This invention relates to a feed leg for drills.

Feed legs for rock drills are well known in the mining industry and may be either single or double acting. A single acting feed leg will exert pressure on the drill to push it into the rock but the drill must be manually extracted. A double acting feed leg will not only exert pressure on the drill to push it into the rock but will also assist in pulling it out of the rock. One disadvantage of existing feed legs is that operators desirous of using both single and double acting feed legs must have numerous parts available for each type. Another disadvantage is that existing single acting legs cannot readily be converted into double acting legs.

One of the objects of this invention is to provide a simple structure that is common to both single acting and double acting feed legs. By use of the invention the total number of parts required for the manufacture of a line of single and double acting feed legs may be reduced.

Other objects and advantages of the invention will appear from the following description of preferred embodiments of the invention.

In the accompanying drawings which illustrate preferred embodiments of the invention:

Figure 1 is a diagrammatic view of a single acting feed leg being used with a drill in a mine;

Figure 2 is a longitudinal view partly sectional and partly broken away of the single acting feed leg;

Figure 3 is a perspective view of a cylindrical plug for one end of the feed leg; and

Figure 4 is a view similar to Figure 2 of a double acting feed leg.

The use of a single acting feed leg can be seen from Figure 1. A pneumatic drill 2 having an air supply hose 4

and a drill rod 6 is braced and supported by a feed leg generally indicated by numeral 8. At one end the feed leg 8 has a mechanical and pneumatic connection 10 with the drill and at its opposite end the feed leg has a foot 12 which can be braced against the mine floor 13 or any convenient structure. As the drilling proceeds, the rod 6 penetrates the rock 14 and the drill advances to the position 2' shown in dotted lines and air supplied from the drill to the feed leg 8 causes the feed leg to extend to the dotted position 8'.

Referring to Figure 2, the feed leg 8 has a cylinder 15 and a hollow tube 16 coaxial with the cylinder 15 and slidable longitudinally therein. The tube 16 has openings 18 in its wall 20. Mounted on the tube 16 over the openings 18 is a piston 22 slidable in the cylinder 15, the piston 22 having passages 24 communicating between the openings 8 and one end 22a of the piston 22, so that fluid under pressure may flow from the interior 26 of the tube 16 to the interior of one end 15a of the cylinder 15. Two U-shaped sealing rings 28 and 30 fit into grooves 32 and 34 in the piston 22. Under the pressure of fluid in the end 15a of the cylinder 15 the arms 36 and 38 of the U ring 28 spread apart, the arm 36 pressing against the cylinder 15 and the arm 38 pressing against the bottom of the groove 32. The two rings 28 and 30, facing in opposite directions as shown in Figure 2, ensure a fluid tight sliding connection between the piston 22 and the cylinder 15 no matter which end of the cylinder is under fluid pressure.

The piston 22 is held firmly but detachably in place on the tube 16 by a flange 40 on the tube 16 abutting the end 22b of the piston 22 and by a cap 42 threadably attached to the end 16a of the tube 16 and abutting the end 22a of the piston 22. Through the cap 42 is a hole 44 coaxial

with the tube 16 and around the hole 44 is a groove 46 adapted to receive a sealing ring as will later be described.

At the end 15b of the cylinder 15 is a cylindrical plug 48 coaxial with and fitting tightly into the cylinder 15 and having at one end a rim 50 that abuts against the cylinder 14. At its other end the plug 48 has a circumferential groove 54 which receives an O ring 55 to provide a fluid seal between the plug 48 and the cylinder 15. A cap 56 threaded onto the outside of the end 15b of the cylinder 15 presses a wiper 58 into a recess 60 in the plug 48 and by its pressure on the wiper 58 helps to hold the plug in the cylinder 15. The cap 56, the wiper 58, and the plug 48 define together a space 62 around the outside end of the plug 48 and this space communicates with holes 64 through the cap 56. In the outside end of the plug 48 are slots 66 (see Figure 3) which communicate between the space 62 and a groove 68 at the inside circumference of the plug. Passages 70 through the plug communicate between the groove 68 and the interior of the end 15a of the cylinder 15, so that fluid may be exhausted from the interior of the end 15a of the cylinder through ports defined by the passages 70, the groove 68, the slots 66, the space 62, and the holes 64 in the cap. The groove 68 is adapted to receive a sealing ring held in position by the pressure of the wiper 58 against the plug 48, as will later be described.

The wiper 58 consists of a neoprene disc 72 backed by and with its outside edge enclosed by a metal disc 74, the neoprene disc 72 abutting against the cap 56 and the metal disc 74 abutting against the plug 48. The plug 48, the metal disc 74, and the cap 56 have respectively holes 76, 78, and 80 through which the tube 16 slides. The neoprene disc 72 has a smaller hole 82 and this disc tightly embraces

the tube 16 with its inside edge 83 deforming outwardly, wiping the tube 16 as it slides through the wiper 58.

To make a single acting leg from the structure so far described, the mechanical and pneumatic connection 10 with the drill is screwed into an interior thread 84 in the end 16b of the tube 16. The connection 10 includes a rod 86 threaded to match the threads 84 and having an interior passage 88 which communicates between the source of fluid and with the interior 26 of the tube 16. At the other end 15a of the cylinder 15, a cap 90 is threadably attached to the outside of the cylinder, the cap 90 having an interiorly threaded hole 92 coaxial with the cylinder 15. Into this hole 92 is screwed the central spike 93 of the foot 12 for the feed leg, the cap 90 and spike 93 together providing a fluid tight seal at the end 15a of the cylinder 15. An outer spike structure 94 of the foot 12 is held against the cap 90 by means of a tightening nut 95 on the central spike.

