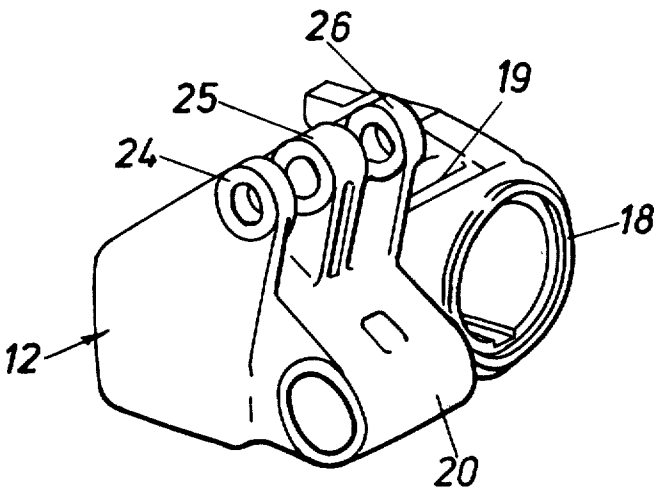


Fig. 3

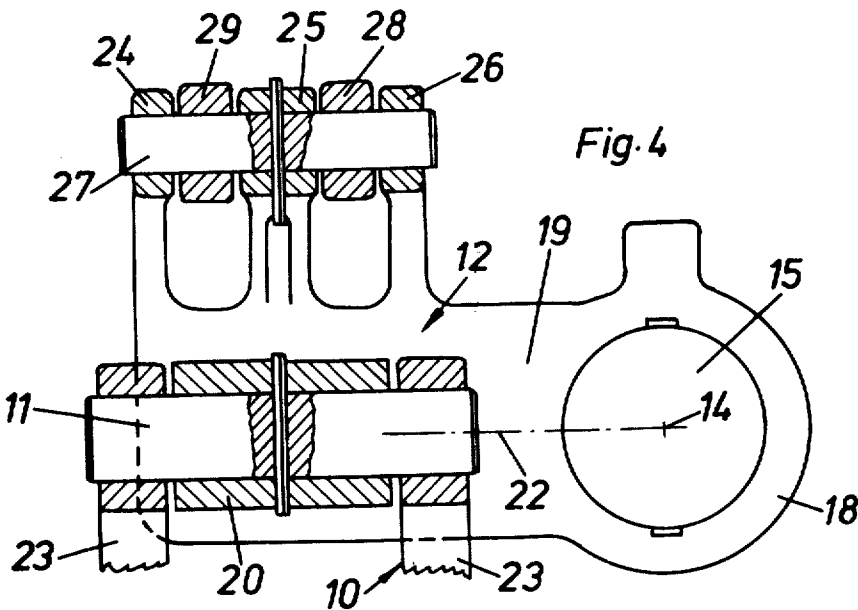


Fig. 4

DRILL BOOM

The invention relates generally to drill booms for rock drilling apparatus and more particularly to a drill boom arrangement for positioning an elongated rock drilling apparatus to different drilling positions with respect to a support of the type incorporating a drill boom pivoted on cross shafts respectively to a boom bracket and a boom head which carries said rock drilling apparatus, the boom bracket being rotatably journaled on the support around a polar axis, which is disposed in a pivotal plane for the rock drilling apparatus normal to the cross shafts, hydraulic cylinder means being pivotally connected between said boom bracket and said drill boom for positioning said rock drilling apparatus.

In the application of such rotatable drill booms it is important during positioning of the rock drilling apparatus that no dead zones will be obtained at the working face, wherein one would be hindered from drilling. In order to get the rock drilling apparatus in alignment with the polar axis or as closed to said axis as possible, the journalling means of the drill boom according to prior applications have been displaced radially within the pivotal plane relative to the polar axis.

A drill boom of the abovementioned type is disclosed in U.S. Pat. No. 3,476,193. A disadvantage with hitherto presented constructions of this type is that the hydraulic cylinder means will project at the boom bracket and will, when such drill booms are mounted in a group, cause a big mounting place. Efforts have been made to keep down the requirement for space at the boom bracket by designing the drill boom as a framework boom with two parallel side elements between which room has been left for the rear part of the rock drilling apparatus to enable lowering thereof in relation to the polar axis. This type of boom, however, does not eliminate the occurrence of dead zones, its design becomes heavy and unsuitable in practice when making the drill boom contractible or extensible.

It is an object of the invention to provide a drill boom of the above type, which with a lighter construction combines less need for room at the boom bracket when the booms are mounted in groups. Another object of the invention is to provide a drill boom which during positioning has no dead zones and by which the rock drilling apparatus when so needed even can be lowered under the level of the polar axis. A further object of the invention is to provide a construction which must make possible efficient contraction or extension of the drill boom so that a greater reach, a more stable transport position and a possibility to drill a succession of consecutive parallel roof holes from the same mounting position of the rotary boom will be obtained.

