March 17, 1970 F. R. RUDMAN 3,500,941

FEED MECHANISM FOR ROCK DRILL HOSE GUIDE

Filed Dec. 9, 1968 2 Sheets-Sheet 1

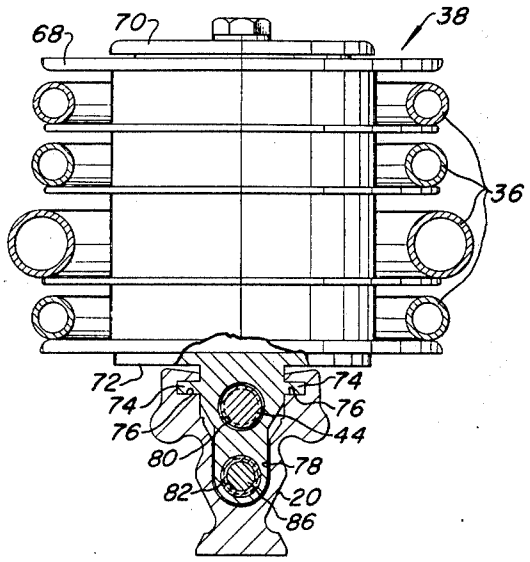

Fig 2

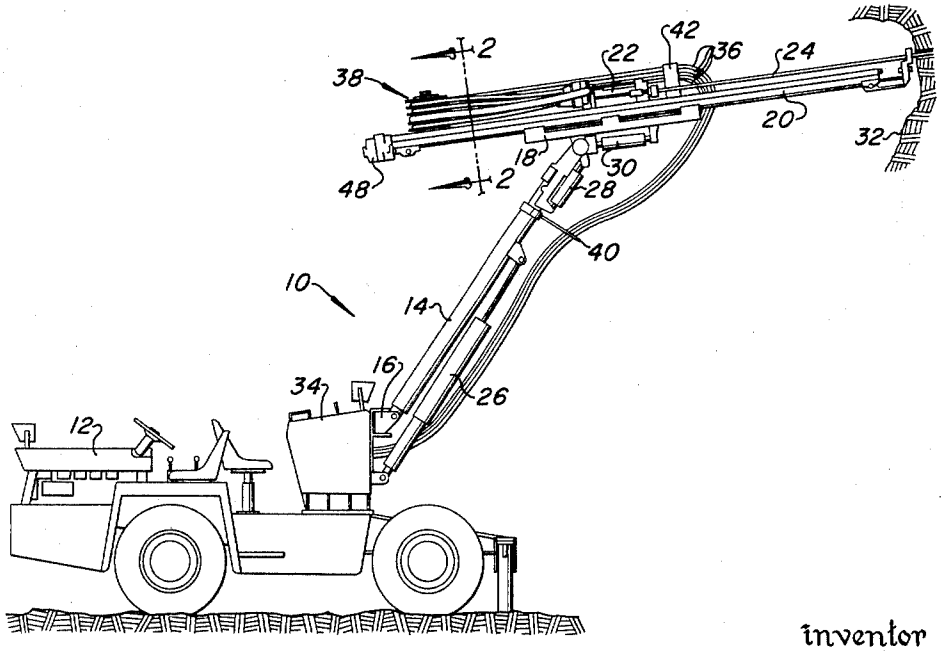

Fig 1

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FEED MECHANISM FOR ROCK DRILL HOSE GUIDE

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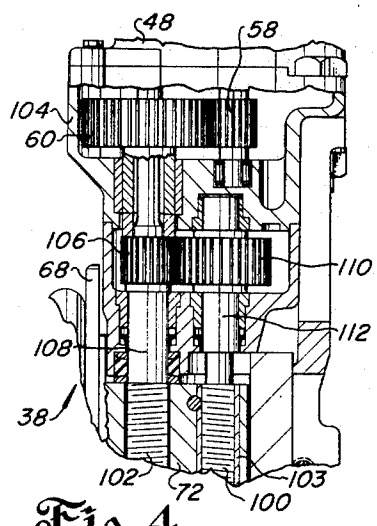

