EXTENSIBLE WATER SUPPLY MEANS FOR A ROCK DRILL

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Original application December 6, 1954, Serial No. 473,207. Divided and this application August 18, 1955, Serial No. 529,122

14 Claims. (Cl. 255—49)

This invention relates to rock drills and more particularly to an extensible liquid supply means for a rock drill for conducting cleansing liquid to the drill-hole to flush away the cuttings from the hole-bottom during the drilling operation.

In rock drills it has become customary practice to supply a cleansing liquid to the bottom of the drill hole to flush away the cuttings from the drill bit during the drilling operation and usually such cleansing liquid supply means involves a loosely hanging liquid supply hose which is apt to become entangled and broken during adjustment of the drilling tool. The present invention contemplates improvements over previous known devices in that the liquid supply hose is maintained under proper tension as the drilling tool is advanced and retracted along its guide frame thereby to eliminate the customary objectionable loosely hanging liquid supply hose.

An object of the present invention is to provide an improved extensible liquid conducting means for supplying cleansing liquid to the drill bit at the bottom of the drill-hole in all positions of the drilling tool along its guide frame. Another object is to provide an improved cleansing liquid supply means for a drilling tool, embodying means for eliminating troublesome slack in the flexible liquid conductor as the drilling tool moves back and forth along its guideways. A further object is to provide an improved winding reel mounted on the drill and on which the cleansing liquid supply hose is wound and embodying improved means for rotating the reel. Still another object is to provide improved energy storing means actuated by forward movement of the drilling tool, for maintaining the liquid conductor under proper tension as the tool is retracted. These and other advantages of the invention will, however, hereinafter more fully appear.

This application is a division of my copending application Serial No. 473,207, filed December 6, 1954.

In the accompanying drawings there is shown for purposes of illustration one form which the invention may assume in practice.

In these drawings:

Fig. 1 is a fragmentary central longitudinal vertical section taken through a rock drill in which an illustrative form of the invention is embodied.

Fig. 2 is a plan view of the forward portion of the drill, partially broken away, and illustrating features of the invention.

Fig. 3 is a plan view of the drill shown in Fig. 1, with parts broken away.

Fig. 4 is an enlarged cross sectional view taken on line 4—4 of Fig. 1, showing the winding reel for the liquid conducting hose.

The rock drill with which the present invention is associated generally comprises a support 1 along which a drill guide frame 2 is guided for rectilinear endwise back and forth movements. Guided for back and forth rectilinear movements along the guideways of the guide frame 2 is a rotating means, generally designated 3, for rotating a drilling implement or tool 4, the latter desirably in the form of a conventional hollow rotary drill steel carrying a rotary drill bit.

As shown in Fig. 1, the drill rotating means 3 embodies a casing 5 in which a terminal driven shaft 6 is suitably journaled, this shaft being arranged with its axis of rotation extending longitudinally of the drill. This shaft has a threaded forward portion 7 to which the drill steel 4 is coupled as by a coupling member 8. A parallel tubular shaft 9, likewise suitably journaled within the casing, has a spur gear 10 secured thereto which meshes with and drives a spur gear 11 fixed to the shaft 6. Suitably mounted at the rear end of the guide frame 2 is a transmission housing 13 and carried at the rearward portion of this housing is a motor 14, desirably a conventional hydraulic motor, and this housing contains a conventional selective multi-speed transmission or reduction gearing 15 for connecting the motor 14 to an elongated splined drive shaft 16 extending longitudinally of the drill guide frame 2 and suitably journaled on the latter. The tubular shaft 9 surrounds the shaft 16 and carries conventional splines engaging the splineway of the shaft 16 so that this shaft may drive the intermeshing gears 10, 11 as the drill rotating means 3 moves rectilinearly along the frame guideways.

The feeding means for the drill rotating means 3 for moving the latter rectilinearly back and forth along the guideways of the guide frame 2 generally comprises a motor 18, desirably a conventional reversible hydraulic motor, mounted on the forward portion of the transmission housing 13 (Fig. 1) and a motor 19 for the shaft 16 is coupled at 19 to a horizontal shaft 20 extending longitudinally of the drill and suitably journaled within the geared housing. Secured to the shaft 20 is a worm 21 meshing with a worm wheel 22 having its hub keyed to a transverse shaft 23 suitably journaled within the housing 13. This shaft 23 drives through intermeshing spur gearing as fully disclosed in my copending application mentioned above, a parallel shaft 24 which is likewise suitably journaled within the housing 13 and this latter shaft drives chain sprockets 25 (Fig. 3) connected by endless drive chains 26 to chain sprockets 27, the latter driving chain sprockets 28 (Fig. 1) which engage and drive parallel feed chains 29, the latter being suitably attached at their ends to the sliding drill casing 5. By properly supplying liquid under pressure to the reversible motor 18 the feed chains 29 may be driven to effect feeding of the drill rotating means 3 either forwardly or rearwardly along the frame guideways.

