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ROTATION MECHANISM

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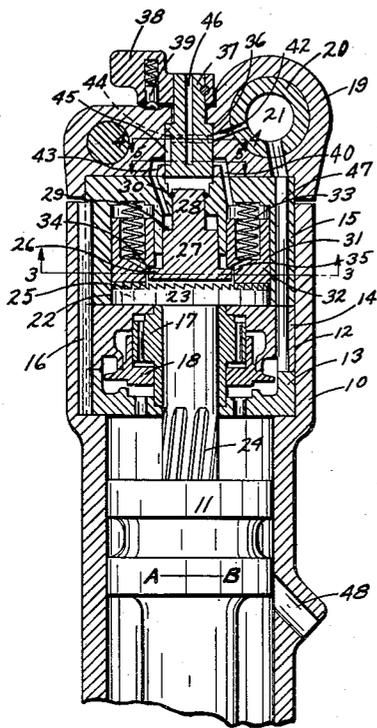


Fig. 1

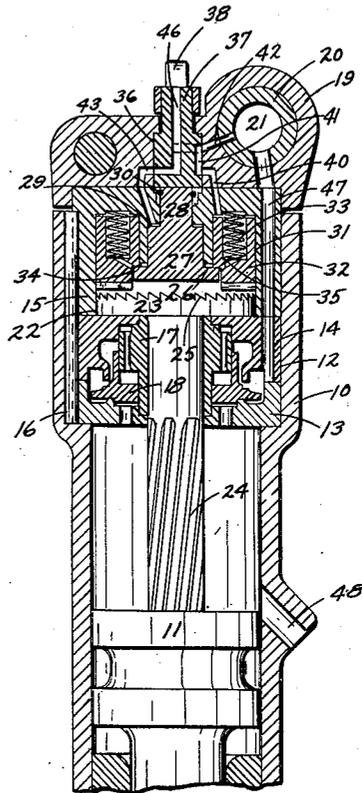


Fig. 2

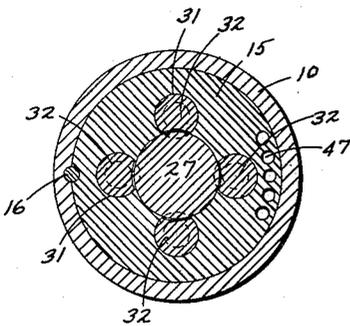


Fig. 3

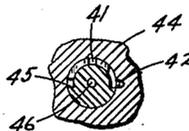


Fig. 4

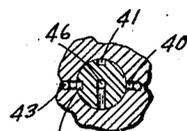


Fig. 5

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ROTATION MECHANISM

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3 Claims. (Cl. 121-7)

This invention relates broadly to rock drills, but more particularly to a rotation mechanism for fluid actuated rock drills of the percussive type.

One object of this invention is to produce an improved rotation mechanism for rock drills, the mechanism having a reduced number of parts and affording a simple construction which is strong, durable and efficient.

Other objects of this invention will be apparent from the following detailed description wherein similar character of references designate corresponding parts and wherein:

Fig. 1 is an elevational sectional view of the rock drill having the invention applied thereto.

Fig. 2 is a view similar to Fig. 1 illustrating some of the parts in different position.

Fig. 3 is a cross sectional view taken in a plane indicated by line 3-3 in Fig. 1.

Fig. 4 is a cross sectional view taken in a plane indicated by line 4-4 in Fig. 1.

Fig. 5 is a cross sectional view taken in a plane indicated by line 5-5 in Fig. 1.

Referring to the drawing, 10 represents the cylinder of a rock drill having a hammer 11 reciprocable therein for delivering blows to a tool implement (not shown). The upper end of the cylinder is formed with a relatively deep counterbore 12 accommodating a valve cap 13, valve housing 14 and a casing 15, which are locked therein against rotation by a dowel pin 16. Within the valve casing 14, there is disposed a stationary valve bushing 17 having slidably thereon a valve 18 automatically actuated for controlling the admission of the motive fluid into the cylinder for actuating the hammer 11.

Detachably secured above the cylinder 10 in engagement with the casing 15, there is a back head 19 having a throttle valve 20 rotatably mounted therein. This throttle valve is provided with a central bore 21 having motive fluid admitted therein in the usual manner.

The casing 15 is formed with a central bore extending therethrough, the bore being of differential diameters one of which, adjacent the valve housing 14, forms a cylindrical counterbore 22 having rotatable therein the head 23 of a rifle bar 24, which extends into the cylinder 10 for interengagement with the hammer 11. The head 23 has its upper end wall provided with ratchet teeth 25, the purpose of which will be explained hereinafter. Leading upwardly from the counterbore 22 there is a smaller counterbore accommodating the annular bead 26 of a small piston 27 slidably mounted within the bore extending through the casing. The upper end of this piston

is reduced to form a stem 28 defining with the main body of the piston an annular shoulder 29. On the stem 28 is mounted a spring clip 30 engageable with the bottom of a small counterbore for limiting the downward movement of the piston. Provided within the casing 15, and disposed around the piston 27, there are four equally spaced flat bottom holes 31 leading upwardly from the bottom of the cylindrical counterbore 22. Within each hole 31, there is slidably mounted a hollow plunger 32 constantly urged toward the disk 23 by a compression spring 33 mounted within the plunger and engaging the bottom of the hole 31. The front end wall of this plunger is formed with teeth capable of operative engagement with the teeth 25 of the disk 23. The plungers 32 are located to extend inside of the marginal edge of the annular bead 26 of the piston 27, and to accommodate this bead each plunger is formed with a circular cut away portion constituting a step 34 with which the bead 26 is engageable for lifting the plungers away from the head 23. Through each plunger, there is a small port 35 leading from the interior of the plunger to a clearance provided between the bead 26 and the adjacent wall of the plunger.