Fig 4

Fig 3

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FEED MECHANISM FOR ROCK DRILL HOSE GUIDE

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U.S. Cl. 173—160 7 Claims

ABSTRACT OF THE DISCLOSURE

A feed mechanism for advancing and retracting a hose guide and tensioning reel on a screw feed type rock drill support. The mechanism comprises a separate feed screw for the hose reel mounted parallel to the feed screw for the drill proper. The hose reel feed screw is driven by the drill feed motor and drive train and has a thread lead proportioned according to the thread lead of the drill feed screw and the relative rotation rate of the two screws whereby the hose reel is advanced along the drill support at substantially one half the feed rate of the drill to maintain uniform tension in the motive fluid hoses leading to the drill.

BACKGROUND OF THE INVENTION

In modern rock drilling equipment it is common practice to mount drills on elongated supports to provide for feeding the drill reversibly therealong. These elongated supports, customarily referred to as drill guide shells, are adapted to be mounted on universally positionable boom assemblies carried by a mobile support comprising a self-propelled wheeled or track laying vehicle. Modern rock drills also require a plurality of flexible fluid conductors or hoses leading to the drill proper for conducting motive pressure fluid and drill hole cleansing fluid to the drill. Accordingly, when drills are mounted in the manner described the required length of hose is such that they are susceptible to being kinked or twisted or severely damaged from dragging on rough ground such as the floor of a mine drift or a construction site. It is, therefore, desirable that guide and tensioning means be provided for training the plurality of hoses to prevent their damage or entanglement and yet allow enough freedom to follow the drill along the feed support.

Guide and tensioning devices for rock drill fluid conductors are known in the prior art and an improvement in a hose guide for a rock drill mounted on an elongated support is disclosed in U.S. application S.N. 752,364, filed Aug. 13, 1968. Known devices have been applied to the heavy duty chain type feed mountings where weight and space are not of prime consideration in the design of the feed support. However, it is also desirable to provide positively driven hose tensioning reels on the lightweight screw type drill feed supports wherein the design emphasis is placed on reducing weight and bulk.

SUMMARY OF THE INVENTION

The present invention resides in the provision of a positively driven guide and tensioning device for the fluid conductors on a screw feed type rock drill support. The invention provides an elongated feed member rotatably mounted on a screw type feed support parallel to the feed screw for the drill proper and adapted to drive a hose guide and tensioning reel at a predetermined rate relative to the feed rate of the drill.

This present invention includes a feed mechanism for a hose guide reel adapted to be mounted on a lightweight drill feed support whereby the entire feed mechanism is housed within the normal cross section of the support member. The reliability of the hose reel apparatus is enhanced by the mechanical simplicity and ruggedness of the hose reel feed mechanism according to the present invention.

An advantageous feature of the present invention resides in the provision of drive means interconnecting a drill feed screw and a hose guide feed screw whereby the two screws are driven at a proportional rate to provide positive relative feed rates between the hose guide reel and the drill. Further advantages and objectives realized with the present invention will be better understood upon reading the following detailed description.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a side elevational view of a universally positionable drilling apparatus mounted on a mobile carrier, and illustrates an embodiment of the present invention.

FIG. 2 is a sectional view taken substantially along the line 2—2 of FIG. 1.

FIG. 3 is a fragmentary elevation, partially sectioned, of the screw type feed support of FIG. 1 illustrating details of the hose guide feed screw and drive mechanism.

FIG. 4 is a fragmentary view of an alternate embodiment of the hose guide feed screw and drive mechanism.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, a mobile rock drilling rig is illustrated and generally designated by the numeral **10**. The rig **10** includes a self-propelled rubber tired carrier **12** upon which is mounted a universally positionable boom **14** pivotally attached to the carrier at the pivot **16**. The distal end of the boom **14** is adapted to carry a pivoted bracket **18** to which is attached an elongated feed support **20**. The feed support **20** slidably mounts a percussion rock drill motor **22** which is longitudinally feedable along the support **20** to drill blast holes and the like by transmitting percussion blows through the drill steel **24** to a bit, not shown.

