ABSTRACT: A drill rig is provided which comprises a foldable two-part boom structure mounted with one end at a mobile chassis for lateral and vertical swinging thereon. A feed bar for a rock drill is mounted at the outer end of the boom structure for universally pivoting thereon.
MOBILE ROCK DRILL RIG

This invention relates to mobile rock drill rigs which have power means for moving a drill into various operating positions. A general object of the invention is to provide a mobile drill rig of the character described which permits adjusting of the drill within an unusually wide range of horizontal, vertical and intermediate drilling positions. A more particular object of the invention is to provide a mobile drill rig which permits drilling of downward and upward directed parallel holes in front of and on either side of its mobile base. Another object of the invention is to provide a mobile drill rig which permits drilling of parallel forward directed holes on either side of its mobile base.

The above and other purposes are obvious from the following description and drawings in which an embodiment of the invention is illustrated by way of example.

In the drawings:

FIG. 1 is a side view in partly section on line 1-1 in FIG. 3 of a drill rig according to the invention;

FIG. 2 is a front end view of the drill rig in FIG. 1 with a rock drill, a supporting frame and a feed bar removed;

FIG. 3 is a top view of the drill rig of FIGS. 1-2 with also a boom structure removed;

FIGS. 3a and 36 shows a turn mechanism illustrated in FIG. 3 in two alternative positions.

FIG. 4 shows on a larger scale connecting parts between an outer boom and a feed bar of the drill rig of FIGS. 1-3; and

FIGS. 5-6 show the drill rig of FIGS. 1-3 in various drilling positions.

The drill rig in the figures includes two frames 10 provided with endless trackways 11. A transverse axle 12 spanning the space between the frames 10 is journaled to each frame by the end parts of the axle which thus can be considered as aligned trunnions. The axle and two platforms 13, 14 form a rigid chassis which is stabilized by two struts 15 at one end rigidly secured to one of the track frames 10 and at the other end journalized on the axle 12. On the chassis there are mounted auxiliary equipments (not shown) such as a hydraulic oil pump usually driven by a pneumatic motor, an oil tank, a water trap for the air supply line etc.

The chassis including the axle 12 is thus free to swing relative to each of the frames 10 and a stabilizing double-acting hydraulic cylinder 16 is mounted at each side to adjustably connect the axle 12 and the respective trackway frame. A valve unit (not shown) may interconnect corresponding ends of the two cylinders 16 by suitable conduits in a known manner thereby permitting oscillation of one track assembly relative to the other and relative to the chassis 12, 13, 14. The trackways are independently driven by air motors and gear boxes 17 suspended on each track frame.

A first head 19 is journaled on an upright pivot shaft 18 fixed to the chassis and may be rotated by means of a double-acting hydraulic cylinder 20 and a link mechanism 21, 22. The cylinder 20 is pivotally secured to the chassis and to a curved link 21, which at one end is pivotally journaled to a lug 23 on the chassis and at the other end is pivotally connected to another curved link 22. This link 22 is pivotally connected to a pair of lugs 22a on a head 19. FIGS. 3a and 3b shows the link system 21, 22 when it has turned the head 19 90° from its middle position shown in FIG. 3.

A first or inner boom 24 is pivotally mounted at the head 19 on a pivot 25 which is perpendicular to the pivot shaft 18, and a second or outer boom 26 is pivotally mounted on a pivot 27 at the outer end of the inner boom 24. The inner boom 24 of the boom structure 24, 26 is actuated by means of a double-acting hydraulic cylinder 28 pivotally mounted between the boom and the head 19 and the outer boom is actuated by means of a double-acting hydraulic cylinder 29 pivotally mounted between the outer boom 26 and the inner boom 24. In FIG. 2, the cylinder 29 is not illustrated due to the fact that the inner boom 24 is provided with a backplate 24a. At its free end, the outer boom 26 supports a second head 30 which is swingable on a pivot 31 which is a part of the head 30, by means of a double-acting hydraulic cylinder 34 and a link mechanism comprising links 32, 33. The link 33 is pivotally secured to the outer boom 26 at 33a and the link 32 to lugs 36 on the pivot 31 and to the link 33. A double-acting cylinder 34 is pivotally connected between the boom 26 and the link 33. This link system 32, 33 permits 180° rotation of the head relative to the outer boom 26 as is shown in FIG. 6.

