Aug. 6, 1935. A. E. PETERS ET AL 2,010,496

FEEDING DEVICE FOR PERCUSSIVE MOTORS

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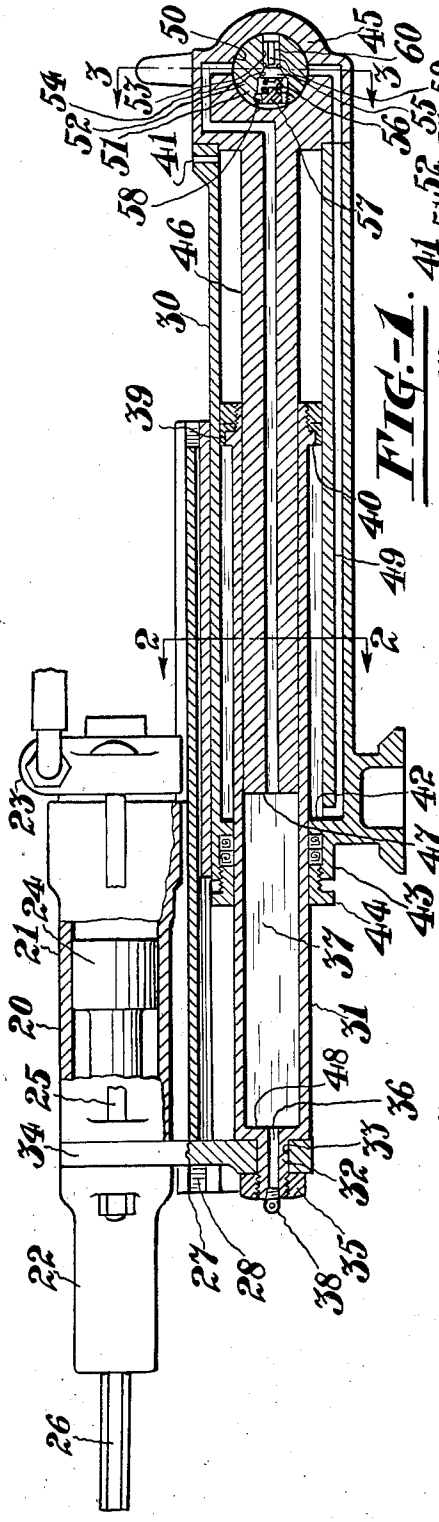


FIG.-1.

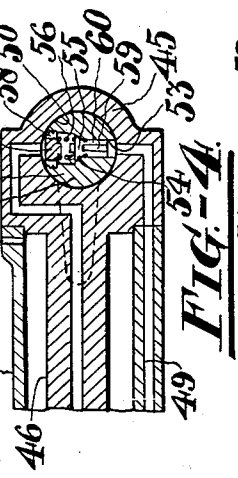


FIG.-4.

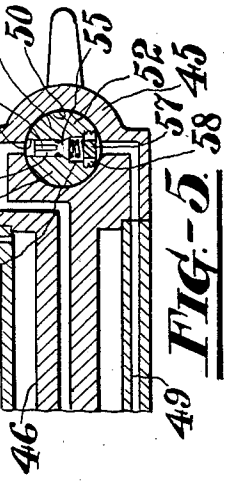


FIG.-5.

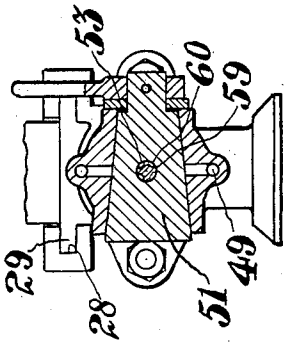


FIG.-3.

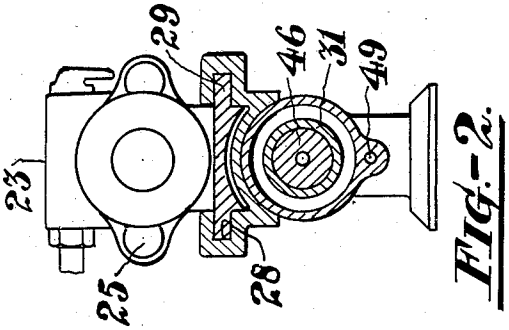


FIG.-2.

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FEEDING DEVICE FOR PERCUSSIVE MOTORS

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7 Claims. (Cl. 121—9)

This invention relates to feeding devices, but more particularly to a feeding device for percussive motors, such as rock drills and the like of the type mounted on supporting devices relatively to which they move to assure a correct operative relationship between the motor and the working implement which the motor actuates.

One object of the invention is to utilize the jars resulting upon reversal of the hammer piston as a force for moving the motor longitudinally of its support.

Another object is to assure the continuous actuation of the motor in one direction for moving it and retracting it from the work.

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 longitudinal elevation, in section, of a feeding device constructed in accordance with the practice of the invention and showing it applied to a percussive motor, the latter being partly broken away,

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

Figures 4 and 5 are longitudinal sectional elevations of the portion of the feeding device containing the controlling mechanism and showing the latter in its various controlling positions.