The manner in which the boom **14** and feed support **20** are mounted and the provision of fluid operated extension cylinders **26, 28** and **30** makes possible the drilling of holes at a wide variety of angles and positions with respect to the workings **32**. Although for clarity of illustration only one boom is shown, drill carriers such as the vehicle **12** often mount a plurality of boom assemblies such as the apparatus disclosed whereby a large face pattern may be drilled expeditiously under control of an operator seated at the control console **34**.

The drill motor **22**, a conventional fluid operated type well known to those familiar with the art of percussion tools, requires a plurality of flexible fluid conductors or hoses **36** leading to the drill proper from a source of pressure fluid, not shown. The hoses **36** necessarily extend from the control console **34** and must be of sufficient length to allow for free movement of the drill mo-

tor 22 along the length of the feed support 20. The hoses 36 must also be sufficiently long enough to allow the feed support 20 to be positioned relative to the boom 14 to the limit of extension of the fluid cylinders 26, 28 and 30.

A substantial amount of slack in the hoses 36 would be caused in certain positions of the drill motor and feed support resulting in kinking, entanglement, and dragging without the provision of guide and tensioning means comprising the grooved reel 38 movably mounted on the feed support 20. As can be seen in FIG. 1 the plurality of hoses 36 are neatly trained around the plural grooves of the reel 38 from whence they lead to the drill motor 22. By also training the hoses 36 through the hanger 40 on the boom 14 and keeping them connected with respect to the feed support 20 by means of the clamp 42 near the pivotal connection of the feed bracket 18 there is no danger of entanglement or damage.

Referring to FIGS. 2 and 3, the feed support 20 is of the lightweight beam type having a narrow cross sectional configuration (FIG. 2), and conventionally formed of an extruded aluminum alloy or steel. In a well known manner the drill motor 22 is slidably mounted on the support 20 and positively driven reversibly therealong by means of an elongated rotatably mounted feed member comprising a screw 44 centrally mounted on the support 20 and threadedly connected to the drill motor 22 by means of a nonrotatable nut 46. The drill feed rate is a function of the thread lead and the rotative speed of the screw 44. As can be seen in FIG. 3 the screw 44 is operable to be rotatively driven by a fluid operated motor 48 which is mounted on the support 20 by means of a two-piece gear housing 50 and the bracket 52. The motor 48 receives and exhausts pressure fluid through conduits 54 and 56 and is controllable from the control console 34, also. The motor 48 reversibly drives the feed screw 44 through a drive train comprising a pinion 58, and a reduction gear 60 splined to an integral extension 62 of the feed screw 44. The reduction gear 60 and screw extension 62 are journaled in bearings 64 and 66 respectively. The opposite end of the drill feed screw 44 is also supported in a conventional bearing, not shown.

Referring to FIG. 2 the hose reel 38 comprises a grooved drum 68 freely rotatable on a hub 70 which is supported by a frame 72. The frame 72 includes laterally extending gibs 74 which are slidably retained in ways 76 formed longitudinally on the feed support 20. The reel frame 72 extends into a longitudinal recess 78 in the feed support 20 and surrounds the drill feed screw 44. A longitudinal bore 80 through the frame 72 provides for clearance of the drill feed screw. Referring also to FIG. 3, the reel frame 72 includes a nut 82 nonrotatably secured to the frame by a pin 84. The nut 82 is threadedly engaged with an elongated member comprising a screw 86 rotatably mounted in the recess 78 parallel to the drill feed screw 44. The screw 86, comprising a feed mechanism for the hose reel 38, extends substantially one half the length of the feed support 20 and is rotatably journaled in a bearing 88 at one end. An extension shaft portion 90, having a gear 92 secured in nonrotative relation thereon, is journaled in bearings 94 in the gear housing 50. The drill feed screw 44 and the hose reel feed screw 86 are rotatably interconnected by means comprising the gear 92 enmeshed with a gear 96 mounted on the screw extension 62. The gear 96 is nonrotatable relative to the screw 44.

