June 24, 1958 J. E. FEUCHT 2,840,347

DRILL FEEDING APPARATUS

Filed Nov. 26, 1954 3 Sheets-Sheet 1

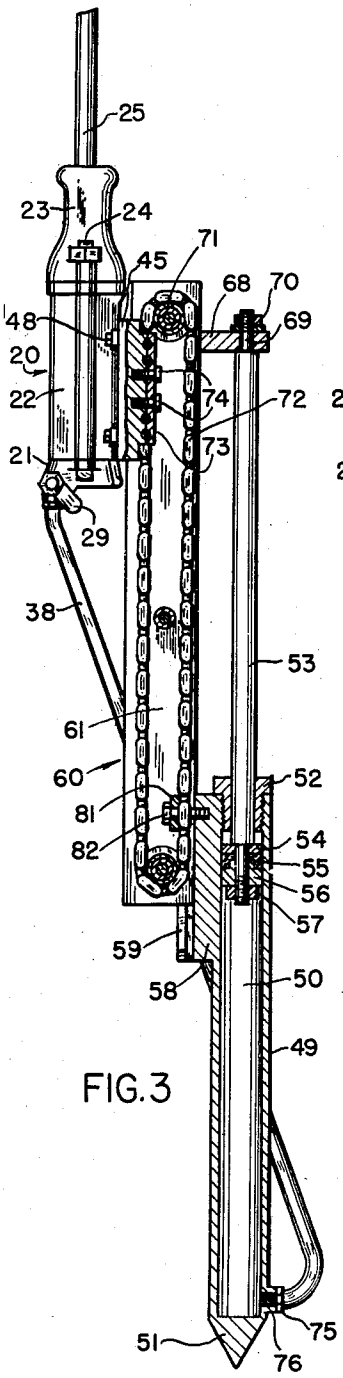


FIG. 3

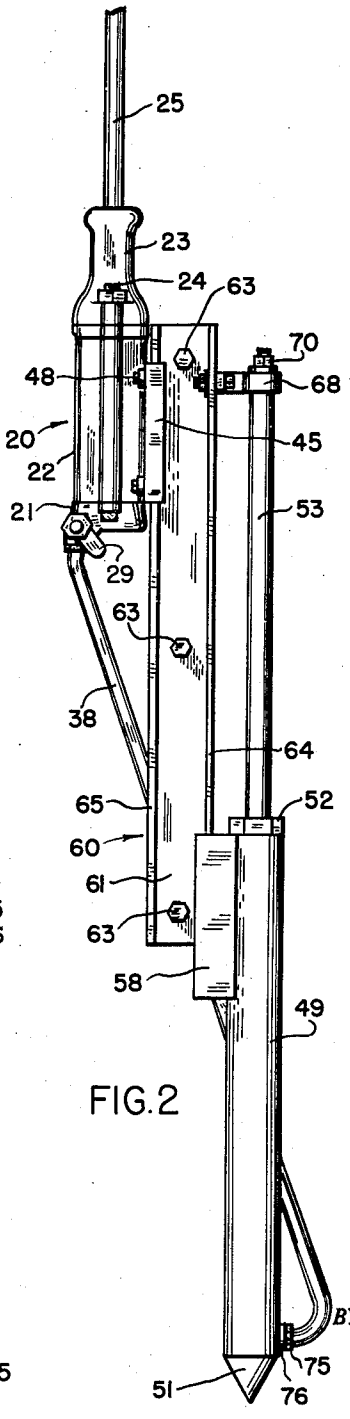


FIG. 2

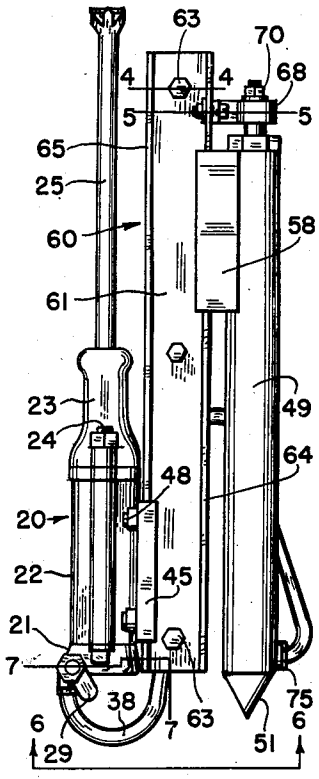


FIG. 1

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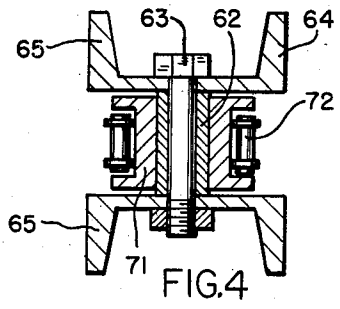


