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 [33] **Switzerland**
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Primary Examiner—Martin P. Schwadron

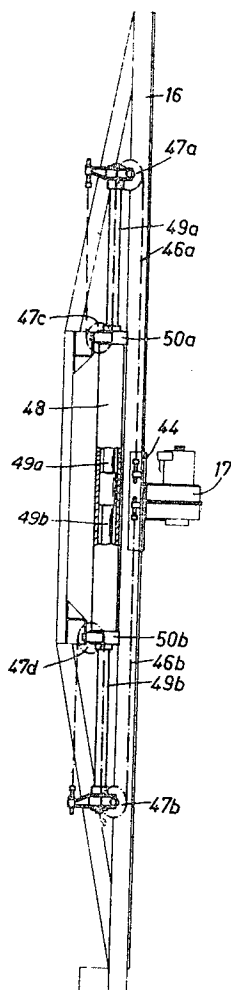
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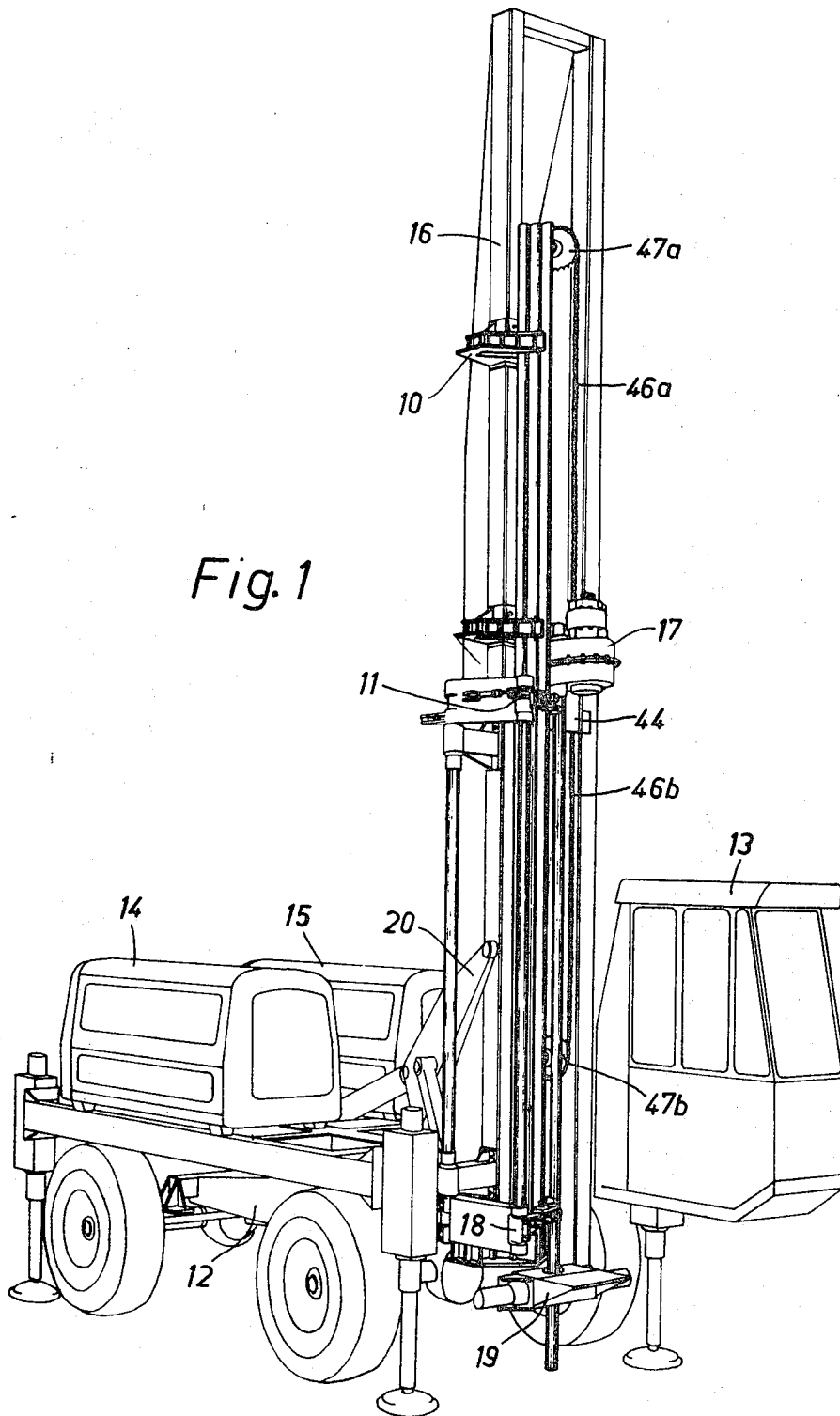
Attorney—Bauer and Goodman

[54] **FEED ARRANGEMENTS IN ROCK DRILLING MACHINES**
 2 Claims, 4 Drawing Figs.