SUMMARY OF THE INVENTION

According to one aspect of the invention there is provided a drill boom arrangement for positioning an elongated rock drilling apparatus to different drilling positions with respect to a support comprising in combination therewith a boom bracket, a base shaft on said bracket for rotatable journalling thereof on said support about a polar axis, a first cross shaft on said bracket, a drill boom pivoted at the rear end thereof on said first cross shaft in a plane parallel with but spaced laterally from said polar axis, a second cross shaft at the forward end of said drill boom, a boom head supported on said second cross shaft for carrying said rock drilling

apparatus with a free motion clearance relative to said drill boom pivotally in a plane normal to said cross shafts and passing through said polar axis, hydraulic cylinder means pivotally connected on the one hand to said drill boom and on the other respectively to said boom head and to said bracket for pivoting respectively said boom head and boom, and power means for rotating said base shaft.

According to another aspect of the invention there is provided an improved boom bracket for supporting a drill boom pivotally with respect thereto and of the type wherein the bracket includes a first shaft rotatably journaled on a support including means for power rotation of said shaft about a polar axis and the drill boom carries a rock drilling apparatus thereon pivotally in a first plane passing through said polar axis, and wherein the improvement comprises an arm on said bracket transversely directed in relation to said first plane, a bore in said arm laterally spaced in relation to said first plane and with its geometrical axis perpendicular thereto, a second shaft rotatably journaled in said bore and connected to said drill boom, a third shaft on said arm laterally spaced in relation to said first plane and parallel with said second shaft, and power means pivotally connected between said third shaft and said drill boom for pivoting said drill boom in a second plane parallel with but in laterally spaced relation to said first plane.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other purposes of the invention will become obvious from the following description and from the accompanying drawings in which one embodiment of the invention is illustrated by way of example. It should be understood that this embodiment is only illustrative of the invention and that various modifications thereof may be made within the scope of the claims following hereinafter. In the drawings,

FIG. 1, shows a side view of a drill boom according to the invention.

FIG. 2 is a top view of the drill boom in FIG. 1.

FIG. 3 is an enlarged perspective view of the boom bracket of the drill boom.

FIG. 4 is an enlarged view partly in section on the line 4—4 in FIG. 2.

DETAILED DESCRIPTION OF ILLUSTRATED EMBODIMENT

In FIGS. 1, 2 a drill boom 10 is pivotally supported on a cross shaft 11 which is supported by a boom bracket 12. By means of a schematically indicated turning means 13, for instance of the general type shown in U.S. Pat. No. 3,476,193 in a variety being built-in in the drill boom, the boom bracket 12 is turnable 360° around a geometrical polar axis 14 which passes the center line of a shaft 15 incorporated in the turning means 13. The boom bracket 12 is non-turnably attached to the shaft 15. The turning means 13 is mounted in a housing 16 which is supported by an element 17. The latter forms part of a drill wagon or rig, not shown, on which several drill booms 10 can be mounted in a group.

The boom bracket 12, FIGS. 3, 4 provided with a bearing sleeve 18 which by wedge-means is secured to the shaft 15. From the bearing sleeve 18 an arm 19 extends transversely or radially and is provided with a bearing sleeve 20 for the cross shaft 11. The geometri-

cal axis 22 of the cross shaft 11 intersects or crosses the polar axis 14 at right angles. Preferably the axis 22 is in alignment with the polar axis 14. At its ends the cross shaft 11 pivotally supports journalling lugs 23, which project upwardly from the rear end of the drill boom 10. Journalling lugs 24, 25, 26 projecting from the transverse arm 19 support a shaft 27 parallel with the cross shaft 11. The shaft 27 forms a pivotal connection for a hydraulic elevating cylinder 28 and a hydraulic pilot cylinder 29, which both with the ends of their piston rods are pivotally attached to a shaft 30 on the drill boom 10. The cylinders 28, 29 are of equal size and mounted parallel to each other in order to get a more compact construction at the boom bracket.

The drill boom 10 supports at its outer end a journal bearing 32 in which a boom extension member 33 is carried axially slidably but non-rotatably. The boom extension member 33 is longitudinally adjustable relative to the drill boom 10 by means of a hydraulic cylinder mounted in conventional manner within the drill boom. The distal end 34 of the boom extension member 33 is provided with journalling lugs 35. The distal end 34 carries a boom head designed as a feed holder 38. The feed holder 38 carries a rock drilling apparatus which includes a feed bar 43 supporting in conventional manner a rock drilling machine 44 fed to and fro therealong by motor power. A hydraulic tilt cylinder 37 is pivotally connected to a shaft 36 in said journalling lugs. The tilt cylinder 37 is pivotally connected to a shaft 41 on the feed holder 38 which by means of a cross shaft 39 is turnably journaled in the distal end 34. The tilt cylinder 37 is of equal size as the cylinders 28, 29, and is also given the same mounting geometry as that of the cylinders 28, 29. In doing that there is provided a hydraulic linking for purpose of automatic parallel displacement of the rock drilling apparatus. By making all the cylinders 28, 29, 37 of equal size the handling with the cylinders is also facilitated. The cross shaft 39 is parallel with the cross shaft 11 of the boom bracket 12 which pivotally carries the drill boom 10.

