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FEED CONTROLLING DEVICE FOR ROCK DRILLING MECHANISMS

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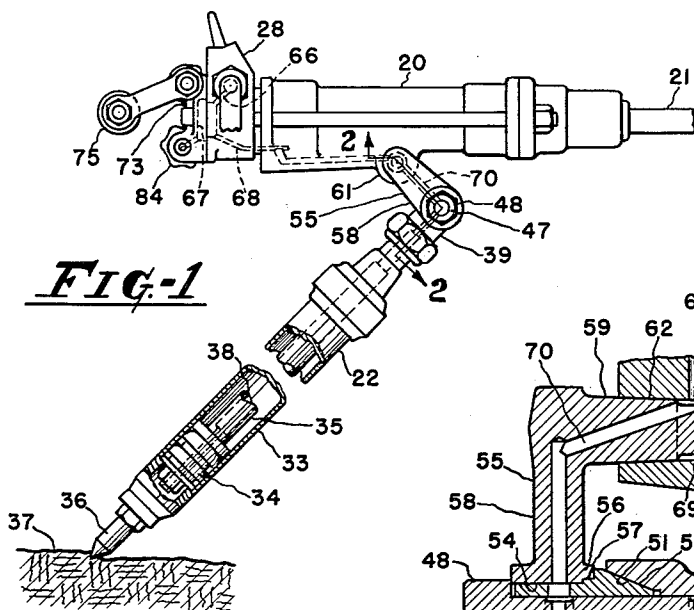


**FIG-1**

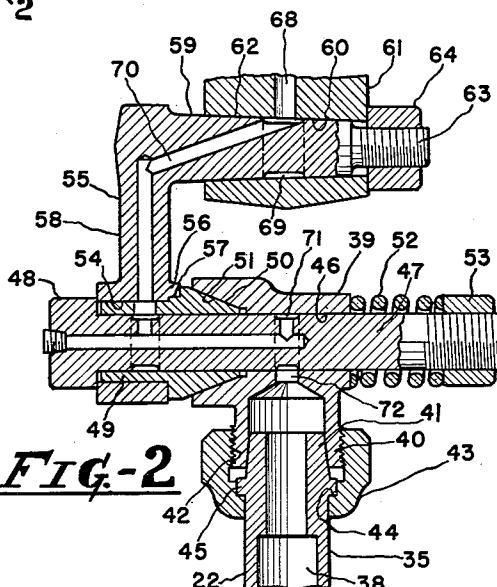


**FIG-2**

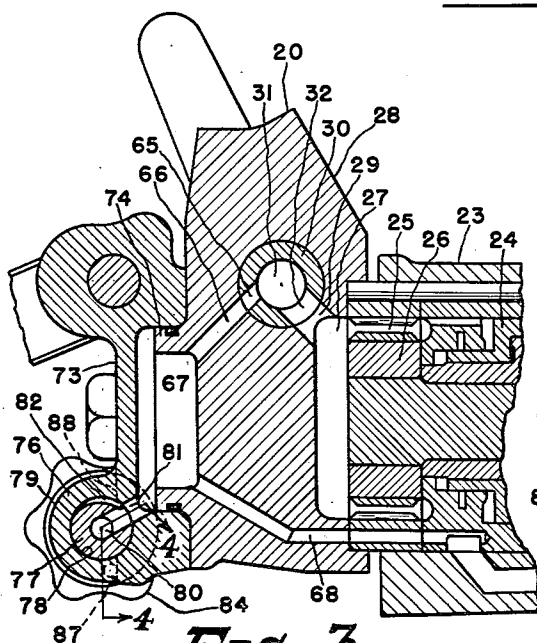


**FIG-3**

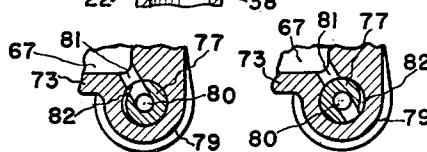


**FIG-5**

**FIG-6**

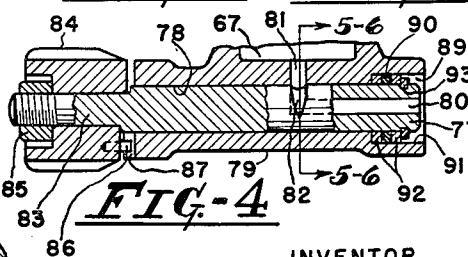


**FIG-4**

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## 3,064,741 FEED CONTROLLING DEVICE FOR ROCK DRILLING MECHANISMS

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This invention relates to rock drilling mechanisms of the type having a fluid actuated feed controlling device attached to a rock drill for advancing it in accordance with the rate of penetration of the drill steel into the work.