[52] U.S. Cl..... **92/137,**
173/147
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E21c 5/06
 [50] Field of Search..... **92/137,**
117, 77/(Inquired), 74/(Inquired), 173/(Inquired):
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ABSTRACT: An arrangement for feeding drill string elements in drilling machines, in which the drilling unit is guided so as to move to and fro along guides on a guiding frame on a mast under the action of a pressure fluid-operated power unit supported by said frame and comprising a cylinder and a piston cooperating with each other, said power unit being connected to said drilling unit via a power transmission comprising flexible transmission elements and pulley wheels.





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Fig. 2b

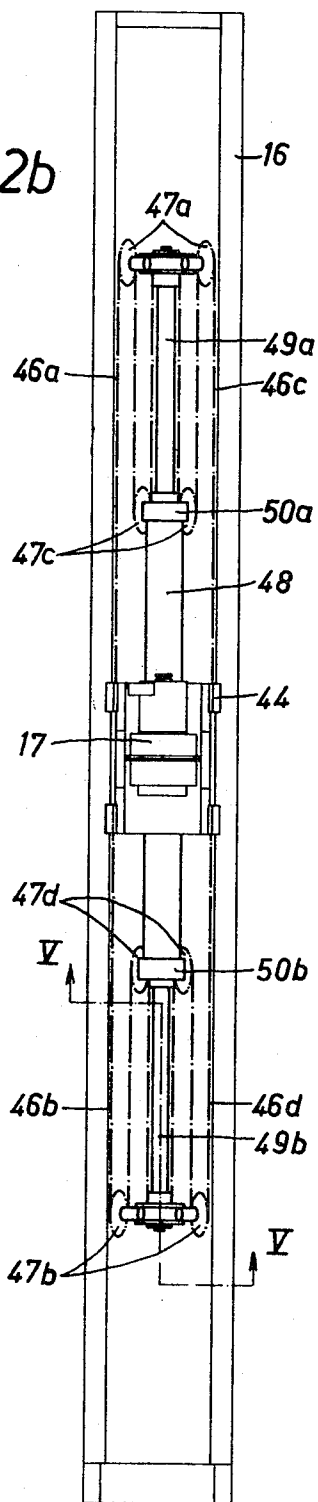
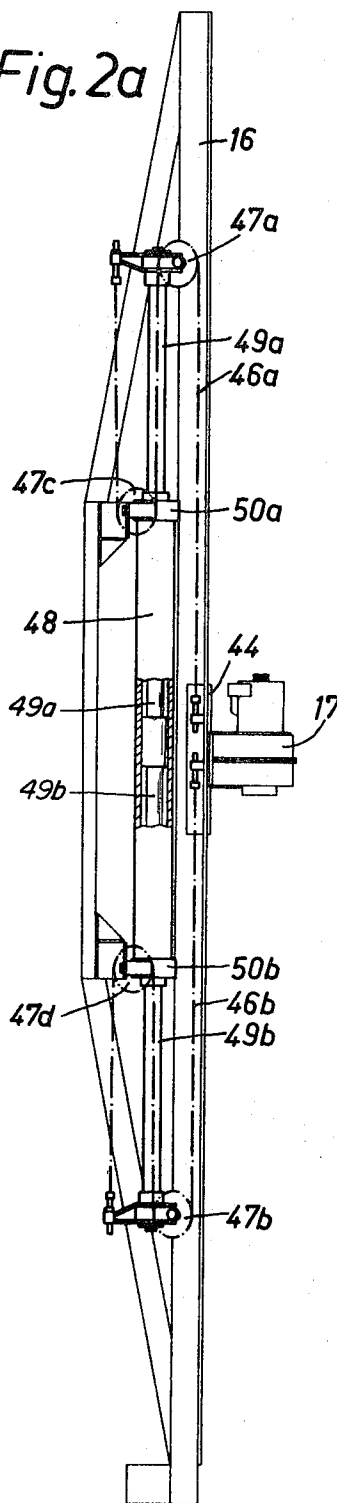
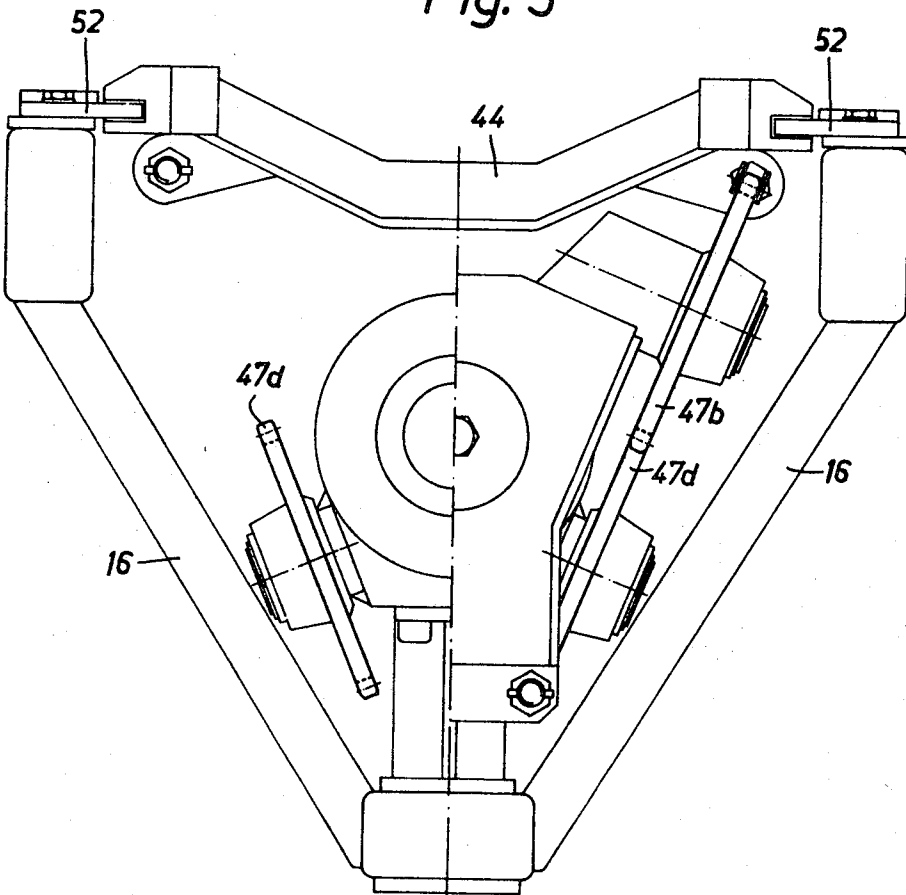