FIG.4

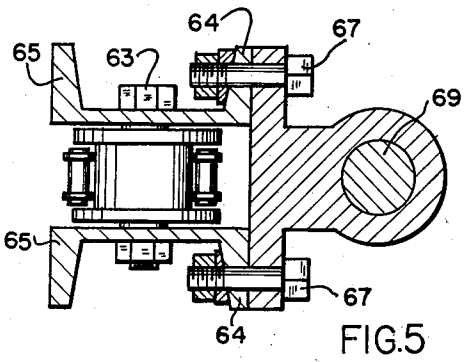


FIG.5

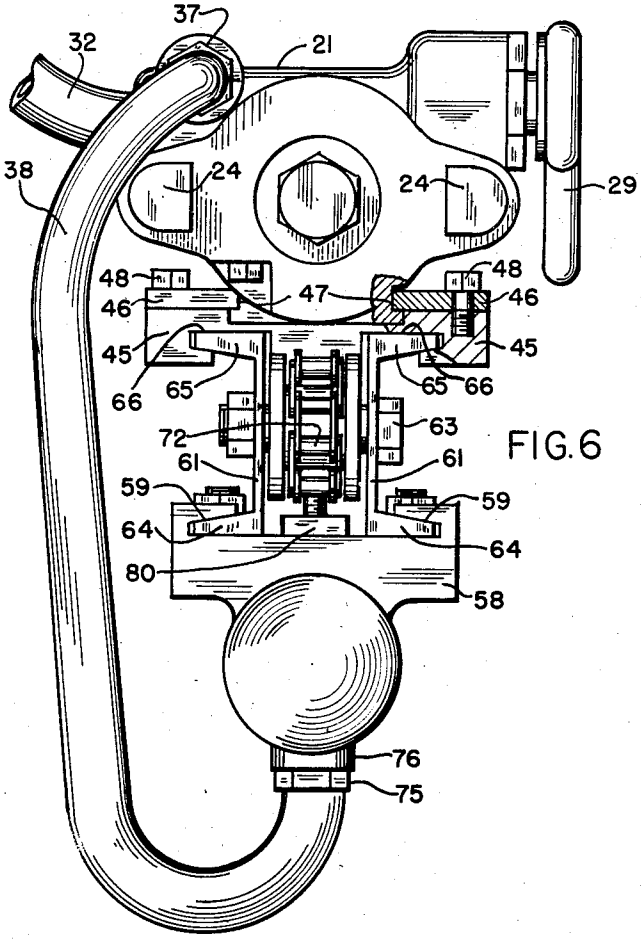


FIG.6

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DRILL FEEDING APPARATUS

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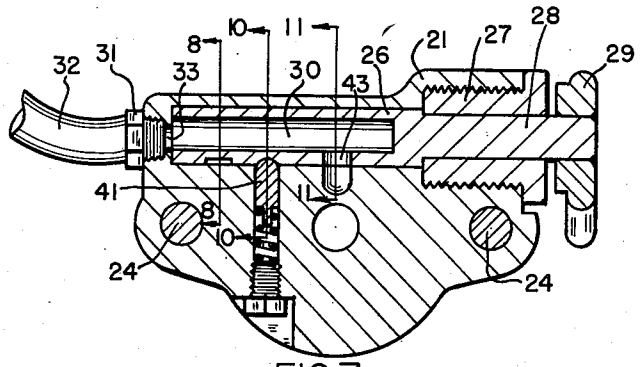