With the arrangement for guiding and tensioning the hoses 36 shown in FIG. 1 whereby the hoses are reversely trained around the reel 38 and are fixed with respect to the feed support by the clamp 42 it is required that the reel 38 move at one half the feed rate of the drill motor 22 to maintain the desired tension. Accordingly, in the embodiment of FIG. 3 the gears 96 and 92 are designed to have a rotative speed ratio of 1:1 and the thread lead of the reel feed screw 86 is one half the lead of the threads of drill feed screw 44. Therefore, even

though in operation the screws 44 and 86 are rotating at the same angular velocity the hose reel 38 will be advanced and retracted along the feed support 20 at one half the rate of the drill motor 22. Since the screws are rotating in opposite directions, however, it is necessary that the threads of the respective screws be of the opposite hand. Screw threads of the same hand could be used on the two feed screws if an idler gear was drivably placed between the gear 92 and the gear 96.

It is not necessary that the gears 92 and 96 be designed so that the rotative speed ratio between the interconnected feed screws be of the value 1:1. The embodiment of FIG. 4 illustrates a hose reel feed screw 100 having a thread lead equal to the thread lead of a drill motor feed screw 102 but as in the embodiment of FIG. 3 the threads are of the opopsite hand. The reel feed screw 100 is threadedly engaged with a nut 103 nonrotatably mounted on the reel frame 72 in place of the nut 82. The gear drive train housed in a modified gear housing 104 includes a gear 106 on the extension 108 of the screw 102 which is engaged with a gear 110 on the extension 112 of the screw 100. The pitch diameter ratio of the gear 110 to the gear 106 is 2:1 whereby the rotative speed of the reel feed screw 100 is one half that of the drill motor feed screw 102 and accordingly the rate of advance of the hose reel 38 is one half that of the drill motor.

It may be appreciated from the foregoing that many combinations of screw thread lead and gear rotative speed ratios can be employed to give a resultant feed rate of the hose reel of one half the feed rate of the drill motor.

What is claimed is:

1. An improved drilling apparatus comprising:
an elongated drill support;
a drill motor movably mounted on said support;
flexible conductor means having one end connected to said drill motor and having another portion connected with respect to said support;
a first elongated member rotatably mounted on said support and operably connected to said drill motor for feeding the same reversibly along said support;
drive motor means operably connected to said first elongated member, the improvement comprising:
guide means movably mounted on said support for guiding said flexible conductor means with respect to said drill motor;
a second elongated member rotatably mounted on said support substantially parallel to said first elongated members and operably connected to said conductor guide means for feeding the same reversibly along said support; and,
means interconnecting said first and second elongated members whereby said members are rotatively driven by said drive motor means for feeding said drill motor and said conductor guide means along said support at a predetermined rate relative to each other.

2. The invention set forth in claim 1 wherein:
said drive means comprises gear means mounted on said conductor guide feed member enmeshed with gear means mounted on said drill motor feed member, and in response to the operation of said drive motor means said drill feed member and said conductor guide feed member are rotated at a predetermined rate relative to each other.

3. The invention set forth in claim 2 wherein:
said drill motor feed member comprises a screw threadedly engaged with said drill motor and said conductor guide feed member comprises a screw threadedly engaged with said conductor guide means.

4. The invention set forth in claim 3 wherein:
the rotative speed ratio of said enmeshed gears is 1:1.

5. The invention set forth in claim 4 wherein:
said conductor guide feed screw has a thread lead of one half the thread lead of said drill motor feed screw whereby in response to the operation of said drive motor, said conductor guide means is fed along said support at one half the rate of said drill motor.

6. The invention set forth in claim 3 wherein:
said rotative speed ratio of said gear means on said drill feed screw with respect to said enmeshed gear means on said conductor guide feed screw is 2:1.

7. The invention set forth in claim 6 wherein:
said conductor guide feed screw has a thread lead equal to the thread lead of said drill feed screw whereby in response to the operation of said drive motor said conductor guide means is fed along said support at one half the rate of said drill motor.

References Cited

UNITED STATES PATENTS

2,730,332	1/1956	Hale	173—159 X
3,162,253	12/1964	Curtis	173—147
3,205,951	9/1965	Pyles	173—160 X

ERNEST R. PURSER, Primary Examiner

U.S. Cl. X.R.

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