

Dec. 28, 1965

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3,226,064

ADJUSTABLE MOUNTING FOR ROCK DRILLS

Filed Aug. 12, 1963

3 Sheets-Sheet 1

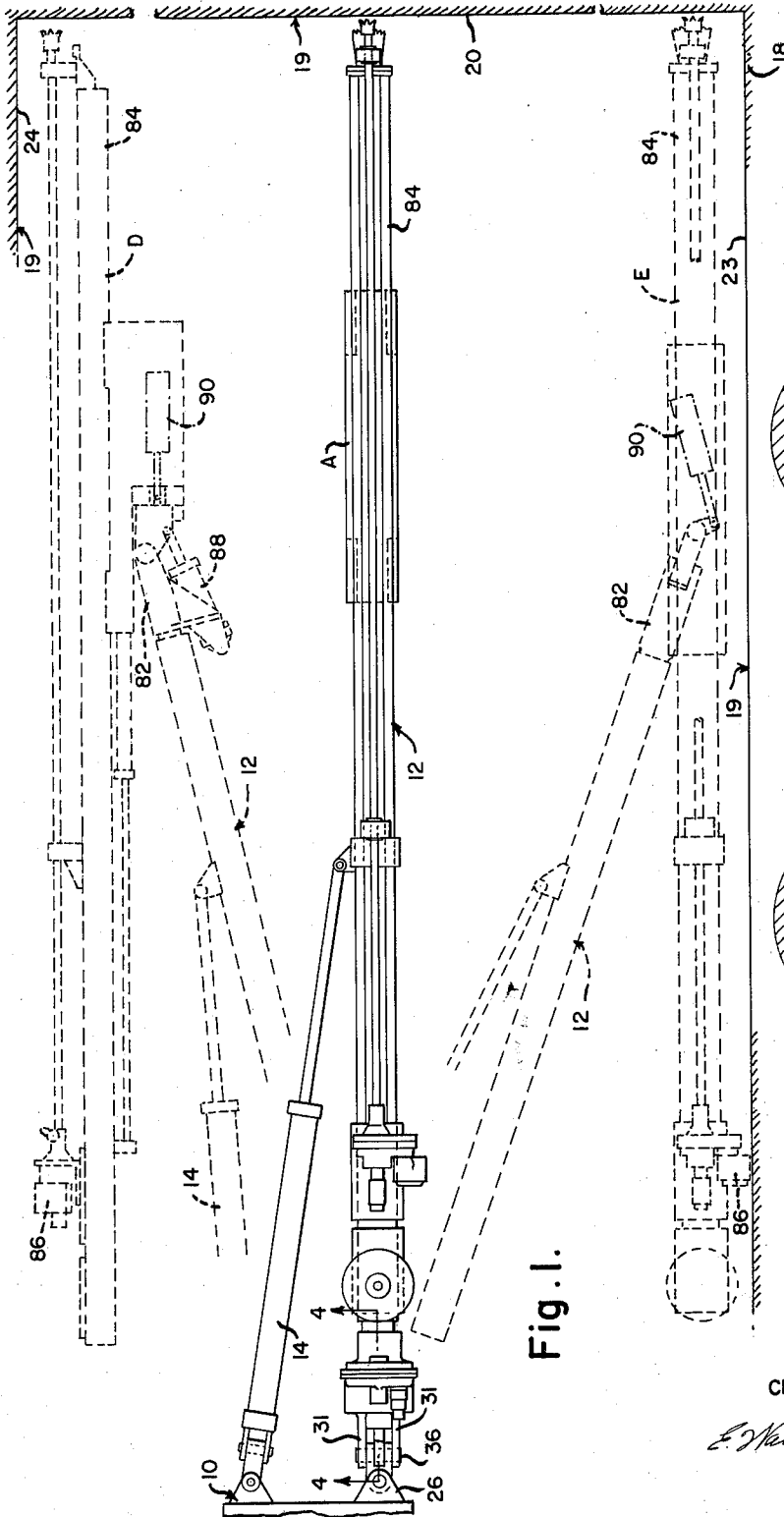


Fig. 1.