The head 30 (FIG. 4) also comprises a sleeve 35 which is perpendicular to and fixedly united with the pivot 31. Inside the sleeve 35 are two bushings 37 in which a pivot or sub shaft 38 carrying a rectangular plate 39 is journaled. The shaft 38 is secured against axial movement by the plate 39 and by an end cover 40 clamped to the shaft by bolts. The plate 39 is united with a supporting frame 41 on which a feed bar 42, guided by guide members 44, is supported and longitudinally slidable. A link mechanism of the character described is also used for rotating the sub shaft 38 and thus the feed bar 42 through an angle of 180°. This mechanism comprises a link 45 which is pivotally connected to a link 47. The link system is actuated by a double-acting hydraulic cylinder 48 pivotally connected between the supporting frame 41 and the link 47. The axial movement of the feed bar is produced by a double-acting hydraulic cylinder which is mounted inside the supporting frame 41 and has a reciprocable piston rod 43 connected to the feed bar 42. Reference numeral 49 indicates a drill feed motor 45 which operates on meshing with a gear (not shown) serves to feed a drill 50, e.g., a hammer drill, with a drill steel 51 towards a rock surface. The drill 50 is guided for longitudinal movement on the feed bar 42. The drill 50, the feed bar 42, the feed motor 49 and the supporting frame 41 are not illustrated in detail since they may be carried out in any conventional manner well known to those familiar with the art.

The axis of the upright pivot shaft 18 can be considered as a first axis of turning and the axes of the pivots 25, 27, 31 and the sub shaft 38 respectively as second, third, fourth and fifth axes of turning. As illustrated, the pivots 25, 27 and 31 are parallel with each other and perpendicular to the pivot shaft 18 and the sub shaft 38. This geometrical configuration together with the use of wide-angle turn mechanisms for the heads 19, 30 and the frame 41 makes it possible to adjust the drill through a wide range of operating positions. FIG. 5 shows a position for drilling parallel forward directed bottom holes and in FIG. 6 other drill positions are illustrated.

The drill rig above described and illustrated in the drawings should only be considered as an example and may be modified in several different ways within the scope of the following claims.

We claim:

1. A mobile rock drill rig comprising a pair of laterally spaced elongated frames each having an endless ground engaging trackway thereon, a chassis suspended between said frames, a head means mounted at said chassis for pivoting about an upright first axis, power actuated turning means for turning said head means about said upright first axis, first boom means mounted on one end at the head means for power actuated pivoting thereof about a second axis perpendicular to said upright first axis, second boom means carried by the outer end of said first boom means for power actuated pivoting thereof about a third axis parallel with said second axis, and a feed bar for feeding and supporting a rock drill mounted at the outer end of said second boom means for power actuated pivoting about each of two fourth and fifth axes, said fourth and fifth axes being perpendicular to each other and one of which being parallel with said second axis.

2. A drill rig according to claim 1 in which said head means is turnable about said upright axis through an angle of at least substantially 180° by the action of said power-actuated turning means.

3. A drill rig according to claim 2 in which said head means is mounted on an upright pivot shaft, the longitudinal axis of which providing said upright first axis, said upright pivot shaft being fixedly connected to the chassis, a second link pivotally connected
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between said first link and the head means and a double-acting fluid cylinder pivotally connected between the chassis and said first link.

4. A drill rig according to claim 2 in which power-actuated turning means are arranged for swinging the feed bar about each of said fourth and fifth axes through angles of at least substantially 180°.

5. A drill rig according to claim 4 in which the feed bar is pivotally mounted at a second head means for pivoting thereon about said fifth axis, said second head means being mounted at the outer end of the second boom means for pivoting about said fourth axis which is parallel with said second axis.

6. A drill rig according to claim 5 in which a power-actuated turning means is provided for pivoting said second head means about said fourth axis, said turning means comprising a first link pivotally connected to the second boom means, a second link pivotally connected between the first link and said second head means, and a double-acting fluid cylinder pivotally connected between the first link and the supporting frame.

7. A drill rig according to claim 6 in which a supporting frame is disposed between the feed bar and said second head member, the feed bar being axially slidably carried by said supporting frame and the supporting frame being pivotally mounted at the head member for swinging thereon by the action of a turning means which comprises a first link pivotally connected to the supporting frame, a second link connected between said first link and the second head portion and a double-acting fluid cylinder pivotally connected between the first link and the supporting frame.

8. A drill rig according to claim 1 in which the feed bar and the head member are pivoted by means of link mechanisms each of which being actuated by a fluid cylinder.

9. A drill rig according to claim 1 in which the chassis is journaled to each said trackway frame by means of aligned trunnion means, a double-acting fluid cylinder being pivotally connected between each of said trackway frames and the chassis.

10. A mobile rock drill rig comprising a pair of laterally spaced elongated frames each having an endless ground engaging trackway thereon, a chassis forming member suspended between said frames, an upright pivot shaft on said chassis forming member, a first head means journaled on said upright pivot shaft, a power-actuated foldable two-part boom structure pivotally mounted at the head means, a second head means pivotally mounted at the outer end of said boom structure, a feeding and supporting means for a rock drill pivotally mounted at said second head means, and a power-actuated turning means for adjusting said first head means into various positions between a position in which said boom structure is substantially perpendicular to the longitudinal axes of the trackway frames and projecting past one of the frames and a position in which the boom structure is substantially perpendicular to the longitudinal axes of the frames and projecting past the other of the frames, said feeding and supporting means being swingable on said second head means through an angle of at least substantially 180° in planes substantially perpendicular to a central plane through the boom structure.