Referring more particularly to the drawing, 20 designates a motor illustrated as a rock drill and comprising a cylinder 21 and front and back heads 22 and 23, respectively. The rear end of the cylinder may contain the usual valve (not shown) for distributing pressure fluid to the cylinder 21 to actuate a reciprocatory hammer piston 24 in the cylinder. The heads 22 and 23 are secured to the cylinder by the usual side rods 25, and the front head 23 supports a working implement 26 against which the hammer piston 24 is adapted to strike.

A suitable support is provided for the motor 20 in the form of a cradle or shell 27 having guideways 28 on confronting surfaces for the accommodation of ribs or guides 29 carried by the motor 20.

In accordance with the practice of the invention means are provided to effect the actuation of the motor 20 longitudinally of the supporting shell 27 by the jars or shocks to which the motor is subjected upon reversal of the hammer piston 24 in the extremities of the cylinder 21. To this end a cylinder 30 is secured to the shell 27 and a cylinder 31 slidable in the cylinder 30 is secured to the motor 20.

The cylinder 31 is provided at its front end with a stem 32 which extends through an aperture 33 of an arm 34 clamped between the front head 22 and the cylinder 21. The free end of the stem 32 is threaded to accommodate a nut 35 which clamps the arm 34 to the cylinder 31, and a passage 36 in the stem serves as an inlet for liquid, as for example oil 37, wherewith the cylinders and associated passages are filled. The outer end of the passage 36 may be sealed by a filler plug 38.

On the opposite end of the cylinder 31 is a head 39 of which the inner surface constitutes a pressure surface 40, and the outer end of the head 39 is exposed to atmospheric pressure maintained in the rear end of the cylinder through a vent 41. The inner surface of the front end of the cylinder 30 forms an opposing pressure surface 42 and in the adjacent wall of the cylinder 31 is a packing member 43 to effect a seal at that end of the cylinder. A gland 44 threaded into the cylinder 30 serves to compress the packing member 43.

A closure is provided for the rear end of the cylinder 30 by a head 45 which may be bolted or otherwise secured to the cylinder 30 and carries a rod 46 which extends into and seals the rear end of the cylinder 31. The free end of the rod 46 serves as a pressure surface 47 which confronts a pressure surface 48 in the front end of the cylinder 31.

Within the rod 46, the head 45 and the cylinder 30 is a passage 49 to afford communication between the cylinders. The passage 49 is bisected by a bore 50, in the head 45, and the bore contains valve mechanism 51 adapted to control communication between the cylinders and to determine the direction of flow of the fluid 37.

The valve mechanism 51 comprises a throttle valve 52 of the rotary type having a passage 53 to afford communication between the adjacent portions of the passage 49. Within the passage 53 is a bevelled seating surface 54 for a valve 55 which is normally held to its seat by a spring 56 seating against a plug 57 in the end of the passage 53. The plug 57 is suitably recessed, as by forming a series of slots 58 in its periphery to permit free communication between the passages 53 and 49.

The valve 51, illustrated as being of the poppet type, carries a guide stem 59 which extends slidably into the passage 53 and has flutes 60 which serve as passages for the liquid 37.

The operation of the device is as follows: Let

it be assumed that the motor is in operation, that is, that the hammer piston 24 is reciprocating within the cylinder 21 to deliver blows against the working implement 26. With the motor thus operating it is, of course, essential that it be kept within the correct operating position relatively to the working implement so that the force of the hammer piston may be effectively applied to the working implement for driving it into the work.

In order to assure this desirable position of the motor the throttle valve 51 is rotated to the position illustrated in Figure 4 to permit the passage of liquid 37 from the cylinder 30 through the passages 49 and 53 into the cylinder 31. Thus, when the piston 24 imparts a shock to the front end of the motor the cylinder 31 is carried forwardly and liquid is ejected from the cylinder 30 by the pressure surfaces 40 and 42 and transferred into the cylinder 31 which is thereby maintained completely filled as are, of course, also the cylinder 30 and the passages affording communication between the cylinders.

Upon transference of liquid from the cylinder 30 into the cylinder 31 at the termination of each forward stroke of the piston 41 the check valve 55 is immediately returned to its seat by the spring 56 to prevent a reverse flow of liquid to the cylinder 30 upon reversal of the piston 24 in the rear end of the cylinder 21. The liquid thus entrapped in the cylinder 31 prevents recoil of the motor 20 and maintains it in the correct position with respect to the working implement 26 for the succeeding working stroke of the piston 24. This cycle of operation may continue until the working implement has penetrated the work to the limit of its extent, whereupon the throttle valve 51 is shifted to the position illustrated in Figure 5.