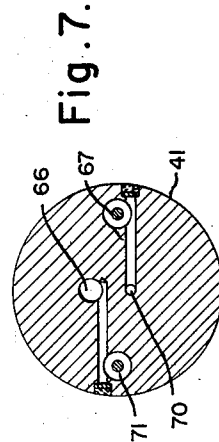


Fig. 6.

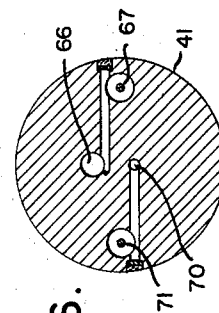


Fig. 7.

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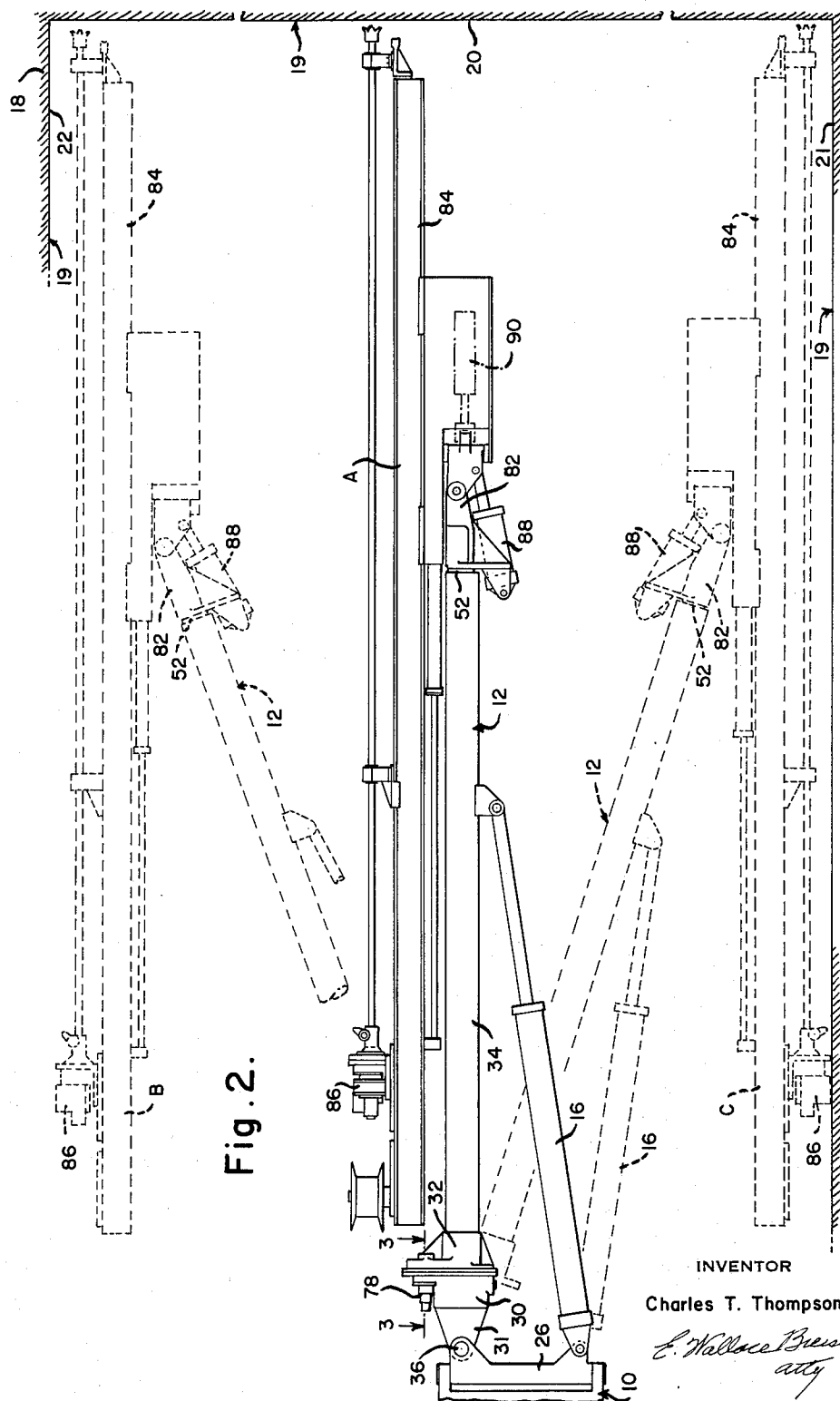
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Fig. 5.