Fig. 2a



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Fig. 3



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FEED ARRANGEMENTS IN ROCK DRILLING MACHINES

The present invention relates to feed arrangements in drilling machines for sinking wells, for quarry drilling and for other purposes, in which machines the drilling unit is guided so as to move to and fro along guides on a guiding frame on a mast under the action of a pressure fluid-operated power unit supported by said frame and comprising a cylinder and a piston cooperating with each other, said power unit being connected to said drilling unit via a power transmission comprising flexible elements, such as chains or the like, and pulley wheels.

In drilling machines it is known to feed the drill string elements, such as tubes or rods, by means of a combination of chains, worm gear and pressure oil motor. The disadvantage of this system is that the mast, when lifting the drill string element, is subjected to forces which tend to compress the mast. It is also known to use a hydraulic cylinder and chain, but in connection with this known device there exists, in addition to the disadvantage of pressure forces in the mast, another drawback, viz. that the input oil flow does not equal the output oil flow on account of different areas on the two sides of the piston, because the piston carries a piston rod at one side only.

One object of the present invention is to provide an improved feed arrangement for drill string elements in a rock drilling machine, said arrangement having such a construction that it does not exert large forces on the mast, whereby the mast can be made slender and thus light.

A further object of the invention is to provide a feed arrangement having a high ratio of transmission towards that part supporting the drilling unit so that the entire length of the mast can be utilized for the feed motion.

A still further object of the invention is to provide a feed arrangement securing equality between input and output pressure fluid, thus rendering possible a connection to a fluid pump in a so-called closed system.

The feed arrangement according to a preferred embodiment of the invention is characterized in that the power unit cylinder is provided at the center portion of the guiding frame, and that its piston is provided with two oppositely extending piston rods which extend through covers at each end of the power unit cylinder, wherein pulley wheels are provided at the piston rod ends and pertaining chains extend from the drilling unit over each pulley wheel at the piston rod ends to turning or attachment points on the guiding frame.

Among the advantages attained by the invention is in addition to the more slender mast substantially thanks to the fact that the pulley wheels are not mounted directly on the mast and thus do not exert any breaking forces on the same, also the advantage that, due to the construction of the piston with a piston rod at each side of the piston and thus the same area on both sides of the piston, the same amount of pressure fluid is applied at one side of the piston as is discharged at the other side of the same.