In order to supply cleansing liquid, desirably water, to the hollow drill steel 4 for flushing cuttings from the hole being drilled in the rock or another material, a flexible liquid conduit, desirably a flexible liquid conductor or water hose 31, is attached, at 32, to the casing 5 of the drill rotating means 3 (Fig. 1). The casing of the rotating means 3 has a water chamber 33 with which an axial passage 34 in the shaft 6 communicates and the bore of the hollow drill steel 4 communicates with the axial shaft passage. In this improved construction, in order to eliminate the conventional troublesome loop of slack hose when the drill rotating means moves along the frame guideways, the water hose is wound on a drum or reel 35. As shown in Fig. 4, this hose drum is journaled on bearings supported by a transverse shaft 36 supported at its ends within lateral arms 37 secured to the gear housing 13 on the rear portion of the operating frame 2. A water supply conduit 38 is connected at 39 to one of the arms 37 and communicates with a passage 40 in the shaft 36, this passage opening laterally out through one side of the shaft. The passage 40 communicates with a chamber 41 within the
2,868,508

3

drum and suitable packings 42 sealingly engage the shaft to prevent leakage. The hose 31 is attached, at 43, to the drum and communicates with the chamber 41. Mounted on small drums 44 at the ends of, and coaxial with, the hose drum are wires or cables 45 which extend upwardly over transverse guide rolls 46 suitably mounted on brackets 47 secured to the upper portion of the housing 13 and the forward portions of these cables extend longitudinally within parallel tubes or conduits 48 secured to the top of the drum housing.

The forward ends of these cables are connected to energized storage means which may assume various forms, but which herein comprise elongated coil springs 49 (Fig. 2) arranged within the tubes 48. As the drum rotating means is advanced along the frame guideways the water hose 31, by the pull thereon, is unwound from the hose drum and as the drum 35 rotates in unwinding direction the small drums 44 rotate in a direction to wind in the cables 45 thereby placing the coil springs 49 under considerable tension to store up energy therein. During retraction of the drum rotating means the energy stored up within the coil springs 49 acts through the cables 45 and drums 44 to effect rotation of the hose drum 35 in unwinding direction so that the water hose is automatically wound in. Thus the water hose is automatically maintained under proper tension irrespective of the position of the drum rotating means along its guideways. A pair of closely spaced guide sheaves 50 (Fig. 3) are journaled on parallel upright axes on the top of the housing 13 and these sheaves serve to guide the water hose 31 as it moves therebetween during movement of the drum rotating means along its guideways.

As the drum rotating means 3 is advanced to feed the drill bit into the rock or other material, the water hose 31 wound on the hose drum 35 supplies water through the hollow drill steel to the bottom of the drill hole to flush away the cuttings and this hose, as described above, is always maintained under sufficient tension by the energy stored within the coil springs to avoid undue slack, and the coil springs rotate the drum automatically to effect winding up of the water hose when the drum rotating means is retracted.

As a result of this invention an improved cleansing liquid supply means for a rock drill is provided wherein the usual troublesome loosely hanging water hose is eliminated. By the provision of the extensible water hose mounted on the drum, which is automatically rotated as the drum rotating means moves along its guideways, water may be supplied to the hollow drill steel to flush away the cuttings from the hole bottom while undue slackness in the hose is avoided. These and other advantages of the invention will be clearly apparent to those skilled in the art.

While there is in this application specifically described one form which the invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In combination, a guide frame providing a longitudinal guideway of said guide frame to move the drilling implement toward and from the work, means for moving said drilling implement back and forth along said guideway, means for conducting fluid to said actuating means, said fluid conducting means comprising a flexible fluid conductor connected to the drilling implement and a drum journaled on said guide frame and on which said conductor is wound, and resilient energy storing means on said guide frame and actuated by said drum as the drill actuating means is advanced to store up energy, said drum being rotated in unwinding direction by the pull of said conductor thereon to pay out said flexible conductor, the energy stored up in said resilient means effecting drum rotation in a direction to wind in said conductor as said drum actuating means is moved rearwardly along said guide frame.

2. A combination as set forth in claim 1 wherein said drum rotating means comprises a second drum coaxial with and secured to said first drum, a cable wound on said second drum, and energy storing means in the form of a spring attached to said guide frame and to which said cable is connected, the rotation of said first drum by the pull of the conductor thereon during advance of said drilling implement causing said second drum to wind in said cable to increase the tension of said spring, said spring acting on said cable to effect rotation of said first drum in winding direction as said drum actuating means is retracted.