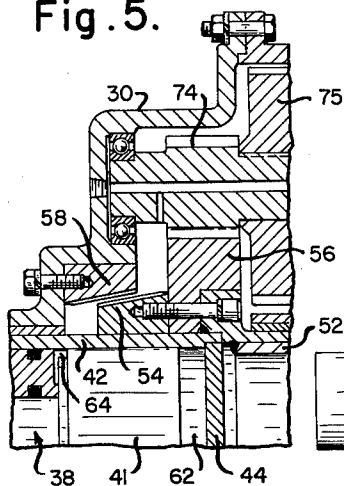


Fig. 3.

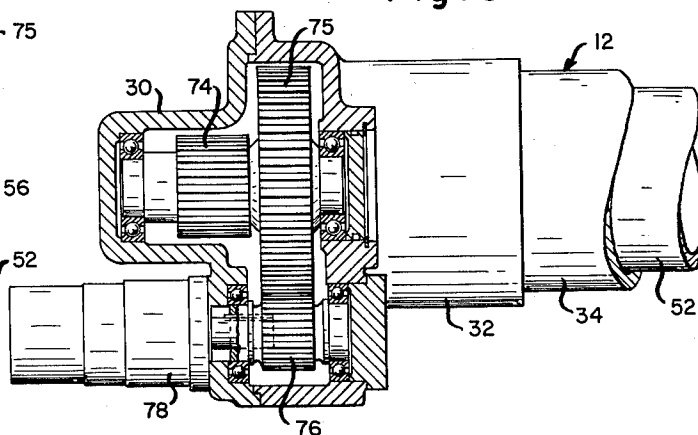
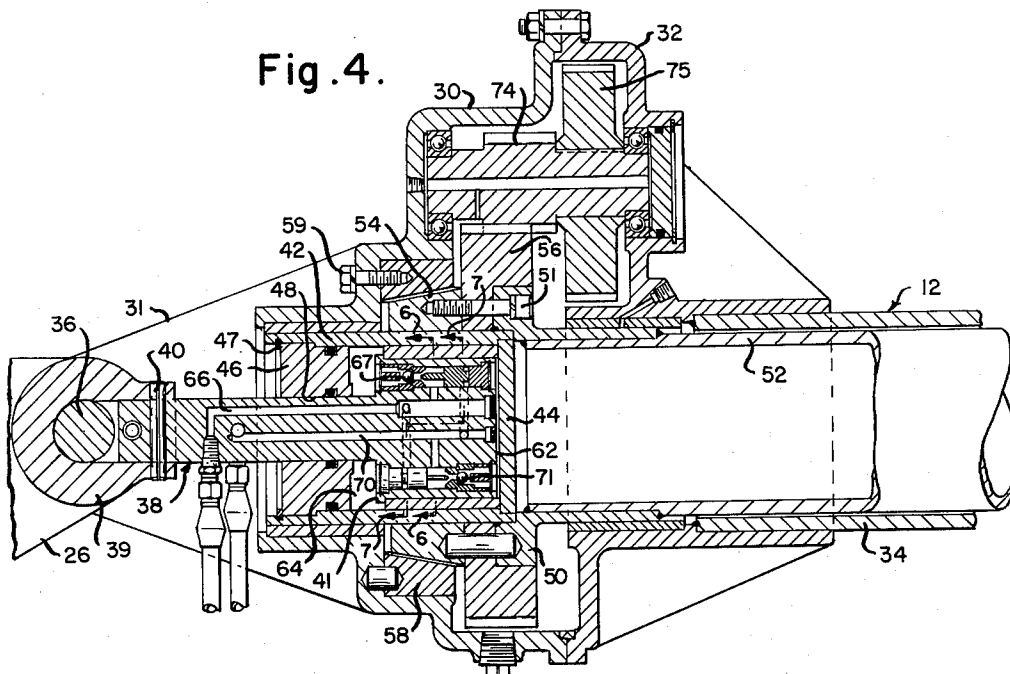


Fig. 4.



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ADJUSTABLE MOUNTING FOR ROCK DRILLS
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5 Claims. (Cl. 248-16)

This invention relates to adjustable tool supports and more particularly to a roll-over boom for mounting a hammer rock drill thereon.

