June 9, 1936. G. W. HULSHIZER 2,043,352

ROTATION MECHANISM

Filed Jan. 16, 1936

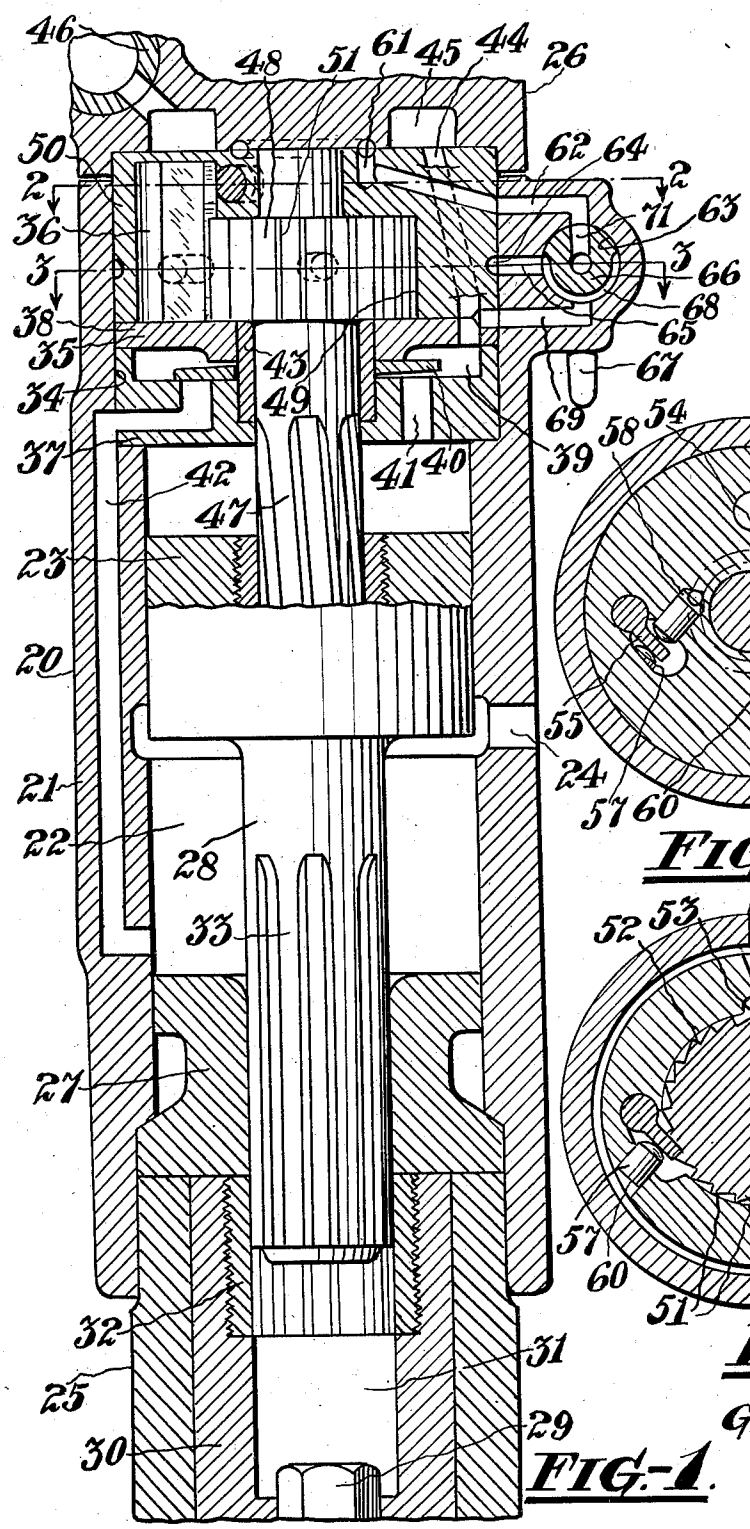


FIG.-1.

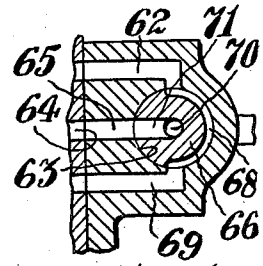


FIG.-4.

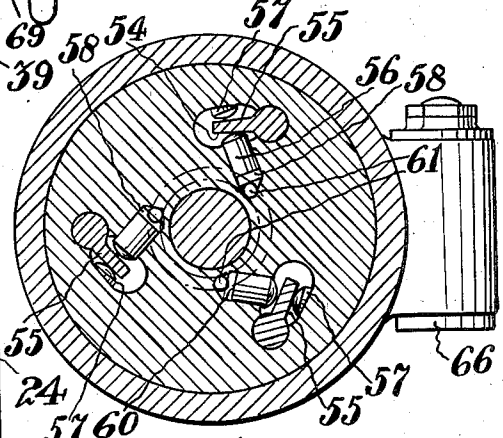


FIG.-2.