More particularly, the invention pertains to the type of rock drilling mechanisms in which a feeding device is pivotally connected to an intermediate portion of a rock drill and include separate flexible conduits in their structures for the delivery of pressure fluid to the rock drill and to the feeding mechanism. In most instances of use, this has been found to be undesirable because of the difficulty of keeping a plurality of conduits out of the area traversed by the operator, and also because of the increased cost of maintenance due to wear and tear upon and frequent damage to the conduits.

It is accordingly contemplated herein to effect the delivery of fluid to the feeding mechanism through channels located only within the drilling mechanism and thereby eliminate the need of a separate conduit and its connections for the feeding device.

A further object is to minimize the need for repeated manipulation of the devices serving to maintain a desired feeding pressure within the feeding device.

Other objects will be in part obvious and in part pointed out hereinafter.

In the drawings accompanying this specification and in which similar reference numerals refer to similar parts,

FIGURE 1 is a side elevation, partly broken away, of a rock drilling mechanism constructed in accordance with the practice of the invention,

FIGURE 2 is a transverse view taken through FIGURE 1 on the line 2—2.

FIGURE 3 is a longitudinal view, in section, of the rearward portion of the rock drill,

FIGURE 4 is a transverse view taken through FIGURE 3 on the line 4—4 showing one of the control valves of the device, and

FIGURES 5 and 6 are similar views taken through FIGURE 4 on the line 5—5, 6—6 showing different controlling positions of the control valve.

Referring more particularly to the drawings and at first to FIGURE 1, 20 designates a rock drill for actuating a drill steel 21, and 22 is a feeding device for supporting and maintaining the rock drill in the correct operative relationship with the drill steel 21.

The rock drill 20 is of the reciprocatory hammer type and contains, in its rearward end 23, a valve mechanism 24 for effecting the distribution of pressure fluid to the percussive element (not shown) of the rock drill. The pressure fluid is delivered to the valve mechanism 24 by a passage 25 which extends through the casing parts 26 of the valve mechanism 24 and communicates with a supply chamber 27 in a back head 28 of the rock drill. Pressure fluid enters the chamber 27 from a passage 29 controlled by a throttle valve 30 which is rotatable within the back head 28 and has a central bore 31 that may be in constant communication with a source of pressure fluid supply and also has a port 32 opening into the bore 31 and positioned for registry with the passage 29.

The feeding device 22 is also fluid actuated. It is extensible and comprises a cylinder member 33 and a piston member 34, which has a rod 35 that projects from the

uppermost end of the cylinder 33. The cylinder 33 is the stationary member of the feeding device 22 and has a pointer 36 at its lower end for engagement with a supporting surface 37.

The piston rod 35 is hollow throughout its length to provide therein a channel 38 for the delivery of pressure fluid into the lower end of the cylinder beneath the piston 34 to thereby extend the feeding device, and on the end portion of the rod 35 projecting from the cylinder 33 is a head 39 having a sleeve portion 40 to receive a tapered end 41 of the rod 35. The sleeve 40 is threaded externally for cooperation with the threads 42 of a nut 43 which has an internal shoulder 44 for engagement with a flange 45 on the rod 35 to draw the tapered end 41 of the rod into firm frictional engagement with the interior surface of the sleeve 40.

In the free end portion of the head 39 is a cylindrical bore 46 that is positioned at right angles to the rod 35 and contains a shaft 47 that projects from the ends of the head 39 and carries on one end a head 48, and on the shaft 47 between the heads 48 and 39 is a sleeve 49 having an externally tapered end portion 50 that is in frictional engagement with the surface of a tapered bore 51 at one end of and concentric with the cylindrical bore 46. The degree of such frictional engagement is controlled by a spring 52 which encircles the opposite end of the shaft between the head 39 and a nut 53, on the shaft 47, whereby the pressure of the tapered portion 50 against the surface of the tapered bore 51 may be varied.

The untapered portion of the sleeve 49 lies within a bore 54 of a connector 55 which has a lateral projection 56 at the inner end of the bore 54 to overlie and engage a flat surface 57 on the periphery of the sleeve 49 for preventing relative rotation between the sleeve 49 and the connector.

The connector 55 comprises an arm 58 in an end of which is the bore 54. The arm 58 is arranged to swing about the axis of the shaft 47 and in the same plane or a plane substantially parallel to the axis of the feeding device 22 and carries at its opposite end an arm 59 which lies at right angles to the arm 58 and extends into a bore 60 of a lug 61 on the intermediate portion of the rock drill. The bore 60 is in parallelism with the shaft 47 and is tapered for frictional engagement with the tapered surface 62 of the arm 59.

The free end of the arm 59 has a threaded extension 63 for the accommodation of a nut 64 which bears against the side of the lug 61 for securing the connector 55 fixedly to the rock drill.