In building modern rock drilling equipment it has become common practice to mount an elongated, longitudinally feedable, drilling device at the forward end of a forwardly extending elongated drill jib or boom, universally adjustably mounted at its rearward end on a mobile support means such as a truck. The jib or boom being pivotable about the rearward end in both the horizontal and vertical planes and the drilling device being angularly adjustable in relation thereto, it is possible to position the drilling device in a wide variety of angular positions relative to the mobile support. Such an adjustable jib mounting for rock drills is shown and described in U.S. Patent 2,791,399.

Such devices have served the purposes for which they were designed, but have not been entirely successful in all conditions of operation for the following reasons. Since great freedom of movement in a vertical plane was a necessary attribute of such prior art mounting, the drilling device was commonly mounted to pivot about a center laterally displaced from the centerline of the jib or boom, in common practice the lateral displacement was equal to not more than twice the transverse dimension of the boom. When such lateral displacement is to the right of the boom it is impossible for the boom to position the drilling device near the lefthand wall or rib of a cut being made in rock or mineral strata unless the operation is interrupted while the drilling device is repositioned on the lefthand side of the boom.

The roll-over boom of the present invention as herein-after described avoids this difficulty and provides for remotely controlled, powered, rapid repositioning of the drilling equipment on either side of the boom as may be desired at different times in the drilling operation.

It is therefore an object of the present invention to provide a new and improved adjustable jib mounting for a rock drill.

Another object of this invention is to provide a new and improved drilling device having an adjustable jib mounting supporting an elongated drill frame in such manner that the drill frame can be positioned and positively locked at any angle of lateral displacement with respect to the centerline of the adjustable jib.

It is a further object of this invention to provide a new and improved rock drill mounting wherein an adjustable jib is provided with a roll-over boom coaxial to the jib and rotatable about the common axis by at least a full turn of 360° so that a rock drill mounted on such roll-over boom is positionable at any desired angle with relation to the axis of the jib and positively lockable at such angle.

A specific object of this invention is to provide a new and improved rock drill mounting wherein a roll-over boom coaxial with a universally adjustable jib mounting and rotatable about the common axis has an elongated drill frame mounted at one end of such roll-over boom in such manner that the drill is transversely displaced from the centerline of the boom so that the rotation of such boom about the common axis provides for positioning and locking the drill frame in any desired angular relationship of the lateral displacement to the centerline of the boom so that the drill frame can be positioned

and operated on either side of the boom as well as above and below the boom as desired.

These and other objects and advantages of the adjustable roll-over boom of this invention will become more readily apparent on further consideration of the following description and drawings in which:

FIGURE 1 is a top plan view of the adjustable roll-over drill mounting of this invention including fragmentary dotted line views of portions of the apparatus in different positions than those shown in the solid line drawing;

FIGURE 2 is a side elevational view of the apparatus shown in FIGURE 1 with dotted line drawings of portions of the apparatus in different positions than that shown in the solid line view;

FIGURE 3 is a partially sectional view taken substantially on line 3-3 of FIGURE 2 looking in the direction indicated by the arrows;

FIGURE 4 is a sectional view taken substantially on line 4-4 of FIGURE 1;

FIGURE 5 is a fragmentary sectional view of a portion of the apparatus shown in FIGURE 4 having certain portions of the apparatus in different positions relative to each other than those shown in FIGURE 4;

FIGURE 6 is a sectional view taken substantially on line 6-6 of FIGURE 4;

FIGURE 7 is a sectional view taken substantially on line 7-7 of FIGURE 4.

The roll-over boom of this invention is herein described as associated with a mobile base carrying a universally adjustable jib although it will be evident that the jib may be mounted in various other manners as on a tripod support. It is also evident that while the drilling tool carried by the support of this invention herein assumes the form of a conventional hammer rock drill, other types of tools, such as rotary drills or wrenches may be supported thereby. In FIGURE 2 there is shown a fragmentary portion of the forward end of a mobile base 10 supported on and rendered movable over a surface by wheels or tracks or other means of locomotion (not shown) and in turn universally pivotably supporting an elongated forwardly extending drill jib 12 in a manner more completely shown and described in the above cited U.S. patent. Movement of the jib 12 in substantially vertical planes about its universal pivot connection with the mobile base 10 is actuated and controlled by a double acting, extensible, hydraulically actuated elevating cylinder 16 suitably supplied with suitably controlled pressure fluid from a source of pressure fluid (not shown). In like manner a swing cylinder 14 actuates and controls the movement of the jib 12 in generally horizontal directions, (see FIGURE 1).