FIG. 7

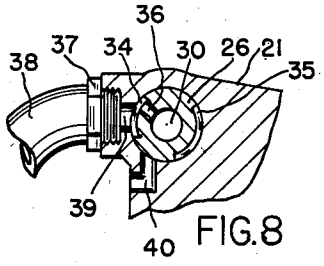


FIG. 8

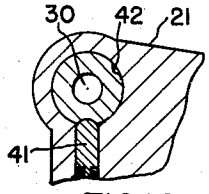


FIG. 10

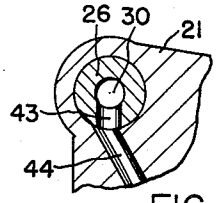


FIG. 11

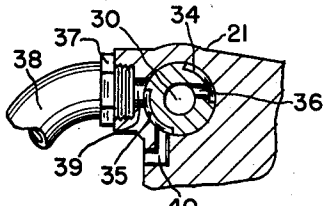


FIG. 9

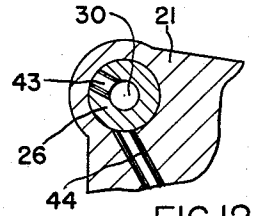


FIG. 12

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United States Patent Office 2,840,347 Patented June 24, 1958

2,840,347

DRILL FEEDING APPARATUS

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Application November 26, 1954, Serial No. 471,286

1 Claim. (Cl. 255—45)

This invention relates broadly to rock drilling apparatus, but more particularly to an improved drilling apparatus especially designed for either stoper or horizontal drilling where short overall length of the apparatus and relatively long feeds are desirable.

One object of this invention is to provide a drilling apparatus with a feeding mechanism of the single power cylinder type, but arranged and constructed in a manner whereby the maximum feed of the drilling motor is materially greater than that of the feed cylinder.

Another object of this invention is to produce a feed mechanism of a short overall length but capable of a relatively long feed such as heretofore obtained with feed of the telescopic cylinder type, the improved feed mechanism being characterized by the use of a single power cylinder and piston unit, thereby resulting in a uniform feed pressure maintained throughout the entire length of feed without resorting to the use of pressure balancers or the like needed to balance the pressure of the various telescoping cylinders.

These objects are accomplished by a construction free of complication, and by an arrangement of parts resulting in a compact unit which is strong, durable and efficient.

In the drawings:

Figure 1 is a side elevational view of a drilling apparatus embodying the invention and shown in a retracted position.

Figure 2 is a view similar to Figure 1 but showing the drilling apparatus in a fully extended position, while Figure 3 is a view corresponding to Figure 2 but shown partly in section to show details of construction.

Figure 4 is an enlarged cross-sectional view taken on line 4—4 in Figure 1.

Figure 5 is an enlarged cross-sectional view taken on line 5—5 in Figure 1.

Figure 6 is an enlarged end elevational view of the drilling apparatus looking in the direction of the arrows 6—6 in Figure 1 and turned 90° in a clockwise direction.

Figure 7 is an enlarged sectional view taken on line 7—7 in Figure 1 and also turned 90° in a clockwise direction.

Figures 8 and 9 are cross-sectional views taken on line 8—8 in Figure 7, showing the throttle valve in different positions.

Figure 10 is a cross-sectional view taken on line 10—10 in Figure 7.

Figures 11 and 12 are cross-sectional views taken on line 11—11 in Figure 7, showing the throttle valve in different positions.

It will be understood from the following description that Figures 7, 8, 10 and 11 show the throttle valve positioned during the drilling operation, and that Figures 9 and 12 show the throttle valve positioned to cut off supply of pressure fluid to the feed cylinder and drilling motor and exhaust the pressure fluid from the feed cylinder.

Referring to the drawings, 20 generally designates a fluid actuated rock drill or drilling motor of the percussive type well known in this art. Briefly it comprises a back head 21, a cylinder 22 and front head 23 secured

together by side bolts 24. A drill steel 25 extends from the front end, on which a piston, not shown, reciprocating within the cylinder 22 delivers impacts in rapid succession.

As shown in Figure 7, back head 21 is equipped with a rotatable cylindrical throttle valve 26 retained therein by a gland nut 27, through which extends the valve shank 28 having affixed to its free end a valve operating handle 29. The throttle valve is provided with a central bore 30 in constant communication with one end 31 of a pressure fluid conveying conduit 32, through a port 33. As shown in Figures 8 and 9, the external wall of valve 26 is provided with two diametrically opposed peripherally extending groves 34 and 35, the grove 34 communicating with the central bore 30 through a radial port 36. Within the cross plane indicated by line 8—8 in Figure 7, back head 21 is machined to receive the screw threaded connection end 37 of a flexible conduit 38, which end is in communication with the valve through a port 39. In the same plane is also located a vent 40 which leads from the valve to the outside of back head 21.

