Nov. 18, 1958 W. B. DE GROFF 2,860,531

PNEUMATIC DRILL CONSTRUCTION

Filed March 21, 1955

Fig. 1

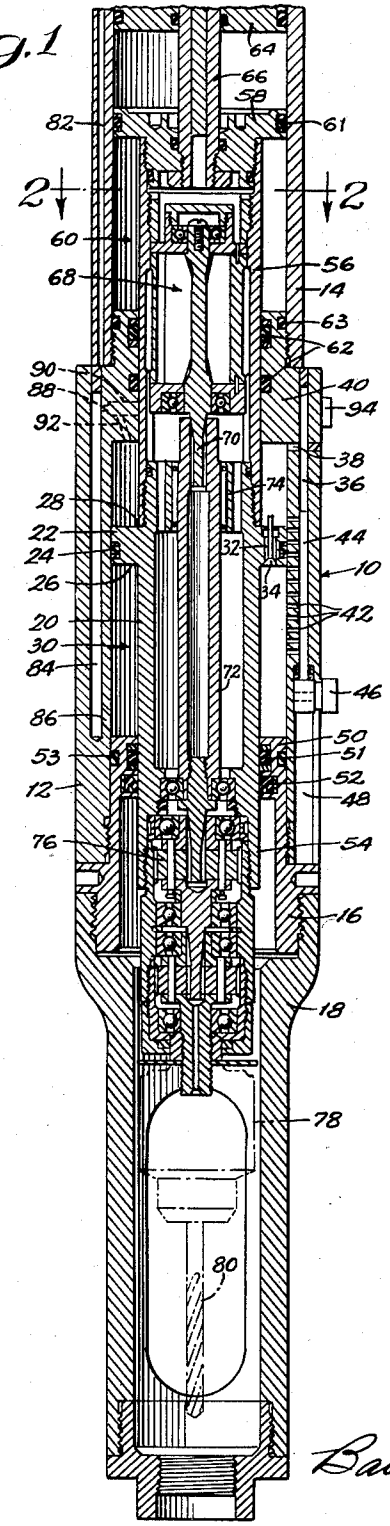
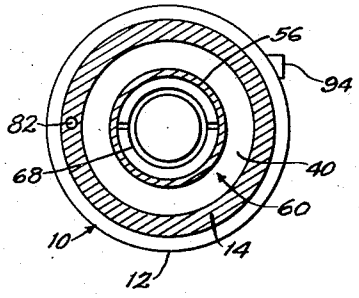


Fig. 2



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PNEUMATIC DRILL CONSTRUCTION

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2 Claims. (Cl. 77—33.5)

The present invention relates generally to a portable automatic drill of the pneumatically operated type, and more particularly to a novel mounting location of an air-feed motor within the drill.

It is a primary object of this invention to provide an improved drill construction of the character disclosed, wherein the gearing assembly, oil dash-pot speed regulating means, air piston reciprocation means, and the air motor are compactly and efficiently arranged in novel longitudinally co-axial relation.

It is another object to provide an air motor particularly mounted in a novel manner within the rear portion of a drill of the pneumatically operated type, wherein said air motor is concentrically disposed for reciprocatory movement through longitudinally co-axial air piston and oil dash-pot chambers.

Further objects and advantages of this invention will become apparent as the following description proceeds and the features of novelty which characterize this invention will be pointed out with particularity in the claims annexed to and forming part of this specification.

A preferred embodiment of the invention is shown in the accompanying drawing, in which:

Figure 1 is a longitudinal cross-sectional view of a portable automatic drill of the air operated type constructed in accordance with the present invention; and

Figure 2 is a transverse cross-sectional view taken substantially as indicated by the line 2—2 on Figure 1.

Referring now more particularly to the drawing I have shown a portable pneumatic drill 10 comprising longitudinally co-axial oil chamber and air piston sections. Drills of this general type and character are disclosed in my co-pending applications, Serial Numbers 486,495, which issued as Patent No. 2,811,877, November 5, 1957, and 476,317. The drill 10 of the present invention represents an improved constructional arrangement over the drills disclosed in my said co-pending applications, wherein the air motor is particularly located in a novel manner adjacent the rear end of the drill at a remote distance from the gearing assembly and drilling tool.

My drill construction comprises a generally cylindrical oil chamber casing or housing 12 and an air piston casing or housing 14, screw-threadedly secured to each other in longitudinally co-axial relation. The forward end of the housing 12 screw-threadedly receives in internally concentric relation an oil retaining sleeve 16. The forward end of the sleeve 16 screw-threadedly mounts an elongated nose housing 18.

An oil piston sleeve 20 is concentrically positioned within the housing 12, and provides a dash-pot piston 22 which slidingly engages the inner wall of the housing 12. A suitable O-ring seal 24 is provided at the interface between piston 22 and housing 12 to effect an oil-tight sliding seal. The piston 22 provides a forward acting face 26 and a reverse acting face 28 for reciprocating movement through a longitudinally elongated oil chamber 30 defined between the sleeve 20 and the housing 12.

A passageway 32 is provided through the dash-pot

piston 22, and a one way slide valve 34 is disposed therein. The valve 34 is arranged so that oil pressure during forward movement of the piston 22 through the oil chamber 30 will effect closure of the passageway 32, while rearward movement will effect valve opening to permit free flow therethrough. A by-pass passageway 36 is formed in the oil chamber housing 12 and terminates at its rear end in a cross port 38 closely adjacent the abutment surface of a rear end wall 40 of the housing 12. A plurality of rapid traverse ports 42 are provided between the oil chamber 30 and the by-pass passageway 36 forwardly of the piston 22 when in its rear position of abutment against the end wall 40. A slidable pin 44 is received within the passageway 36, and is of sufficient length to effect closure of all of the ports 42. An adjustment and lock knob 46 is provided for positioning the pin 44 along a guide slot 48 formed within the housing 12. In this way, rapid traverse adjusting means is provided to permit the drill tool to be initially moved forwardly toward the work at a relatively high rate of speed, and thereafter fed forwardly during the drilling operation at a substantially lower rate of speed, as described in detail in my co-pending application Serial Number 486,495 (Patent No. 2,811,877).

The oil retaining sleeve 16 provides a rear end wall 50 disposed between the oil piston sleeve 20 and the oil chamber housing 12. An O-ring seal 51 and a wiping seal 52 are provided at the interface between sleeve 20 and end wall 50 to effect an oil-tight sliding seal. An O-ring seal 53 is provided at the fixed interface between end wall 50 and housing 12 to effect a further oil-tight seal. The oil piston sleeve 20 provides a forwardly extending portion 54 which is adapted in this way to be reciprocably movable in oil-tight manner through the end wall 50.

An inner air piston sleeve 56 is screw-threadedly telescoped onto the rear end of the oil piston sleeve 20, and serves to define an air motor housing. An air piston 58 is screw-threadedly carried by the sleeve 56 at its rear end. A pneumatic actuator or air piston chamber 60 is defined by the sleeve 56 and the surrounding air piston housing 14 through which the air piston 58 is adapted to be reciprocated. The air piston 58 effects sliding engagement with the inner wall of the housing 14, and an O-ring seal 61 is provided to effect an air-tight sliding seal at the interface. O-ring seals 62 are also provided at the interface between sleeve 56 and housing end wall 40 to effect an air-tight sliding seal. An additional O-ring seal 63 is provided at the fixed interface between end wall 40 and housing 14.

A control valve housing 64 defines the rear end of air piston chamber 60. A hollow air feed tube 66 extends forwardly from the valve housing 64 through the air piston 58 to an air motor 68 rotatably mounted within the sleeve 56. The tube 66 is slidably movable through housing 64, and serves to deliver a controlled air supply to the air motor 68 to effect rotating drive thereof. The air motor 68 provides a drive shaft 70 which is coupled at its forward end to a drive shaft extension 72. The shaft extension 72 is rotatably mounted within a bearing support 74 carried internally of the oil piston sleeve 20, and extends forwardly to a gearing assembly 76 rotatably supported within the forward sleeve portion 54.

A suitable drill chuck 78 is carried by the forward driving end of the gearing assembly 76, and supports a drilling tool 80 in forwardly extending relation therefrom.