Centrally located through the back head 19, there is a bore 36 having a relatively small valve 37 rotatable therein and protruding from the back head to receive a handle 38, which carries a spring pressed plunger 39 engageable within notches formed on the head for locking the valve 37 against accidental rotation.

Leading from the bottom of one hole 31 accommodating a plunger 32 to the valve 37, there is a port 40, which is capable of communication with the throttle valve chamber 21 through a passage 41 formed on the valve 37, and a port 42 leading from the valve 37 into the valve chamber 21. The valve 37 is also in communication with the annular shoulder 29 formed on the piston 27 through a port 43, which port is capable of communication with the throttle valve chamber 21 through the port 42, a valve groove 44 and a valve passage 45. Through the valve 37, there is another port 46 opening to the atmosphere and capable of communication with the port 43.

From the throttle valve chamber 21, motive fluid may be admitted to the automatic valve 18 through a plurality of ports 47, from where it is admitted into the cylinder 10 for actuating the hammer 11 in the usual manner. The cylinder 10 is also provided with a port 48 to allow the exhaust of the motive fluid from the cylinder.

In the operation of the mechanism, let us as-

sume that the valve 37 is positioned as shown in Fig. 1, and that motive fluid is admitted into the throttle valve chamber 21. From this chamber, the motive fluid will flow through the ports 47 into the cylinder 10 for effecting the reciprocation of the hammer 11. Due to the engagement of the helical splines formed on the bar 24 with similar splines formed within the hammer 11, it is obvious that the reciprocation of the latter will tend to cause the oscillatory motion of the bar. However, with the valve 37 positioned as shown in Fig. 1, motive fluid from the throttle valve chamber 21 is admitted on the annular shoulder 29 of the piston 27 via the port 42, valve groove 44, valve passage 45 and port 43, thus maintaining the piston 27 downwardly and allowing the engagement of the spring pressed plungers 31 with the disk 23. Since the end wall of each plunger is formed with teeth meshing with the teeth 25 of the disk 23, it will be understood that the rotation of the disk 23 and stem 24 in a B to A direction is prevented by the plungers 32, thus causing the hammer 11, during its upward stroke, to rotate in an A to B direction. During the downward stroke of the hammer 11, the latter will tend to rotate the stem 24 in an A to B direction. In this instance the pawls 31 compressing the springs 33 will simply ride the teeth 26 of the disk 23, allowing the rotation of the latter without effecting the rotation of the hammer.

In a rock drill of the character described, the hammer 11 is operatively associated with the drill steel or tool implement by a suitable chuck connection, whereby the rotation of the piston in one direction is transmitted to the drill steel.

When it is desired to use the rock drill without imparting rotation to the drill steel, the valve 37 may be positioned as shown in Fig. 2. In this instance, motive fluid from the throttle valve chamber 21 will flow via the port 42, valve passage 41 and port 40 into the interior of one pawl 31, from where it will be admitted on the front end of the piston 27 via the port 35. Simultaneously the motive fluid previously admitted on the annular shoulder 29 of the piston 27, is free to exhaust therefrom via the port 43 and valve port 46, allowing thereby the motive fluid acting on the front end of the piston 27 to drive the piston rearwardly. During this rearward motion of the piston 27, the annular bead 26 engaging the step 34 of the plungers 35, will move and maintain the plungers out of engagement with the teeth 25 of the disk 23, thus permitting the oscillatory motion of the stem 24 during the reciprocation

of the hammer 11 without effecting the rotation of the latter.

Although the foregoing description is necessarily of a detailed character, in order to completely set forth the invention, it is to be understood that the specific terminology is not intended to be restrictive or confining and it is to be further understood that various rearrangements of parts and modification of structural detail may be resorted to without departing from the scope or spirit of the invention as herein claimed.

I claim:

1. In a fluid actuated rock drill, the combination of a housing, a reciprocatory hammer in the housing, a rotatable rifle bar operatively associated with said hammer, teeth on said bar, a plurality of non-rotatable elements engageable with the teeth on said bar for locking the bar against rotation for effecting the rotation of said hammer, and a single fluid actuated member engageable with all of said elements for concurrently lifting and holding the same out of engagement with the teeth of said bar for allowing the bar to rotate instead of the hammer during the reciprocation of the latter.

2. In a fluid actuated rock drill, the combination of a housing, a reciprocatory hammer in the housing, a rotatable rifle bar operatively associated with said hammer, detents receiving means on said bar, a plurality of non-rotatable detents disposed around the longitudinal axis of said bar movable into said detents receiving means on said bar for holding the bar stationary and effecting the rotation of said hammer, and means including a fluid actuated member coaxially disposed with said bar engageable with said detents for concurrently lifting and holding the same out of said detents receiving means for allowing the bar to rotate instead of the hammer during the reciprocation of the latter.

3. In a fluid actuated rock drill, the combination of a housing, a reciprocatory hammer in the housing, a rotatable rifle bar operatively associated with said hammer, a head on said bar having teeth formed thereon, a plurality of non-rotatable and axially movable elements engageable with said teeth for holding the bar stationary for effecting the rotation of said hammer, and a single fluid actuated piston engageable with all of said elements for axially lifting and holding the same out of engagement with said teeth for allowing the bar to rotate instead of the hammer.

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