To establish the directions hereinafter used in the description of this machine there is shown at the right-hand end of FIGURES 1 and 2, a hatched portion representing earth strata such as a mineral vein 18 having a portion of a tunnel or entry 19 developed therein. The entry 19 has a substantially vertical face 20 representing the most advanced portion of the entry 19 so far developed with a substantially flat, substantially horizontal floor surface 21 and a substantially horizontal roof line 22 (see FIGURE 2) as well as wall portions or righthand and lefthand ribs 23 and 24 respectively (see FIGURE 1) the ribs 23 and 24 being substantially vertically disposed and forming the sides of the tunnel or entry 20.

Referring again to FIGURE 2, the mobile support 10 is provided with a connecting means 26 pivotable about a vertical axis and in turn pivotably connected to the jib 12 and the elevating cylinder 16 to provide the universally pivotable connection between the mobile support 10 and the jib 12 as described in the above cited U.S. patent. The jib 12 comprises a formed hollow gear case 30 and

a gear case cap 32 removably secured thereto to form a fluid tight casing for gears, bearings and other parts hereinafter described and further comprises an elongated tubular portion 34 rigidly secured to the cap portion 32 as by welding (see FIGURE 4). The gear case is pivotably secured to the connecting means 26 as by a pair of suitable lugs 31 and an elongated cylindrical pin 36 to provide for movement of the jib 12 in substantially vertical planes.

An elongated horizontally disposed generally cylindrical piston member 38 is pivotably secured at its lefthand end as viewed in FIGURE 4 to a central portion of the pin 36 as by a yoke member 39 and a pin 40 rigidly removably securing the piston member 38 to the yoke member 39 as by a driving fit. The piston member 38 is coaxial with the tubular portion 34 and extends inwardly of the gear case 30 with an enlarged head portion 41 of the piston member 38 slidably received within an axially movable hollow cylinder member 42 having a fluid tight cylinder head portion 44 and a fluid tight cylinder base portion 46 removably secured within the movable cylinder 42 as by a snap ring 47. A central bore 48 in the base portion 46 slidably receives the piston member 38 and is maintained in fluid tight relation therewith by sealing members such as O rings as is well known in the art. Rigidly secured to a forward portion of the outer surface of the cylinder member 42 (to the right as viewed in FIGURE 4) is a hollow, flanged collar member 50 which is in turn rigidly secured to and coaxial with an elongated tubular boom member 52 which is coaxial with and substantially longitudinally co-extensive with the tubular member 34 and slidably, rotatably received therein. Rigidly removably secured to the collar member 50 as by a plurality of cap screws 51 and circumferentially engaging a central portion of the exterior of the cylinder member 42 is an externally toothed gear member 56 and a generally frusto-conical, externally splined clutch member 54. The clutch member 54 engages and mates with an internally frusto-conical, ring shaped, internally splined anchor member 58, rigidly removably secured within the gear case 30 as by a plurality of cap screws 59, which engagement of the members 54 and 58 effectively prevents rotation of the boom 52 in relation to the gear case 30 which is in turn non-rotatable with respect to the mobile support 10.

The enlarged head portion 41 of the piston 38 is substantially smaller in axial dimension than the space defined between the head portion 44 and the base portion 46 of the movable cylinder 42 and defines therewith two spaces 62 and 64 respectively, 62 being the space between the head portion 44 of the cylinder member 42 and the head portion 41 of the piston 38 while space 64 is defined between the head portion 41 and the base portion 46. A suitable passageway 66 communicates through the piston 38, and a suitable pilot operated check valve 67, with the space 64 while another suitable passageway 70 in the piston member 38 communicates, through a pilot operated check valve 71, with the space 62. The operation of pilot operated check valves being familiar to those well versed in the art of hydraulic actuation, it is sufficient to say that these check valves are arranged so that pressure fluid in the passageway 70 opens the check valve 67 allowing any fluid present in the space 64 to escape therefrom through the valve 67 and the passageway 66 and at the same time supplies pressure fluid from the passageway 70 to the space 62 biasing the cylinder member 42 to the right. In like manner, pressure fluid in the passageway 66 opens the check valve 71 allowing any fluid in the space 62 to escape through the valve 71 and passageway 70 and at the same time supplies pressure fluid to the space 64 biasing the movable cylinder member 42 to the left. Passageways 66 and 70 respectively communicate with a suitable valve structure (not shown) which is suitably connected to a source of pressure fluid in such manner that pressure fluid can be