The supply of pressure fluid for the feeding device 22 is also controlled by the throttle valve 30 which has a port 65 for registration with a supply passage 66 that opens into a supply chamber 67 in the back head 28, and a passage 68 extends from the supply chamber 67, through the casing parts of the rock drill 20, to an annular groove 69 in the periphery of the arm 59. A passage 70 leads from the annular groove 69, through the arms 59—58 and through the sleeve 49 and the shaft 47, to an annular groove 71 in the periphery of the shaft 47, and the groove 71, in turn, communicates with a port 72 opening into the sleeve portion 40 of the head 39. The arrangement of the passages leading to the feeding device is such that the feeding device will be in constant communication with the supply chamber 67.

The supply chamber 67 may, as shown, be located in the rearward end of the back head 28 and is covered by a cap 73 in telescopic engagement with an annular flange 74 which extends from the rearward surface of the back head and defines the supply chamber 67.

The cap 73 carries a grip member 75 for guiding the rock drill relatively to the work and constitutes a housing for means serving to control the pressure within the feed-

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ing device. Such control means, designated in general by 76, includes a rotary valve 77 which is arranged within a bore 78 extending through an enlargement 79 on the cap 73 and has a passage 80 leading from the periphery of the valve 77 to an end thereof for communication with the atmosphere. A port 81 in the cap affords communication between the chamber 67 and the passage 80, and said port and the passage 80 are of larger flow area than the supply passage 66 so that, when the passage 80 is in full registry with the port 81, both the pressure fluid entering the chamber 67 from the supply passage 66 and that from the feeding device may be exhausted to the atmosphere without first requiring the manipulation of the throttle valve 30 to cut-off the chamber 67 from the source of pressure fluid supply.

To the end that the exhaust of fluid from the chamber 67 may be effected at a rate suitable to maintain a desired pressure within the feeding device, the valve 77 is provided with a partly annular groove 82 in its periphery which opens at one end into the passage 80, and is so formed that its flow area diminishes gradually towards its opposite end. This may be accomplished by gradually decreasing its depth or its width, or both.

At one end of the valve 77 is a reduced extension 83 carrying a knob 84 for rotating the valve, which knob is fixedly secured to the extension 83 by a nut 85. The range of movement of the valve is limited by a stop member in the form of a pin 86 projecting from the inner end of the knob 84 for engagement with shoulders 87 and 88 on the cap 73 and lying on opposite sides of the bore 78. The pin 86 and the shoulders 87 and 88 are so arranged that the passage 80 or any portion of the groove 82 may be placed in communication with the port 81 and that the port 81 may be blanked-off by the valve in a half revolution of said valve.

Means are provided for holding the valve 77 in its various controlling positions. To this end, the terminal portion of the valve, through which the outlet portion of the passage 80 extends, projects into an annular recess 89 in the enlargement 79 and carries a ring 90, rubber for example, for frictional engagement with the surface 91 of the recess 89. The ring 90 may be affixed to the valve 77 in any suitable manner and is supported at its opposite sides by metallic rings 92. All of the rings are held immovable, axially, by a spring ring 93 seated in the periphery of the valve and abutting the outermost ring 92.

In operation, the drilling mechanism is placed in a position to incline the feeding device 22 toward the work and the connector 55 is positioned angularly with respect to the rock drill to bring the latter into approximate balance on the shaft 47.

The nut 64 is next rotated to draw the arm 59 into tight engagement with the surface of the bore 60 so that the connector 55 will remain immovable relatively to the rock drill. Thereafter, the nut 53 is manipulated upon the shaft 47 to compress the spring 52 to the value required to draw the tapered portion 50 into a desired degree of frictional engagement with the surface of the bore 51. The valve 30 is next rotated to place the ports 32 and 65 in communication with the passages 29 and 66, respectively. Pressure fluid will then flow into the supply chamber 27 and through the passage 25 to the valve mechanism 24 whereby it is distributed to the percussive element of the rock drill for actuating the drill steel 21. Pressure fluid will then also flow into the supply chamber 67 and, through the associated passages, into the cylinder 35 to act against the piston 34 to urge the rock drill toward the work.

The valve 77 is next rotated to communicate the supply chamber 67 with the atmosphere. In the event that it be intended to merely maintain the feeding device in extended position, and in which case only manual pressure is applied to the rock drill for pressing the drill steel against the work, the area of communication between the passage

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80 and the port 81 will be large to effect a comparatively free exhaust of fluid from the supply chamber. If, on the other hand, it be desired to press the drill steel forcibly against the work with the assistance of the feeding device, a lesser area of communication will be established between the passage 80 and the port 81 and the pressure within the cylinder will rise in consequence. This, as will be readily understood, may be accomplished by placing only a small area of the passage 80 in communication with the port 81 or by placing any portion of the groove 88 in overlapping relation with said port.