The operation of the device as a single acting feed leg is as follows. Referring to Figure 2, fluid under pressure is admitted from the drill through the passage 88 in the connection 10 and into the interior 26 of the tube 16. The fluid flows through the openings 18, the passages 24, and into the interior of the end 15a of the cylinder 15 where it acts on the piston 22 to drive the tube 16 out the end 15b of the cylinder 15. Air is exhausted from the interior of the end 15b of the cylinder 15 through the passages 70, the groove 68, the slots 66, the space 62, and the holes 64 in the cap 56. The tube 16 exerts pressure on the drill 2 through the connection 10. When the feed leg is in its extended position, it must be manually telescoped back into its retracted position.

Now referring to Fig. 4, a double acting feed leg can be made using much of the structure described above for a single acting leg. The foot 12 is secured, by the threads 84, to the end 16b of the tube 16. In the groove 68 of the

plug 48 is placed a sealing ring 94, preferably a U-ring similar to the rings 28 and 30 on the piston 22. The pressure of fluid in the passages 70 of the plug spreads apart the arms 96 and 98 of the sealing ring 94, the arm 96 blocking off flow of fluid through the exhaust ports provided by the passages 70, groove 68, slots 66, space 62 and holes 64, while the arm 98 presses against the outside surface of the tube 16, ensuring a fluid tight seal with the tube 16 as it slides through the sealing ring 94. Thus with the sealing ring 94 held between the plug 48, which serves as a seat for the sealing ring, and the cap or cover 56, fluid cannot escape from the interior of the end 15b of the cylinder 15.

For a double acting leg the piston 22 is placed on the tube 16 in a position reversed end for end from its position in the single acting leg. The passages 24 in the piston now communicate with the interior of the end 15b of the cylinder and, through the openings 18, with the interior 26 of the tube 16.

At the end 15a of the cylinder a valve head 100 is threadably attached at 102 to the outside of the cylinder and seals this end of the cylinder except for passage of fluid through the head 100 itself. A tube 104 integral with and projecting from the valve head 100 extends through the hole 44 in the cap 42 and into the interior 26 of the tube 16, the tube 104 being coaxial with the tube 16. The tube 104 being immovable relative to the cylinder 15, the tubes 16 and 104 have a fluid tight sliding seal between them at the cap 42 where a sealing ring 106 inserted into the groove 46 presses against the outside surface of the tube 104. At the open end of the tube 104 a flange 108 slidably supports the tube 104 within the tube 16. Holes 110 near the flange 108 permit passage of fluid between the interior of the tube 104 and both ends of the interior 26 of the tube 16.

At the head end of the tube 104, a passage 112 leads from the interior of the tube 104 to a valve chamber 114, the chamber 114 being cylindrical and parallel to the cylinder 15. From the valve chamber 114, near one end 114a, another passage 116 leads to a port 118 which opens into the interior of the end 15a of the cylinder 15. A third passage 120 leading from the valve chamber 114 at a point between the passages 112 and 116 connects with an inlet 122 in the valve head 100. Into this inlet 122 is screwed the connection 10 with the drill.

In the valve chamber 114 are two exhaust vents 124 and 126, the vent 124 being in the wall of the valve chamber 114 near its end 114b and the vent 126 being in the end 114a of the valve chamber 114. A spool shaped plunger 128, to one end of which is attached a push rod 130, fits slidably within the valve chamber 114. A spring 138 normally holds the plunger at the end 114a of the valve chamber 114, where the plunger allows communication between the passages 116 and 120 while blocking off both these passages from the exhaust vents 124 and 126. At the same time the passage 112 communicates through the valve chamber 114 with the exhaust vent 124.

To draw the plunger 128 towards the end 114b of the chamber 114, a lever 140 having an arm 142 is pivoted at 143 on the handle 144 of the cylinder 15. This lever 140 is forked over the push rod 130 and is in sliding contact with a nut 146 on the end of the push rod. When the arm 142 of the lever is pulled upwards, the lever moves the plunger 128 towards the end 114b of the valve chamber 114, against the pressure of the spring 138. The plunger 128 assumes a position where it blocks off the passages 112 and 120 from the exhaust vents 124 and 126, and allows communication

between the passages 112 and 120. At the same time the passage 116 communicates through the valve chamber 114 with the exhaust vent 126.

The operation of the device as a double acting feed leg is as follows. Referring to Figure 4, fluid under pressure is admitted from the drill connection 10 through the inlet 122 into the passage 120 in the valve head 114. With the plunger 128 in the position shown in Figure 4 the fluid passes through the passage 116, the port 118, and into the interior of the end 15a of the cylinder 15. It here exerts pressure between the piston 22 and the valve head 100, and since the tube 16 is braced against the mine floor by means of the foot 12 the cylinder 15 is forced to slide longitudinally of the tube 16 and press the mining drill forwardly. Fluid is exhausted from the interior of the end 15b of the cylinder 15 through the passages 24, the openings 18, the interior 26 of the tube 16, the holes 110, the interior of the tube 104, the passage 112, the valve chamber 114, and the exhaust vent 124.

When it is desired to retract the feed leg from its extended position, the arm 142 is moved upwards, moving the plunger 128 towards the end 114b of the valve chamber 114. Fluid under pressure is then admitted through the inlet 122, the passage 120, the passage 112, the interior of the tube 104, the holes 110, the interior 26 of the tube 16, the openings 18, and the passages 24 into the interior of the end 15b of the cylinder 15. It here exerts pressure between the piston 22 and the plug 48 to drive the tube 16 back into the cylinder and withdraw the mining drill from the rock. The end 15a of the cylinder exhausts through the port 118, the passage 116 and the vent 126.