supplied to either of the passageways 66 and 70 while at the same time the other of the two passageways is connected to a tank or other place of storage for fluid exhausted from the respective space 62 or 64.

A pinion member 74, suitably journaled in upwardly extending portions of the gear case 30 and the gear case cap 32 as seen in FIGURE 4 is rotatable about an axis parallel to the axis of the boom member 52 and has teeth engaged with the teeth of gear member 56. The pinion member 74 is axially displaced to the right in relation to the gear member 56 by an amount equal to approximately one-quarter the face width of the pinion member 74 for a purpose to be hereinafter explained. Rigidly secured to the pinion member 74 and rotatable therewith is a driven gear member 75 which has teeth drivingly engaged with the teeth of a drive pinion 76 (see FIGURE 3) mounted upon and rotatable by the power shaft of a hydraulically operable power means or hydraulic motor 78, suitably, rigidly removably mounted on the rear surface of the gear case 30 and suitably connected to a suitable source of pressure fluid to be reversibly operable to drive the gear train above described.

The boom member 52 extends outwardly through the forward end of the jib 12 as seen in FIGURE 2 and is there rigidly secured to a mounting member 82 which is pivotably secured to and supports an elongated drill frame 84 of a type well known in the art adapted to apply longitudinal feed motion to a rotary percussive hammer drill 86 in a manner familiar to those well versed in this type of drilling activity. Two double acting, fluid actuated, positioning cylinders 88 and 90 control the pivoting of the drill frame 84 in relation to the mounting member 82 in a well known manner.

Operation of the device of this invention is entirely conventional in producing many of the desired holes necessary for blasting or other operations to extend the entry 19 in a forward direction to the right as viewed in FIGURES 1 and 2. The mobile base 10 is operated in conjunction with the swing cylinder 14 and the elevating cylinder 16 to position the drill frame 84 in the attitude shown in solid outline in FIGURES 1 and 2 with the drill frame 84 positioned vertically above the jib 12, hereinafter designated position A. For the production of bores from the position A upward and not too close to the ribs 23 and 24, the only necessary adjustment in the positioning of the drill frame with relation to the jib 12 are accomplished by activation of the swing cylinder 14, the elevating cylinder 16 and the positioning cylinders 88 and 90 while the boom member 52 remains fixed with relation to the jib 12 by the engagement of the clutch member 54 with the anchor member 58 as hereinbefore described. The upper position shown dotted in FIGURE 2 and indicated as position B is typical of the positions attainable by action of the cylinders 14, 16 and 88. When it is desired to produce bores near the floorline 21 the drill frame must be positioned below the jib 12 as shown in the lower dotted line outline of FIGURE 2 and indicated as position C so that the backwardly extending portion of the frame 84 will not interferingly engage the jib 12 and so that the drill 86 will be positioned as near the floorline 21 as possible. To achieve this repositioning of the drill frame 84 with relation to the jib 12 pressure fluid from a suitable source is supplied to the passageway 70 and through the check valve 71 to the space 62 between the piston head 41 and the cylinder head member 44. The pressure in the passageway 70 also unseats the pilot check valve 67 so that as pressure fluid is supplied to the space 62 the cylinder member 42 can move to the right with an increase in the space 62 and a decrease in the space 64. Any fluid in the space 64 is forced outwardly through the opened check valve 67 into the passageway 66 and returns through the valve means (not shown) to tank. As the cylinder member 42 moves to the right, as viewed in FIGURE 4, the clutch member 54 and the anchor