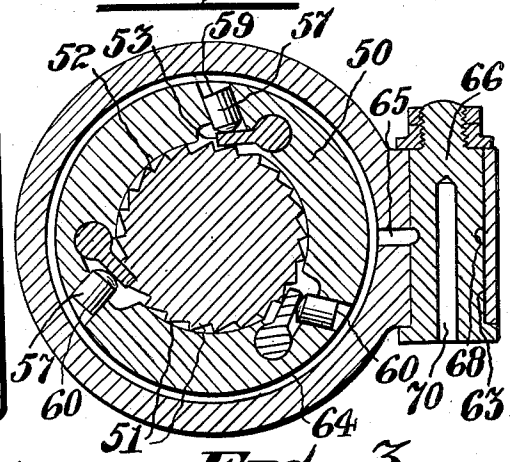


FIG.-3.

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Patented June 9, 1936

2,043,352

UNITED STATES PATENT OFFICE

2,043,352

ROTATION MECHANISM

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Application January 16, 1936, Serial No. 59,363

5 Claims. (Cl. 121—7)

This invention relates to percussive tools, but more particularly to a rotation mechanism for tools of this type.

One object of the invention is to assure a simplified and durable rotation mechanism for effecting step-by-step rotative movement of the working implement in order to change its position on the rock between blows of the percussive element actuating the implement.

Another object is to control the action of the rotation mechanism through the medium of pressure fluid.

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

In the accompanying drawing illustrating the invention and in which similar reference numerals refer to similar parts,

Figure 1 is a sectional elevation of a rock drill equipped with rotation mechanism constructed in accordance with the practice of the invention,

Figures 2 and 3 are transverse views taken through Figure 1 on the lines 2—2 and 3—3, respectively, and

Figure 4 is an elevation, in section, of a detail.

Referring more particularly to the drawing, 20 designates a rock drill comprising a cylinder 21 of which the interior constitutes a piston chamber 22 to accommodate a reciprocatory hammer piston 23. The piston chamber 22 has a free exhaust port 24 which is controlled by the piston 23.

The cylinder, together with a front head 25 and a back head 26, constitutes the casing parts of a rock drill which may be held together by any suitable means, as by the usual side rods (not shown).

A closure is provided for the front end of the piston chamber 22 by a front cylinder washer 27 which lies within the cylinder 21 and serves as an abutment for the front head 25. The front cylinder washer 27 is bored to guide a piston stem 28 whereby the blows of the hammer piston 23 are transmitted to a working implement 29 in the front head 25.

The working implement 29 is shown as being of polygonal cross sectional form to interlockingly engage a chuck 30 adapted to rotate in the front head 25 and having a cavity 31 into which the working implement extends. In the rearward portion of the cavity 31 is a fluted nut 32 which engages ribs 33 on the stem 28 to prevent relative rotary movement between the stem and the chuck 30.

In the rear end of the cylinder 21 is an enlarged bore 34 to accommodate valve mechanism 35 and rotation mechanism 36, respectively. The valve mechanism serves to control the admission of pressure fluid to the piston chamber 22 for actuating the piston 23 and is preferably arranged adjacent the rear end of the piston chamber. It comprises a pair of plates 37 and 38 which cooperate to define a valve chamber 39 containing a distributing valve 40.

The valve chamber 39 communicates with the rear end of the piston chamber 22 through an inlet passage 41 and with the front end of the piston chamber through an inlet passage 42. The passages 41 and 42 are controlled by the valve 40 which is illustrated as being of the oscillatory plate type disposed about a bushing 43 seated in the plates 37 and 38.

The pressure fluid distributed by the valve 40 is conveyed into the valve chamber 39 by a passage 44 leading from a supply chamber 45 in the back head 26, and communication between the supply reservoir 45 and the source of supply is controlled by a throttle valve 46 in the back head 26.

The rotation mechanism, constructed in accordance with the practice of the invention, comprises the usual rotatable rifle bar 47 which extends through the bushing 43 and the plate 37 into the piston chamber 22 and interlockingly engages the piston 23 in a well known manner. The rifle bar carries an integral head 48 which seats upon the plate 38 and lies within a recess 49 in the front end of a plate 50 interposed between the plate 38 and the back head 26 and serving as a seat for the latter.

In the periphery of the head 48 are a series of longitudinally extending teeth 51 having seating surfaces 52 for the ends of pawls 53 arranged in the plate 50 wherein they are adapted to oscillate to serve as abutments for the ratchet teeth. The pawls seat upon the plate 38. They are of greater length than the head 48 and the opposed surfaces of the wing portions of the pawls serve as seating surfaces 54 and 55 for plungers 56 and 57 arranged between the rifle bar and the pawls and between the pawls and the rock drill casing, respectively. The plungers 56 and 57 are arranged and adapted to reciprocate in bores 58 and 59, respectively, in the plate 50.

The ends of the plungers 56 and 57 remote from the pawls 53 constitute pressure surfaces 60 against which pressure fluid acts for shifting the pawls into and out of engagement with the teeth 51. The pressure fluid employed for shifting the plungers 56 is conveyed thereto by passages 61 opening into the innermost ends of the bores 58

and communicating with a passage 62 in the back head 26, the plate 50 and the cylinder 21 and leading to a valve chamber 63 in the cylinder.