In the new position of the throttle valve the check valve is positioned to permit the flow of liquid only from the cylinder 31 to the cylinder 30. Thus, when the piston 24 reverses in the rear end of the cylinder 21 the jar resulting from the act of reversal is imparted to the cylinder 31 and a portion of the liquid 37 is expelled through the passages 49 and 53 into the cylinder 30 at the end of each rearward stroke of the piston 24. The motor is thereby caused to be retracted from the work and the liquid entrapped in the cylinder 30 prevents recoil of the motor in a forwardly direction at the instant of reversal of the hammer piston 24 in the front end of the cylinder.

The motor and the feeding device will continue to function in this wise until the working implement has been withdrawn from the drill hole after which a longer working implement may be inserted in the drill and the valve mechanism 51 is again shifted to cause actuation of the motor towards the work.

We claim:

1. In a feeding device, the combination of a support and a motor slidable on the support, a reciprocatory hammer piston in the motor imparting jars thereto tending to move the motor longitudinally of the support, a stationary cylinder, a movable cylinder in the stationary cylinder and being affixed to the motor, means providing passages to communicate the cylinders with each other, pressure surfaces on the cylinders, a body of liquid in the cylinders and the passages, and means for controlling the transference of liquid from one cylinder to the other, whereby the liquid displaced in one cylinder by the jar resulting upon reversal of the piston at the end of one stroke is introduced into the other cylinder to prevent recoil of the motor upon reversal of the piston at the end of the succeeding stroke.

2. In a feeding device, the combination of a support and a motor slidable on the support, a reciprocatory hammer piston in the motor imparting jars thereto tending to move the motor longitudinally of the support, a stationary cylinder, a movable cylinder in the stationary cylinder and being affixed to the motor, means providing passages to communicate the cylinders with each other, a body of liquid in the cylinders and being forced from one cylinder to the other by the jars resulting upon reversal of the piston, and means for controlling the direction of flow of the liquid whereby one cylinder is selectively caused to serve as a feed reservoir for the liquid and the other cylinder as a receptacle for the liquid to prevent recoil of the motor.

3. In a feeding device, the combination of a support and a motor slidable on the support, a reciprocatory hammer piston in the motor imparting jars thereto tending to move the motor longitudinally of the support, a stationary cylinder, a movable cylinder in the stationary cylinder and being affixed to the motor, means providing passages to communicate the cylinders with each other, a body of liquid in the cylinders and being forced from one cylinder to the other by the jars resulting upon reversal of the piston, means for forcing the liquid from one cylinder to the other upon relative longitudinal movement of the cylinders, and means for selectively determining the direction of flow of the liquid and thereby cause either cylinder to serve as a feed reservoir and the other cylinder as a receptacle for liquid to prevent recoil of the motor at the end of one of the strokes of the piston.

4. In a feeding device, the combination of a support and a motor slidable thereon, a reciprocatory hammer piston in the motor imparting jars thereto tending to move the motor longitudinally of the support, a stationary cylinder, a movable cylinder slidable in the stationary cylinder and being affixed to the motor, pressure surfaces on the cylinders, a passage affording communication between the cylinders, a body of liquid in the cylinders and the passage, and valve means in the passage for controlling the direction of flow of the liquid whereby a portion of the liquid subjected to the jar resulting upon reversal of the piston at one end of its stroke is forced into the other cylinder to prevent recoil of the motor upon reversal of the piston at the other end of its stroke.

5. In a feeding device, the combination of a support and a motor slidable thereon, a reciprocatory hammer piston in the motor imparting jars thereto tending to move the motor longitudinally of the support, a stationary cylinder, a movable cylinder slidable in the stationary cylinder and being affixed to the motor, pressure surfaces on the cylinders, a passage affording communication between the cylinders, a body of liquid in the cylinders and the passage, a throttle valve controlling the passage, and a check valve in the throttle valve for determining the direction of flow of the liquid whereby a portion of the liquid subjected to the jar resulting upon reversal of the piston at one end of its stroke is forced into the other cylinder to prevent recoil of the motor upon reversal of the piston at the other end of its stroke.

6. In a feeding device, the combination of a support and a motor slidable thereon, a reciprocatory hammer piston in the motor imparting

jars thereto tending to move the motor longitudinally of the support, a plurality of relatively movable receptacles arranged telescopically with respect to each other and one of which is connected to the motor, means providing passages to communicate the receptacles with each other, a body of liquid in the receptacles, pressure surfaces in the receptacles for forcing the liquid from one receptacle into another to prevent recoil of the motor upon reversal of the piston, and means for controlling the direction of flow of the liquid.

7. In a feeding device, the combination of a support and a motor slidable thereon, a reciprocatory hammer piston in the motor imparting jars thereto tending to move the motor longitudinally of the support, a stationary cylinder affixed to the support, a movable cylinder affixed to the motor and extending slidably into the stationary cylinder, a rod on the stationary cylinder extending into the movable cylinder, a passage in the rod and the stationary cylinder to afford communication between the cylinders, a body of liquid in the cylinders and the passage, pressure surfaces on the cylinder and on the rod for forcing the liquid from one cylinder into another to prevent recoil of the motor upon reversal of the piston, and control means for the passage to determine the direction of flow of the liquid.

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