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member 58 become disengaged as shown in FIGURE 5 while the gear member 56 is biased into full engagement with the pinion 74 as shown in FIGURE 5. When the elements within the gear casing 30 have been moved into the position shown in FIGURE 5, pressure fluid need no longer be supplied to the passageway 70 since the check valves 67 and 71 are designed to retain the fluid already present within the spaces 64 and 62 to maintain the clutch member 54 and the anchor member 58 in the disengaged relationship, with the gear member 56 and the pinion 74 in the fully engaged position. Suitable activation of the hydraulic motor 78 causes the drive pinion 76, the driven gear 75, the pinion member 74 and the gear member 56 to rotate in suitable directions so that the boom member 52 is rotated within the jib 12 to a total angular distance of 180°. After the boom member 52 has been thus rotated, pressure fluid is supplied to the passageway 56 and through the check valve 67 is supplied to the space 64. Pressure fluid in the passageway 66 unseats the check valve 71 and allows pressure fluid in the space 62 to flow through the check valve 71 into the passageway 70 and through the valve means back to tank. As pressure fluid is added to the space 64 the cylinder member 42 moves in a leftward direction to renew the splined engagement of the clutch member 54 and the anchor member 58 to rigidly secure the boom member 52 against rotation within the jib 12 while further drilling operation proceeds.

It is to be noted that the splined engagement of the clutch member 54 and the anchor member 58 is maintained by the presence of fluid in the space 64 because such fluid cannot escape from the space 64 since the check valve 67 prevents such outward flow from the space 64 until the check valve 67 is unlocked by pressure fluid admitted to the passageway 70. It is further to be noted that the number of possible positions of the boom member 52 in relation to the jib 12 is limited only by the number of mating splines on the clutch member 54 and the anchor member 58. For example, if only 12 positions are desired, then 12 splines could be used on each of these members 54 and 58; however, if a greater number of positions is desired, as many as 30 or 40 splines could be used on each of the members 54 and 58 without interfering with the operation of the boom 52 in the desired manner. Under some conditions of operation for very fine adjustment of rotative motion between the boom 52 and the jib 12 the splining on the members 54 and 58 could be entirely eliminated with surface friction on the frusto-conical surfaces of the members 54 and 58 being depended upon to maintain the relative positioning of the drill frame 84 and the jib 12.

In like manner positioning of the drill frame 84 in a horizontal plane with relation to the jib 12 as shown in FIGURE 1 can be achieved by suitable disengagement of the members 54 and 58 as hereinabove described and suitable activation of the hydraulic motor 78 to cause a 90° rotation from the position A to a position D as shown in dotted outline in the upper portion of FIGURE 1. This positioning of the drill frame 84 allows for the drilling of holes in the face 20 very near to the lefthand rib 19. Further suitable operation of the cylinder member 42 and the hydraulic motor 78 is used to rotate the boom member 52 and the attached drill frame 84 into the position shown in the lower portion of FIGURE 1 and designated as position E. This position is similar to position A in that the central portion of the drill frame 84 is vertically above the mounting member 82 and is merely illustrative of the positioning of the drill frame 84 in relation to the jib 12 for normal operation of the drill in producing holes in the upper half of the face 20, when these holes are not close enough to the ribs 19 or 23 to require the positioning of the drill frame 84 in a rotated position such as position D.

It is to be appreciated that rotation of the boom member 52 within the jib 12 can be a total of 360° or more

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and is limited only by the length and arrangement of hose connections necessary to supply pressure fluid to the drill 86 and the positioning cylinders 88 and 90.

Suitable actuation of the positioning cylinders 88 and 90 can position the drill frame 84 cross-wise of the jib 12 so that the drill frame 84 is at right angles to the ribs 23 and 24 or to the roof line 22 and the floor surface 21. In this position rotation of the boom member 52 can be used to position the drill frame 84 for ring drilling parallel to the face 20 or for roof bolting in a vertical direction upward through the roof.

It is further to be appreciated that advantages resident in this invention over devices of the prior art include: positive locking of the roll-over boom 52 in relation to the jib 12 in any desired relative position; achieving such locking independently of the gear train, thus protecting the gears from drilling stresses; maintaining such locking by check valve action without keeping any hoses pressurized; eliminating looseness and lost motion in the locked position because gear back lash clearance affects only the drive and not the locking mechanism; remote control of unlocking, repositioning and locking actions; and rapid repositioning of the drill frame 84 with respect to the jib 12 with a minimum interruption of the drilling cycle.