Within the cross plane indicated by line 10—10 in Figure 7, back head 21 is provided with a bore having slidable therein a spring biased plunger 41 having its outer end adapted to fit within either of two peripherally spaced notches 42, only one of which is shown on the drawing, for holding the valve in two different positions.

Within the cross plane indicated by line 11—11 in Figure 7, throttle valve 26 is provided with a radial port 43 affording possible registry of central bore 30 with a passage 44 through which pressure fluid may be supplied to the drilling motor 20 for actuating same in the usual manner.

As viewed in Figure 6, the under side of cylinder 21 is provided with a fixed guide block 45 secured thereon by plates 46 having their inner ends fitting within the cylinder guide-ways 47 and clamped to the guide block by bolts 48.

Referring now more particularly to the invention, the supporting and feeding mechanism for the drilling motor 20 comprises an upright tubular casing or cylinder 49 formed with a cylindrical chamber 50 extending substantially the full length thereof and closed at its lower end by an abutment-engaging pointed end 51. The upper end of chamber 50 is closed by a screwed in head 52 through which extends the piston rod 53 of a piston 54 slidably mounted within chamber 50. This piston, which is of the single acting type carries one or more cup shaped packings 55 facing toward the lower end of the chamber, which packings are retained on the inner end of the piston rod 53 by a follower 56 and nut 57. Near its upper end, cylinder 49 has formed on one side thereof and integrally therewith a longitudinally extending block 58, which as shown in Figure 6 is provided with laterally spaced and longitudinally extending parallel guide-ways 59.

Interposed between the drilling motor 20 and the feed cylinder 49, there is an elongated sliding frame generally designated by 60, which is formed of two parallel laterally spaced channel members 61. The two channel members are clamped against the ends of spacer sleeves 62 mounted on cross bolts 63. As seen in Figure 6, the lower sides of the channel members 61 constitute guides 64 closely fitted within the guide-ways 59 of the feed cylinder 49 for guided sliding movement relative thereto. Similarly the upper ends of the channel members constitute guides 65 closely fitted for slidable guided movement within corresponding guide-ways 66 formed within the underside portion of the guide block 45. Near its upper end, sliding frame 60 has fixed to its guides 64, by bolts 67, a bracket 68 formed with a bore in which is fixed, by a nut 70, the reduced free end 69 of the piston rod 53.

On each spacer sleeve 62 carried by the end cross

bolts 63 of the frame 60 is rotatably mounted a roller 71 having a taut flexible member or chain 72 passing over them with two portions extending therefrom parallelly and longitudinally between the channel members 61 of frame 60, with the ends of the chain attached to the underside of the guide block 45 between the guide-ways 66 by a clamping plate 73 and bolts 74. At a place equally spaced from its ends or its connection with guide block 45, chain 72 is also attached to the upper end of cylinder 49 or more particularly to a pad 80, rising between the guide-ways 59 of the block 58, by a clamping plate 81 and bolt 82.

From back head 21, flexible conduit 38 leads to the lower end of cylinder 49, where its threaded end connection 75 is secured in a boss 76 and opens into the lower end of chamber 50. This conduit is long enough to assume substantially the position shown in Figures 2 and 3 when the drilling apparatus is fully extended.

From the foregoing description, it will be understood that the guides 64 of the frame 60 are slidably fitted within the guide-ways 59 of the cylinder 49 and together form a guiding connection between the frame 60 and cylinder 59. It will also be understood that the bracket 68 forms a driving connection between the frame 60 and the free end of the piston rod 53, thereby enabling the frame to move freely with the piston 54 relative to the stationary cylinder 49. Similarly, the drilling motor 20 is adapted to move longitudinally on the frame 60, the guide-ways of its guide block 45 being fitted over the guides 65 of the frame to assure guided movement of the drilling motor on its supporting frame.

In the operation, when the apparatus is in the retracted position shown in Figure 1 and is held in that upright position by the operator, upon turning of the throttle valve 26 to the positions shown in Figures 8, 10 and 11, pressure fluid supplied by the conduit 32 into central bore 30 will flow therefrom through port 36 and port 39 into conduit 38 and into the lower end of piston chamber 50 of feed cylinder 49 through the connection 75. In this instance, pressure fluid admited in the lower end of the cylinder will act on piston 54 to drive it upwardly, thereby causing upward movement of frame 60 through the guide ways 59 of cylinder 49 at the same rate of speed as that of the piston relative to the cylinder.