The invention will be described more detailed in the following specification with reference to the accompanying drawings, in which embodiments of a feed arrangement according to the invention in connection with a quarry drilling machine are illustrated by way of example.

In the drawings:

FIG. 1 shows the drilling machine with a feed arrangement according to the invention in a perspective view;

FIG. 2a is an elevation of the drilling machine mast with the feed arrangement according to the invention as seen from one side;

FIG. 2b is an elevation of the mast with the feed arrangement as seen from the front;

FIG. 3 is a plan view of the mast with the feed arrangement, in part in a cross section along the line V-V in FIG. 2b.

The drilling machine according to FIG. 1 comprises a wheeled chassis 12, an operator's cab 13, a compressor unit 14, a hydraulic pump unit 15, a rotary drive unit 17, a mast cradle 20 and a mast 16. A drill string element support 19 and

a drill string element magazine 10 having a main gripping arm system 11 and an auxiliary gripping arm system 18 for handling the drill string elements are made as a structural unit with the mast 16. The rotary drive unit 17 is mounted on a slide 44, which through the chains 46a, 46b and the pulley wheels 47a, 47b, as shown in FIG. 1, is connected with the feed arrangement according to the invention, not shown in FIG. 1.

FIG. 2a shows in a side elevation and FIG. 2b shows in a front elevation the mast 16 with the feed arrangement. Said arrangement comprises a cylinder 48 for pressure fluid, firmly fixed to the mast 16 substantially at the middle portion of the same, and for instance being a hydraulically operated cylinder having a piston with two similar piston rods 49a, 49b at each opposite end of the piston, said rods extending through the cylinder covers 50a, 50b. The piston rods 49a and 49b are connected to the slide 44 by means of four chains 46a, 46b, 46c and 46d carried over four sets of pulley wheels 47a, 47b, 47c and 47d which are mounted in pairs at the outer ends of the two piston rods and at the cylinder covers 50a, 50b. The chains extend from mounting points at the slide 44 over the pulley wheel sets at the piston rod ends, over the pulley wheel sets at the cylinder covers and to mounting points at the piston rod ends.

FIG. 3 shows three of the eight pulley wheels in the embodiment according to FIGS. 2a and 2b, viz. the two wheels in the pair 47d and one in the pair 47b. Moreover the slide bars 52 for the slide 44 are shown.

The feed arrangement according to FIGS. 2a and 2b operates as follows. When it is desired to feed a drill string element, supported by a driving spindle of the drive unit 17 and guided by the drill string element support 19, the cylinder piston is pressed downwards in the cylinder 48 by means of associated hydraulically operated means. This causes the piston rod 49a to move into the cylinder by the same amount as the piston rod 49b is protruded out of the cylinder. Consequently the same amount of oil is expelled from the cylinder below the piston, as the amount forced into the cylinder above the piston. If the displacement of the pistons is designated by s , the slide is displaced a distance $3s$, if a system having two pulley wheels per chain is used as shown in FIGS. 2a and 2b. The travel range of the piston need thus be only a third of the travel range of the slide on the mast in order to get a full travel length of the slide along the whole of the mast.

I Claim:

1. A rock drilling machine comprising a vertically oriented support mast, a pressure cylinder stationarily mounted in a central location on said support mast, a flexible cable means operatively connected at opposite ends to provide a vertically shiftable cable loop adjacent said pressure cylinder, a drilling machine operative unit secured to said cable loop in substantially a medial location therealong, and piston means to both support said cable loop in a taut condition and to cause said vertical shifting movements in said cable loop, said piston means including at least one piston rod disposed within said pressure cylinder and having its opposite ends in supporting engagement with said cable loop, a piston fixedly mounted to said piston rod and operatively disposed within said pressure cylinder, said piston rod having pulleys at opposite ends in supporting engagement with said cable loop, said piston rod additionally supporting at each said opposite end a laterally extending bracket and additional pulleys are supported at said cylinder, and wherein said cable loop is entrained about said pulleys and has its ends thereof respectively connected to each said laterally extending bracket, whereby vertical movement in said piston rod produces shifting movements in said cable loop and in turn produces corresponding vertical raising or lowering movements in said drilling machine operative unit which is secured to said cable loop.

2. A rock drilling machine as defined in claim 1 including vertically oriented guide rails supported on said mast and wherein said drilling machine operative unit is operatively arranged to track along said guide rails.

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,535,985 Dated October 27, 1970

Inventor(s) KURT ANDERS GUSTAV ATTEBO

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

First page, left hand column, line 10, Item No. [33],
"Switzerland" should read --Sweden--.

Signed and sealed this 8th day of June 1971.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents