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PNEUMATIC HAMMER ROCK DRILL
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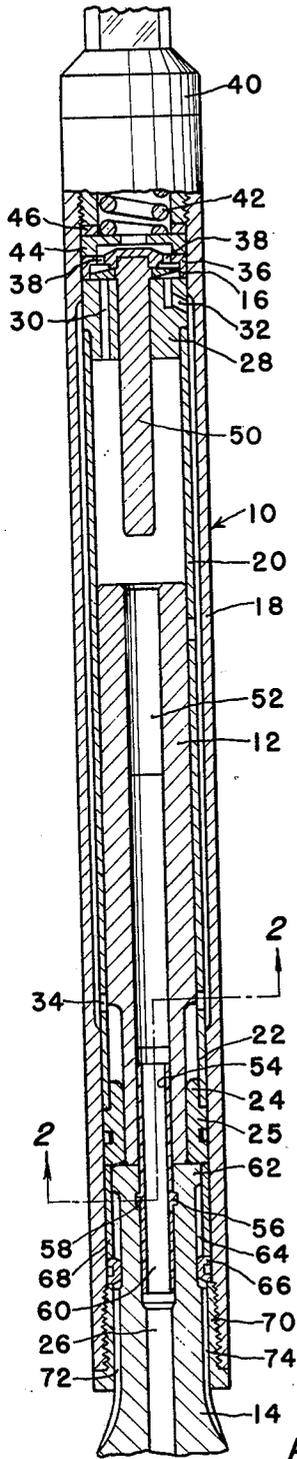


FIG. 1

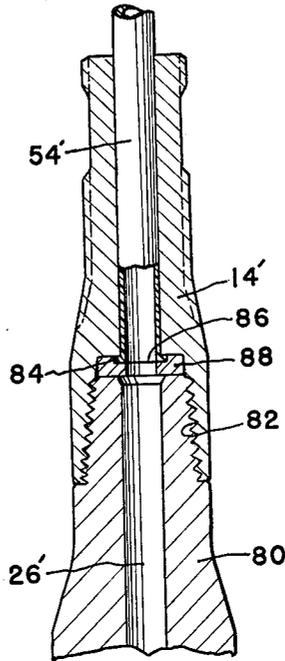


FIG. 3

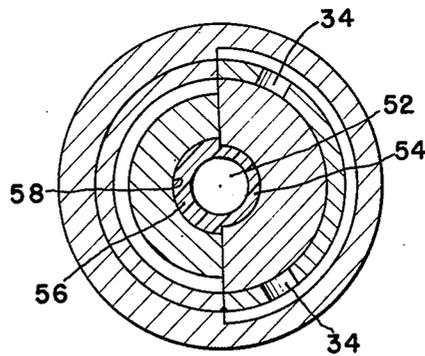
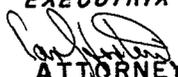


FIG. 2

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PNEUMATIC HAMMER ROCK DRILL

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3 Claims. (Cl. 121-10)

This invention relates to pneumatic hammer rock drills and more particularly to that type of rock drill which is adapted to follow the drill bit down the hole being drilled.

The type of drill referred to is most useful when large holes are being drilled. They are very powerful and cut large quantities of material of which the removal is an important problem especially as these drills operate at great depths of hole. The most practical way of removing the cuttings is to blow them out by air admitted to the hole usually through a central bore in the drill bit. By this invention such air is supplied from the drill as exhaust air which has been used to reciprocate the hammer piston.

It is an object of this invention to provide a simplified construction of drill by which the exhaust air therefrom is conducted to the bottom of the hole being drilled.

Another object of the invention is to improve the construction and efficiency of the rock drill assembly.

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

Referring to the drawings,

FIGURE 1 is a longitudinal section of a rock drill arrangement, a preferred embodiment of the invention,

FIG. 2 is a cross section along the line 2-2 of FIG. 1 looking in the direction of the arrows, and

FIG. 3 is a longitudinal sectional view of the front end of a drill showing an alternative form of bit and method of maintaining an exhaust tube in place.

Referring to the drawing, the pneumatic hammer rock drill illustrated comprises a cylinder 10 within which is disposed a reciprocatory hammer piston 12 adapted to strike a hollow drilling implement or bit 14 extending into cylinder 10, and means for actuating piston 12, in this instance, an oscillatory valve 16.

Cylinder 10 is composed of an outer shell 18 preferably cylindrical and having a cylinder liner 20 spaced from housing 18 except at its front end as shown at 22 where it fits snugly in the housing. A tubular guide piece 24 for the forward end portion of the piston 12 is mounted at the forward end of the cylinder liner 20 and includes a flange 25 clamped between the cylinder liner 20 and a sleeve 68, the purpose of sleeve 68 to be explained hereinafter.

The drilling implement 14 is hollow being provided with a central bore 26 for conducting air for blowing the cuttings from the hole introduced by way of hole 26 in bit 14.

At its rear end liner 20 is supported by a valve seat 28 fitting into housing 18 and provided with an inlet port 30 leading to the rear end of the cylinder and a second inlet port 32 communicating with the space between liner 20 and housing 18 to admit motive air into the front end of the cylinder to return piston 12 to its rearward position. Ports 34 in liner 20 provide communication between the space between liner 20 and housing 18 to the interior of liner 20.

Valve 16 is adapted to control admission of air to ports 30 and 32 and is of the well known rocking type. It is held in position by a cap 36 provided with holes 38 leading to the interior of the cap. At the back end the assembly is held together by a backhead 40 screwed into housing 18 and containing a heavy compression spring 42 providing pressure through a bushing 44 seated on top

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of cap 36. Leakage is prevented by a sealing ring 46 between backhead 40 and bushing 44.

As described above air for actuating piston 12 is introduced into the cylinder through ports 30 and 34. In this way the piston 12 is driven back and forth in the liner 20. Upon completion of its strokes piston 12 is adapted to control the exhaust of motive fluid through the passage 26 and bit 14. Exhaust from the rearward end of the cylinder is controlled by piston 12 cooperating with a plunger 50 held stationary at the rear of the cylinder and adapted to enter a central bore 52 in piston 12 extending the entire length thereof. Thus when piston 12 approaches the end of its forward stroke plunger 50 leaves bore 52 and permits the motive air in the corresponding end of the cylinder to pass through bore 52 into passage 26, and thus to the bottom of the drill hole. Exhaust of spent motive fluid from the front end of the cylinder is adapted to be controlled by a tube 54 mounted in bit 14 and having a running fit with the passage 52 of piston 12. Thus when piston 12 moves away from bit 14 after having struck it, the end of tube 54 withdraws from passage 52 and what motive air may be in the front end of the cylinder escapes through tube 54 into passage 26 of bit 14, and thence to the bottom of the drill hole.

In the embodiment shown in FIG. 1 and FIG. 2, tube 54 is preferably formed of a material such as nylon and is held in place in bit 14 by a small flange 56 cooperating with a groove 58 in the bore 60 extending longitudinally within bit 14 and centrally. The material being somewhat compressible and elastic tube 54 can be pressed into the bore 60 to compress flange 56 until it meets groove 58. Bit 14 in the embodiment of FIG. 1 and FIG. 2 is thus of one piece.

As indicated, bit 14 is adapted to slide with a limited amount of motion within the front end of the cylinder. It is provided with a head 62 and a reduced portion 64 to cooperate with a collar 66 held in position within housing 18 between sleeve 68 and a retainer nut 70 threaded into the front end of housing 18. Bit 14 is fluted as at 72 to engage corresponding flutes 74 on the inner surface of nut 70. By means of the flutes at 72 and 74 rotary motion of the housing 18 is transmitted to the bit 14.

In FIG. 3 is shown an alternative arrangement for securing a tube 54' in place. It will be understood that the function of tube 54' is as described in connection with tube 54 of FIG. 1. In this embodiment bit 14' is provided with a detachable cutter portion 80 hollow as at 26' and secured to the shank portion of bit 14' by a tapered thread as shown at 82. In this embodiment, also, tube 54' has an end flange 84 cooperating with an internal seat 86 within bit portion 14' and held in place by detachable cutter part 80 which compresses flange 84 against seat 86 through the medium of a washer 88.

A great advantage of this invention is that the character of the blow struck by the piston can be regulated by suitably timing the exhaust opening this being permitted by varying the length of plunger 50 or tube 54. Furthermore the arrangement of liner 20 which is spaced from housing 18 for the greater part of its length permits a certain amount of give in the housing 18 without affecting the liner 20 to any substantial extent.

Thus by the above construction are accomplished, among others, the objects hereinbefore referred to.

What is claimed is:

1. A pneumatic hammer rock drill comprising a cylinder, a reciprocatory hammer piston in said cylinder, a drill implement extending into said cylinder in position to be struck by said piston, means alternately to admit compressed air to the opposed ends of the cylinder to actuate said piston, said means actuated responsive to piston terminal stroke position, said piston being provided with a central axial passage, said implement having an exhaust

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passage to conduct exhaust air from said cylinder above and below said piston and a separate nonmetallic tube secured in said exhaust passage in said implement and extending upwardly into said cylinder in alignment with the central passage of said piston, said tube cooperating with said central axial passage of said piston to conduct exhaust fluid from said cylinder below the piston during the initial part of said piston movement in a direction toward said drill implement, said tube operating with the central passage of said piston to prevent exhaust fluid from flowing from said cylinder below the piston during the latter part of the piston movement toward said drill implement.

2. A pneumatic hammer rock drill comprising a cylinder, a reciprocatory hammer piston in said cylinder, a drill implement extending into said cylinder in position to be struck by said piston, means to alternatively admit compressed air to opposite ends of the cylinder to actuate said piston, said means actuated responsive to piston terminal stroke position, said piston being provided with a central axial passage, said implement having an exhaust passage to conduct exhaust air from said cylinder above and below said piston to the interior of said drill implement, and a separate nonmetallic tube secured in said exhaust passage in said implement extending upwardly into said cylinder in alignment with the central passage of said piston and dimensioned to enter thereinto when said piston moves in one direction and to leave said central passage when said piston moves in the opposite direction to control the flow of exhaust air from below the piston when said piston moves in said opposite direction and said tube leaves said central passage.

3. A pneumatic hammer rock drill comprising a cylinder, a reciprocatory hammer piston in said cylinder to deliver impact blows, a drill implement extending into

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the forward portion of said cylinder in position to be struck by said piston, means to alternately admit compressed air to the opposite ends of the cylinder to actuate said piston, said piston being provided with a central axial passage, an exhaust passage in said implement to conduct exhaust air from said cylinder above and below the piston, a separate nonmetallic tube secured in said exhaust passage and extending upwardly into said cylinder in alignment with the central passage of said piston, the upward portion of said tube extending into said cylinder and being dimensioned so as to slidably enter the central passage of the piston during the latter portion of the impacting stroke of said piston and to leave the central passage of the piston during the return stroke of the piston to provide for the exhaust of fluid from below the piston through said tube during the beginning of the impacting stroke of the piston.

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