An air feed passageway 82 extends axially within the air piston housing 14, and serves to supply actuating air pressure selectively to the forward end of the air piston chamber 60 from the control valve housing 64. In addition, air pressure is also selectively transmitted to the chamber 60 adjacent its rear end from the con-

trol valve housing 64. In this way, regulated reciprocation of the air piston 58 within the chamber 60 may be effected, as in the manner set forth in detail in my co-pending application, Serial Number 476,317.

An axially extending oil flow passageway 84 is formed within the oil chamber housing 12, and communicates through a cross passage 86 with the oil chamber 30 adjacent its forward end, and through a cross passage 88 with a by-pass control passage 90. A passage 92 provides a flow communication from the by-pass passage 90 to the oil chamber 30 adjacent its rear end. Suitable needle valve means 94 serves to regulate oil flow in an adjustable manner through the by-pass 90. In this way, the forward rate of drilling speed may be regulated, as in the manner set forth in detail in my said co-pending application Serial Number 486,495 (Patent No. 2,811,877).

The drill construction which I have described defines a compact and efficient longitudinal arrangement of drill components in a co-axial and concentrically disposed manner, wherein the gearing assembly is reciprocably mounted at the forward end of the drill and is operatively coupled to an air motor reciprocably mounted at the rear end of the drill. Intermediate the gearing assembly and the air motor, oil dash-pot means are provided for effecting controlled speed regulation. Concentrically surrounding the air motor, air piston means are provided for effecting forward and reverse reciprocation of the drilling tool. The air motor is particularly arranged to permit reciprocatory movement through both the air piston and oil dash-pot means. Rear positioning of the air motor remote from the forward end of the drill permits a compact, concentrically co-axial arrangement of longitudinally disposed drill elements, to provide a drill of novel elongated construction.

Changes may be made in the construction and arrangement of the parts of my pneumatic drill construction without departing from the real spirit and purpose of my invention, and it is my intention to cover by the claims any modified forms of structure or use of mechanical improvements which may be reasonably included within their scope.

What I claim as new and desire to obtain by Letters Patent of the United States is:

1. A portable automatic drill comprising an elongated tubular casing, first transverse wall means separating said casing into forward and rear compartments, a rotary air motor of elongated form slidably extending through said transverse wall means in fluid-tight relation therewith so as to effect fluid isolation of said compartments within said casing, said air motor being of substantially smaller diameter than the inner wall of said casing to define therewith an oil dash-pot chamber in said forward compartment and an air actuator chamber in said rear compartment, a pair of pistons secured to the opposite ends of said air motor and slidably reciprocable within said oil dash-pot and air actuator chambers respectively, second transverse wall means at the forward end of said casing, a gearing assembly slidably reciprocable through said second wall means in fluid-tight relation therewith and adapted to mount a drilling tool for driving rotation, elongated shaft means operatively interconnecting said air motor and said gearing assembly, and means for alternately admitting and exhausting air under pressure to the opposite sides of said air actuator piston to effect unitary reciprocation of said air motor, dash-pot piston, and gearing assembly.

2. A portable automatic drill comprising an elongated tubular casing, first transverse wall means separating said casing into forward and rear compartments, a rotary air motor of elongated form slidably extending through said transverse wall means, sealing means at the interface between said air motor and first wall means serving to effect fluid isolation of said compartments within said casing, said air motor being of substantially smaller diameter than the inner wall of said casing to define therewith an oil dash-pot chamber in said forward compartment and an air actuator chamber in said rear compartment, a pair of pistons secured to the opposite ends of said air motor and slidably reciprocable in sealing engagement with the inner wall of said casing within said oil dash-pot and air actuator chambers respectively, second transverse wall means at the forward end of said casing, a gearing assembly slidably reciprocable through said second wall means in fluid-tight relation therewith and adapted to operatively mount a drilling tool, sealing means at the interface between said gearing assembly and second wall means, elongated shaft means operatively interconnecting said air motor and said gearing assembly, and means for alternately admitting and exhausting air under pressure to the opposite sides of said air actuator piston to effect unitary reciprocation of said air motor, dash-pot piston, and gearing assembly.

References Cited in the file of this patent

UNITED STATES PATENTS

2,127,003	Nash	Aug. 16, 1938
2,406,482	Tucker	Aug. 27, 1946
2,604,759	Smith	July 29, 1952
2,657,595	Shaff	Nov. 3, 1953