Whenever it is required to remove the pressure of the feeding device from the rock drill while at the same time continuing operation of the rock drill, as when the drill steel becomes stuck in a drill hole, the valve 77 is rotated to a position in which the passage 80 is in full registry with the port 81. The pressure fluid thereafter entering the supply chamber 67 from the passage 66 will then flow directly to the atmosphere, and since the flow areas of the port 81 and the passage 80 are greater than that of the passage 66, pressure fluid will also be exhausted from the feeding device to the atmosphere to remove the thrust of the feeding device against the rock drill.

As will be readily apparent from the foregoing description, by so constructing the drilling mechanism that all of the pressure fluid utilized by the feeding device passes to and from it through channels located within the drilling mechanism only one supply conduit will be required and the cost of maintenance will thereby be minimized.

A further highly desirable advantage of the present invention is that, by rendering the pivotal connection between the feeding device and the rock drill shiftable, the rock drill may be conveniently balanced on the feeding device to compensate for such variations in weight as result through the insertion of drill steels of different lengths into the rock drill.

#### I claim:

1. In a rock drilling mechanism, the combination of a rock drill and a fluid actuated extensible feeding device for the rock drill, means for pivotally connecting the feeding device to an intermediate portion of the rock drill, there being a passage in the rock drill and the said means for conveying fluid to and from the feeding device, a supply chamber in the rock drill for the passage, a supply passage in the rock drill for the supply chamber, and means in the rock drill for exhausting pressure fluid from the supply chamber to the atmosphere to control the pressure within the feeding device and having greater capacity for fluid flow than the supply passage.

2. In a rock drilling mechanism, the combination of a rock drill and a fluid actuated extensible feeding device for the rock drill, connecting means connected to the rock drill intermediate the ends thereof and pivotally to the feeding device, there being a passage in the rock drill and the said means for conveying fluid to and from the feeding device, a supply chamber in the rock drill for the passage, a supply passage in the rock drill for the supply chamber, a valve for controlling the supply passage, an exhaust port for the supply chamber having greater capacity for fluid flow than the supply passage, and a manually operable valve for controlling the exhaust passage.

3. In a rock drilling mechanism, the combination of a rock drill and a fluid actuated extensible feeding device for the rock drill, a connector pivotally connected to the rock drill, means for securing the connector immovably to the rock drill, a pivot in the connector for the feeding device, there being a passage in the rock drill and the connector and the pivot for conveying fluid to and from the feeding device, a supply chamber in the rock drill for the passage, a supply passage in the rock drill for the supply chamber, and means in the rock drill for exhausting pressure fluid from the supply chamber to the atmosphere for controlling the pressure within the feeding device and

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having greater capacity for fluid flow than the supply passage.

4. In a rock drilling mechanism, the combination of a rock drill and a fluid actuated extensible feeding device for the rock drill, a connector pivotally connected to the rock drill, means for securing the connector immovably to the rock drill, a pivot in the connector for the feeding device, friction members on the connector and the feeding device cooperating with each other to resist free relative pivotal movement between the rock drill and the feeding device, there being a passage in the rock drill and in the connector and the pivot for conveying fluid to and from the feeding device, a supply chamber in the rock drill for the passage, a supply passage in the rock drill for the supply chamber, and means in the rock drill for exhausting pressure fluid from the supply chamber to the atmosphere for controlling the pressure within the feeding device and having greater capacity for fluid flow than the supply passage.

5. In a rock drilling mechanism, the combination of a fluid actuated rock drill and a fluid actuated extensible feeding device for the rock drill, connecting means for pivotally connecting the rock drill to the feeding device, a passage in the rock drill and the connecting means for conveying fluid to and from the feeding device, a valve for controlling the supply of pressure fluid to the passage and to the rock drill, and means for exhausting such fluid from the passage to the atmosphere for controlling the pressure within the feeding device and having greater flow capacity than the passage.

6. In a rock drilling mechanism, the combination of a rock drill and a fluid actuated feeding device for the rock drill, connecting means having a pivot mounted on

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the rock drill intermediate the ends thereof and having a second pivot mounted on the feeding device, said pivots being in substantial parallelism with each other such that the rock drill and the feeding device are turnable about the respective pivots in substantially parallel planes, and a passage in the rock drill and the connecting means for conveying fluid to and from the feeding device.

7. In a rock drilling mechanism, the combination of a rock drill and a fluid actuated feeding device for the rock drill, connecting means having a pivot mounted on and extending transversely of the rock drill and having a second pivot in substantial parallelism to the first mentioned pivot mounted on and extending transversely of the feeding device such that the rock drill and the feeding device are turnable about the respective pivots in the same plane, and a passage in the rock drill and the connecting means for conveying fluid to and from the feeding device.

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