Although a specific embodiment of this invention has been described as applied to a hammer rock drill mounted on a pivotable jib boom carried by a mobile support, application of the principles of this invention to other devices such as rotary drills and wrenches are within the broad scope of this invention. It is therefore respectfully requested that this invention be interpreted as broadly as possible and be limited only by the prior art.

I claim:

1. A drill mounting comprising; an elongated jib means, elongated boom means longer than said jib means rotatable about a longitudinal axis of said boom means supported by and substantially parallel to said jib means, selectively operable power means drivingly connected to said boom means for so rotating said boom means, fluid actuated locking means comprising clutch means rigidly secured to one end of said boom means and coaxially rotatable therewith and anchor means mounted at one end of said jib means coaxial with said clutch means and engageable therewith by axial movement of said boom means toward said anchor means to lock said boom means in any position of rotation and axially movable away from said anchor means to unlock said boom means and allow such rotation thereof, and drill mounting means secured to the end of said boom means remote from said locking means.

2. A drill mounting comprising; an elongated internally cylindrical jib, an elongated externally cylindrical boom member longer than said jib rotatably mounted in and coaxial with said jib, drive means drivingly connected to said boom member for reversibly rotating said boom member within said jib about the common axis of said jib and said boom member, locking means comprising externally splined frusto-conical clutch means coaxially mounted on one end of said boom and rotatable therewith and internally splined frusto-conical anchor means rigidly secured to one end of said jib coaxial with said clutch means and selectively engageable with said clutch means, fluid actuated means for axially moving said boom member within said jib for locking and unlocking said boom with relation to said jib and, angularly adjustable drill frame mounting means secured to the end of said boom member remote from said locking means.

3. A drill mounting comprising; an elongated internally cylindrical jib universally pivotably mounted at one end upon a drill support means, an elongated double acting fluid actuated cylinder connected between said support means and said jib for swinging said jib in substantially vertical planes, an elongated fluid actuated extensible cylinder connected between said support means and said jib for swinging said jib in substantially horizontal planes, an

elongated externally cylindrical boom longer than said jib rotatably mounted in and coaxial with said jib, drive means mounted at one end of said jib for reversibly rotating said boom within said jib about the common axis of said jib and said boom, locking means comprising frusto-conical clutch means coaxially mounted on one end of said boom and rotatable therewith and frusto-conical anchor means rigidly secured to one end of said jib coaxial with said clutch means and selectively engageable with said clutch means, fluid actuated means for axially moving said boom within said jib for locking and unlocking said boom with relation to said jib and, drill frame mounting means secured adjacent to the end of said boom remote from said locking means.

4. A drill mounting comprising; an elongated internally cylindrical jib, an elongated externally cylindrical boom longer than said jib rotatably mounted in and coaxial with said jib, a drill mounting support means universally pivotably connected to one end of said jib, elongated fluid actuated double acting cylinder means having one end pivotably connected to said support means and the other end pivotably connected to said jib intermediate its ends for swinging said jib in substantially vertical planes, a second elongated fluid actuated cylinder means having one end pivotably connected to said support means and the other end pivotably connected to said jib intermediate the ends of said jib for swinging said jib relative to said support means in substantially horizontal planes, reversible power means mounted at said one end of said jib, plural gear means in driven relationship with said power means and

in driving relationship with said boom, for reversibly rotating said boom within said jib about the common axis of said jib and said boom, fluid actuated means for moving said boom axially within said jib, locking means comprising clutch means rigidly secured to one end of said boom means and coaxially rotatable therewith and anchor means mounted at said one end of said jib means coaxial with said clutch means and engageable therewith by axial movement of said boom means toward said anchor means to prevent such rotation of said boom means one pair of said gear means being partially axially disengaged by such movement and axially movable away from said anchor means to unlock said boom means and allow such rotation thereof said pair of gear means being fully engaged thereby, and angularly adjustable drill mounting means secured to the end of said boom means remote from said locking means.

5. A drill mounting as specified in claim 4 wherein said clutch means and said anchor means comprise frusto-conical members.

References Cited by the Examiner

UNITED STATES PATENTS

2,638,326	5/1953	Lehner	173—43
2,791,399	5/1957	Curtis et al.	248—13
3,020,012	2/1962	Morrocco et al.	173—43 X

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