Since chain 72 is attached to both the upper end of the stationary feed cylinder and the drilling motor 20, the frame 60 during its upward movement will, through its upper roller 71, act on the chain 72 to effect sliding motion of the drilling motor on the frame at the same rate of speed and same direction as that of the frame on the cylinder and consequently at twice the speed of the frame relative to the stationary cylinder.

In the position of the throttle valve as shown in Figure 11, pressure fluid from central bore 30 is also free to flow through valve radial port 43 into passage 44, and therefrom into the drilling motor 20 for actuating same and causing impacts in rapid succession to be delivered to the drill steel 25.

When it is desired to retract the apparatus or lower the drilling motor, the throttle valve may be positioned as shown in Figures 9 and 12. In this instance, pressure fluid is cut off from the drilling motor 20 by port 43 moved out of registry with passage 44. At the same time, supply of pressure fluid is also cut off from piston chamber 50 by groove 34 moved out of registry with port 39, and groove 35 connecting port 39 with exhaust or vent 40, thereby enabling exhaust of the pressure fluid from the piston chamber 50 and collapse or retraction of the apparatus by gravity. By more or less complete registration of groove 35 with ports 39 and 40, it is possible for the operator to control the rate of speed at which retraction of the apparatus takes place.

While drilling apparatus of the type wherein feeding motion is imparted to the drilling motor at twice the rate of speed of the primary feeding element, have been used before and are well known in this art, it has been found that by the present aggroupment of parts, their length as well as the length of the sliding bearings between relatively slidable parts, makes it possible to obtain longer feed for the drilling motor for a given retracted length of the apparatus, than heretofore possible with any known feeding mechanism of this type. Because of the arrangement of the parts as above described, it is possible in the retracted position of the apparatus for the lower ends of the drilling motor 20 and sliding frame 60 to be substantially level or flush with the lower end of cylinder 49, while the upper end of the sliding frame is well above or beyond the corresponding end of the drilling motor. In the extended position, the sliding frame 60 is well beyond the upper end of the stationary cylinder 49, only a relatively small portion of its guides 64 remain within the guide-ways 59, while the front end of the drilling motor 20 is also well beyond the corresponding end of the frame 60.

As clearly shown in Figure 1, the retracted position of the apparatus, the sliding bearings or supporting means between the stationary cylinder 49 and sliding frame 60 are close together within the upper end portion of the cylinder. As the apparatus is gradually extended during the normal drilling operation, these two supporting bearing means, that is, the sliding engagement of block 58 with the frame and the bracket 68 connecting the front ends of the frame and piston rod, gradually move apart to assume the final fully extended position shown in Figures 2 and 3. In this last position, both ends of the sliding frame 60 are connected to and supported by the stationary cylinder 49, thereby affording the entire drilling apparatus to operate efficiently until it reaches its fully extended position, without danger of distortion and with the assurance that the drilling motor 20 and its drill steel 25 will always be fed to the work parallelly to the center axis of the feed cylinder to maintain the drill steel in its best and most advantageous drilling position.

The details of structure and arrangement of parts shown and described may be variously changed and modified without departing from the spirit and scope of the invention.

I claim:

In a drilling apparatus, a stationary upright cylinder having a piston slidable therein, an abutment-engaging lower end for said cylinder, a piston rod extending from said piston through the upper end of said cylinder, means admitting pressure fluid within the lower end of said cylinder for effecting upward movement of said piston and rod, parallel guide-ways on the upper end portion of said cylinder, an upright frame alongside of said cylinder formed of two parallel channel bars mounted back to back in spaced relationship, said bars forming a first and a second pair of parallel guides extending the full length of said bars, said first pair being slidable within said guide-ways, a rigid connection between the upper ends of said rod and frame transmitting upward movement of the former to the latter, a drilling motor, parallel guide-ways on said drilling motor, said second pair of guides being slidable within last said guide-ways, rollers between the ends of said bars, and a flexible member between said bars taut over said rollers and attached to said motor and the upper end of said cylinder whereby upward slidable movement of said frame is transmitted to said motor at a different rate of speed from that of said frame relative to said cylinder.

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