The pressure fluid employed for actuating the plungers 57 is conveyed to the bores 59 by an annular groove 64 in the periphery of the plate 50 and a passage 65 communicating the groove 64 with the valve chamber 63.

The valve 66 arranged in the valve chamber 63 for controlling the passages 62 and 65 is of the rotary type, having a handle 67 whereby it may be manipulated, and in the periphery of the valve 66 is a partly annular groove 68 to afford communication between the passages 62–65 and a supply passage 69 leading, in this instance, from the passage 44 to the valve chamber 63. Within the valve 66 is an exhaust passage 70 having a lateral passage 71 to register with the passages 62 and 65 for selectively communicating the bores 58 and 59 with the atmosphere.

The operation of the device is as follows: With the throttle valve 46 in the open position pressure fluid flows through the supply chamber 45, the passage 44 into the valve chamber 39. From there the pressure fluid is distributed to the ends of the piston chamber 22 by the valve 40, in the usual manner, to effect reciprocation of the piston 23.

With the valve 66 occupying the position shown in Figure 1 pressure fluid flows through the passage 69, the groove 68, the passage 65 and the groove 64 into the bores 59 and will act against the pressure surfaces 60 of the plungers 57 to press the pawls 53 gently into engagement with the teeth 51 and to hold them constantly in readiness for engagement with said teeth. Thus, during the operation of the hammer piston as during its rearward stroke, a pawl 53 will engage a tooth 51 and prevent rotary movement of the rifle bar. The piston 23 will then rotate with respect to the rifle bar and, being slidably interlocked with the chuck 39, will effect a partial rotary movement of the working implement.

During the subsequent forward stroke of the piston 23 the rifle bar will be rotated with respect to the pawls and the piston will be free to deliver a forceful blow against the working implement. During the time that pressure fluid is being admitted to the plungers 57 the pressure surfaces 60 of the plungers 56 will be in communication with the atmosphere through the passages 61, 62, 71 and 70.

In the event that it be desired to render the rotation mechanism non-effective, as when starting a drill hole and which may be best accomplished with a non-rotatable drill steel, the valve 66 is shifted to the position shown in Figure 4. In this position of the valve the bores 59 are communicated with the atmosphere through the passages 65, 71 and 70 and the groove 68 establishes communication between the supply passage 69 and the passage 62. Pressure fluid then flows through the latter passage and the passages 61 into the bores 58 and, acting against the pressure surfaces 60 of the plungers 56, moves the pawls out of engagement with the teeth 51. The rifle bar 47 is then disconnected from the casing so that during the starting of the drill hole the working implement 29 may be slowly rotated by hand to assure the correct starting of the drill hole. After the hole has been started the valve 66 may again be returned to its initial position to supply pressure fluid to the plungers 57 for holding the pawls in engaging position and to exhaust the pressure fluid from the bores 58.

I claim:

1. A fluid actuated percussive tool comprising a casing, a piston reciprocable therein, rotation mechanism for the piston comprising a rotatable member interlockingly engaging the piston, a stationary member, teeth on one of the members, pawls in the other member, fluid actuated plungers for actuating the pawls into and out of engagement with the teeth, and means for controlling the flow of pressure fluid to and from the plungers.

2. A fluid actuated percussive tool comprising a casing, a piston reciprocable therein, rotation mechanism for the piston comprising a rotatable member interlockingly engaging the piston, a stationary member, teeth on one of the members, pawls in the other member, fluid actuated plungers for actuating the pawls into engagement with the teeth, other fluid actuated plungers for actuating the pawls out of engagement with the teeth, and means for selectively controlling the flow of pressure fluid to and from the plungers.

3. A fluid actuated percussive tool comprising a casing, a piston reciprocable therein, rotation mechanism for the piston comprising a rotatable member interlockingly engaging the piston, a stationary member, teeth on one of the members, pawls in the other member, a set of fluid actuated plungers for actuating the pawls into engagement with the teeth, a set of fluid actuated plungers for actuating the pawls out of engagement with the teeth, and means for simultaneously supplying pressure fluid to one set of plungers and exhausting pressure fluid from the other set of plungers.

4. A fluid actuated percussive tool comprising a casing, a piston reciprocable therein, a rifle bar for the piston, teeth on the rifle bar, a stationary member encircling the rifle bar, pawls in the stationary member, fluid actuated plungers in the stationary member arranged in opposed sets to actuate the pawls into and out of engagement with the teeth, and means including ports and passages and a valve controlling said ports and passages for supplying pressure fluid to one set of plungers and simultaneously venting the other set of plungers to the atmosphere.

5. A fluid actuated percussive tool comprising a casing, a piston reciprocable therein, a rifle bar for the piston having a head, teeth on the periphery of the head, a plate in the casing having a recess in one end to receive the head, pawls in the plate, fluid actuated plungers in the plate arranged in opposed sets to actuate the pawls into and out of engagement with the teeth, and means including ports and passages and a valve controlling said ports and passages for supplying pressure fluid to one set of plungers and simultaneously venting the other set of plungers to the atmosphere.

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