A hydraulic cylinder 40 for displacing the feed bar is fixed to the feed holder 38 and furthermore fixed to a bracket 42 which in its turn is fixed in the feed bar 43. The rock drilling machine 44 rotates and delivers impacts against a drill steel 46 which is guided by means of drill steel centralizers 47, 48 arranged on the feed bar. The feed bar 43 is supported slidably in the longitudinal direction thereof on the feed holder 38 by means of guides 45 fixed thereon. By extension or contraction of the hydraulic cylinder 40 the feed bar 43 can be adjusted longitudinally with respect to the drill boom 10.

By actuating the hydraulic cylinder means 28, 29 and the hydraulic tilt cylinder 37 the drill boom 10 and the feed bar 43 are adjusted angularly. During adjustment the feed bar will move in a pivotal plane extending through the polar axis 14. By actuation of the turning means 13 this plane can be turned around the polar axis 14. As is evident from FIG. 2 the feed bar 43 during pivoting thereof by means of the hydraulic cylinders 28, 29 and 37 has a free motion clearance with respect to the drill boom 10 and the rock drilling machine 44 can unimpededly be lowered to alignment with or under the polar axis 14, FIG. 1. As the pivotal plane of the feed bar 43 by means of the turning means 13 can be turned 360° all dead zones in connection with hole drilling in a forward direction are eliminated.

By means of the hydraulic cylinder mounted inside the drill boom 10 said drill boom can be shortened to a stable transport position or, if the feed bar 43 is put vertically, roof holes can be drilled as the boom extension member 33 of the drill boom 10 is shortened stepwise. By means of the hydraulic feed displacing cylinder 40 the variation in length of the drill boom 10, 33 is in its entirely compensated so that a free motion clearance between the rear end of the feed bar 43 and the boom bracket 12 always can be safeguarded. What I claim is:

1. A drill boom arrangement for positioning an elongated rock drilling apparatus to different drilling positions with respect to a support comprising in combination therewith a boom bracket, a base shaft on said bracket for rotatable journalling thereof on said support about a polar axis, a first cross shaft on said bracket, a drill boom pivoted at the rear end thereof on said first cross shaft in a plane parallel with but spaced laterally from said polar axis, a second cross shaft at the forward end of said drill boom, a boom head supported on said second cross shaft for carrying said rock drilling apparatus with a free motion clearance relative to said drill boom pivotally in a plane normal to said cross shafts and passing through said polar axis, hydraulic cylinder means pivotally connected to said drill boom and further pivotally connected respectively to said boom head and to said bracket for pivoting respectively said boom head and boom, and power means for rotating said base shaft.

2. A drill boom arrangement according to claim 1 in which said hydraulic cylinder means connected between said drill boom and said boom bracket comprises a pair of adjacent cylinders of substantially equal size.

3. A drill boom arrangement according to claim 2 in which said hydraulic cylinder means connected between said drill boom and said boom head comprises a third cylinder of substantially equal size with each cylinder of said pair of cylinders.

4. A drill boom arrangement according to claim 1 in which said bracket is provided with an arm transversely directed in relation to said normal plane for carrying said first cross shaft.

5. A drill boom arrangement according to claim 4 in which said first cross shaft is carried in coplanar alignment with said polar axis.

6. A drill boom arrangement according to claim 4 in which said bracket is further provided with pivot means parallel with said first cross shaft and laterally spaced in relation to said normal plane for the pivotal connection of said hydraulic cylinder means to said bracket.

7. A drill boom arrangement according to claim 1 in which means are incorporated in said drill boom for the contraction and extension thereof, and further including means for mounting said drilling apparatus in longitudinally movable relation on said boom head, and additional hydraulic cylinder means connected between said boom head and drilling apparatus for moving said drilling apparatus in the longitudinal direction thereof relative to said boom head to compensate contraction of said drill boom by a longitudinal extension of said drilling apparatus so as to safeguard a free motion clearance between the rear end of said drilling apparatus and said boom support.

8. An improved boom bracket for supporting a drill boom pivotally with respect thereto and of the type wherein the bracket includes a first shaft rotatably jour-

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nalled on a support including means for powered rotation of said shaft about a polar axis and the drill boom carries a rock drilling apparatus thereon pivotally in a first plane passing through said polar axis, the improvement comprising an arm on said bracket transversely directed in relation to said first plane, a bore in said arm laterally spaced in relation to said first plane and with its geometrical axis perpendicular thereto, a second shaft rotatably journaled in said bore and connected to said drill boom, a third shaft on said arm laterally spaced in relation to said first plane and parallel with said second shaft, and power means pivotally con-

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nected between said third shaft and said drill boom for pivoting said drill boom in a second plane parallel with but in laterally spaced relation to said first plane.

9. A boom bracket according to claim 8 in which there is provided a pair of adjacent hydraulic cylinders of substantially equal size connected between said third shaft and said drill boom.

10. A boom bracket according to claim 9 wherein said adjacent hydraulic cylinders are substantially parallel arranged with respect to each other, and are pivotally connected to said drill boom.

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