3. In combination, a guide frame providing a longitudinal guideway, actuating means for a hole-forming drilling implement, said actuating means guided for rectilinear movement back and forth along the guideway of said guide frame to move the drilling implement from and toward the work, means for moving said drilling implement back and forth along said guideway, means for conducting fluid to said actuating means comprising a flexible fluid conductor connected to the drilling implement, said actuating means mounted on said guide frame and on which said conductor is wound, energy storing means on said guide frame and actuated by said actuating means to store up energy as said actuating means is fed along said guide frame in one direction, and means for transmitting the energy stored up by said storing means to said winding means to effect rotation of said winding means as said actuating means moves along said guide frame in the opposite direction.

4. A combination as set forth in claim 3 wherein said energy storing means comprises resilient means placed under tension and said transmitting means operationally connects said resilient means to said winding means.

5. A combination as set forth in claim 3 wherein said transmitting means comprises a flexible element operationally connected to said actuating means and to said winding means for rotating the latter.

6. A combination as set forth in claim 3 wherein said transmitting means comprises cable means operatively connected to said actuating means and to said winding means, and drum means is connected to said winding means and on which said cable means is wound, said cable means effecting rotation of said winding means.

7. A combination as set forth in claim 3 wherein said motion transmitting means effects rotation of said winding means in a direction for paying off said conductor from said winding means as said actuating means is advanced along said guide frame and for automatically rotating said winding means to wind in said conductor as said actuating means is retracted along said guide frame.

8. In combination, a guide frame, a drilling tool for actuating a drilling implement and guided for movement back and forth along said guide frame, means for conducting cleansing fluid to said drilling implement during the drilling operation comprising a fluid supply hose, a drum journaled on said guide frame and on which said hose is wound, energy storing means actuated by said drilling tool as the latter is fed forwardly along said guide frame, and means for transmitting the energy stored up by said storing means to said drum for rotating the latter in a direction to wind in said hose as said drilling tool moves rearwardly along said guide frame.

9. A combination as set forth in claim 8 wherein said transmitting means comprises a drum rotatable with said first mentioned drum and a cable wound on said last mentioned drum and operationally connected to said energy storing means.
10. In combination, a guide frame providing a longitudinal guideway, a boring tool for forming a blast hole in an earth formation and guided for movement back and forth along said guideway, means for moving said drilling implement back and forth along said guideway, means for conducting a fluid medium to said tool during the tool boring operation comprising a flexible fluid conductor element, a drum journaled on said guide frame and on which said conductor element is wound, energy storing means on said guide frame and actuated by said boring tool to store up energy as said boring tool is fed forwardly along said guide frame, and means for transmitting motion effected by energy stored up by said storing means to said drum for rotating the latter in a direction to wind in said flexible conductor element as said boring tool moves rearwardly along said guide frame.

11. A combination as set forth in claim 10 wherein said transmitting means also transmits motion to said storing means to store up energy therein as said boring tool moves forwardly along said guide frame.

12. A combination as set forth in claim 1 wherein said energy storing means comprises a chamber-providing means extending lengthwise of said guide frame and the chamber containing said resilient means, and an operative motion transmitting connection actuated by said drum and connected to said resilient means.

13. A combination as set forth in claim 12 wherein said operative connection comprises a cable and a second drum is connected to and rotated by said first drum and on which said cable is wound, whereby when said drilling implement is advanced along said guide frame said cable is wound on said second drum to increase the stored up energy within said resilient means.

14. A combination as set forth in claim 13 wherein said resilient means comprises a coil spring, said spring when said drilling implement is moved rearwardly along said guideway effecting through said cable rotation of said second drum to drive said first drum in winding direction to wind in said flexible conductor.

References Cited in the file of this patent

UNITED STATES PATENTS

1,045,903 Smith ------------------- Dec. 3, 1912
1,245,274 Riley ------------------- Nov. 6, 1917
1,999,261 Shultz et al. ------------ Apr. 30, 1935
2,094,353 Gartin ------------------ Sept. 28, 1937
2,562,881 Baldwin et al. --------- Aug. 7, 1951
2,710,352 Hale ------------------- Jan. 10, 1956
UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,868,508

January 13, 1959

David M. Cowan

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the grant, lines 1, 2, and 3, for "David M. Cowan, of Columbus, Ohio," read -- David M. Cowan, of Columbus, Ohio, assignor to Joy Manufacturing Company, of Pittsburgh, Pennsylvania, a corporation of Pennsylvania, --;
line 12, for "David M. Cowan, his heirs" read -- Joy Manufacturing Company, its successors --;
in the heading to the printed specification, line 4, for "David M. Cowan, Columbus, Ohio" read -- David M. Cowan, Columbus, Ohio, assignor to Joy Manufacturing Company, Pittsburgh, Pa., a corporation of Pennsylvania --;
column 3, line 75, for "activating" read -- actuating --.

Signed and sealed this 5th day of May 1959.

(SEAL)

Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents