May 8, 1945. C. F. OVERLY 2,375,490

ROTARY POWER TOOL

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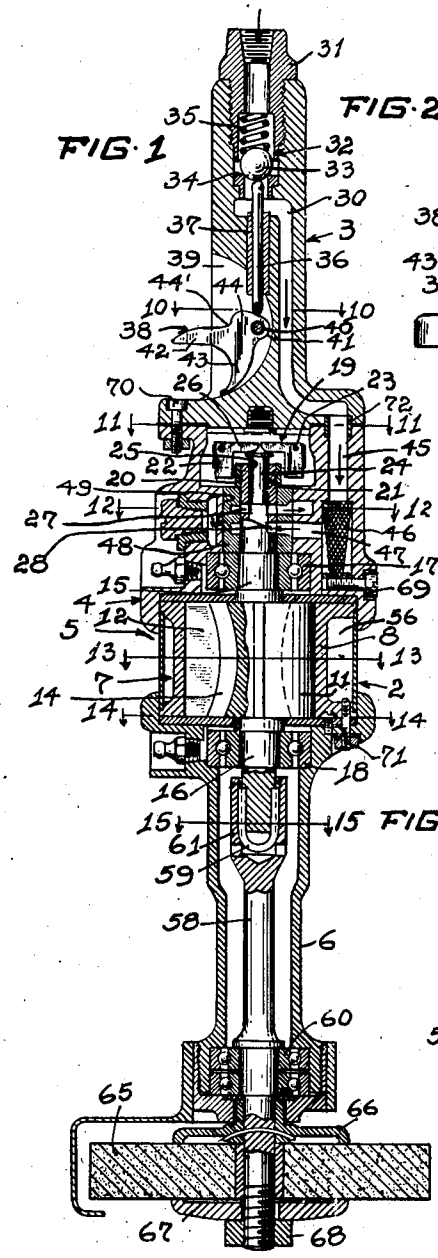


FIG. 1

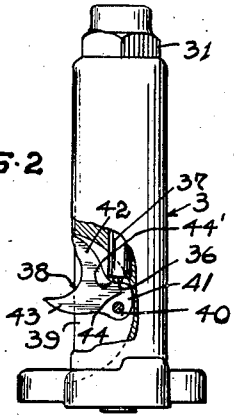


FIG. 2

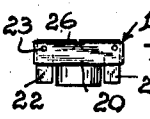


FIG. 3

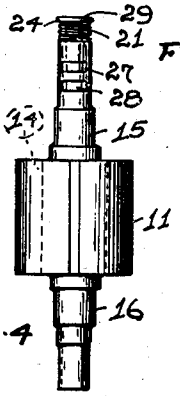


FIG. 4

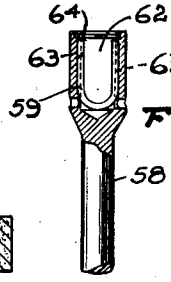


FIG. 5

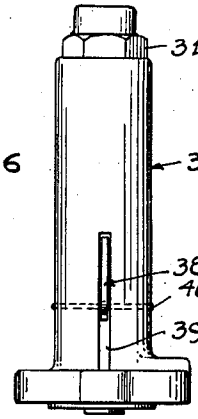


FIG. 6

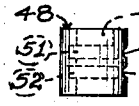


FIG. 7

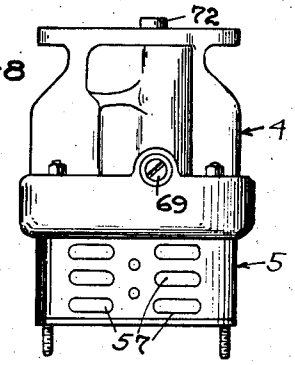


FIG. 8

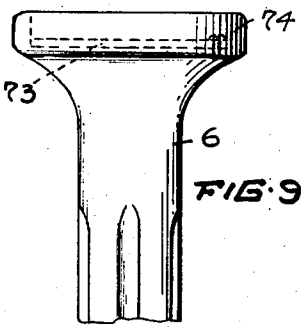


FIG. 9

INVENTOR.

CHARLES F. OVERLY

BY Gustav. A. Wolff

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ROTARY POWER TOOL

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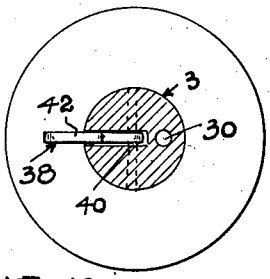


FIG. 10

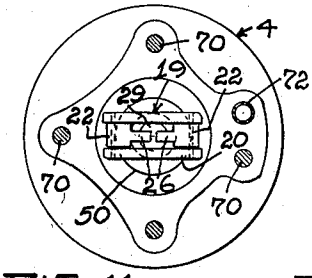


FIG. 11

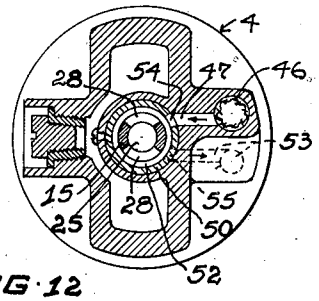


FIG. 12

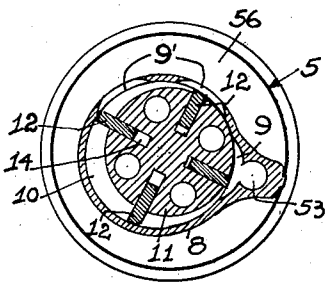


FIG. 13

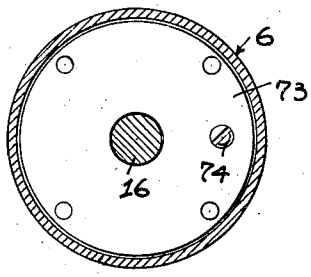


FIG. 14

FIG. 15

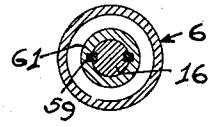


FIG. 17



FIG. 18



FIG. 16

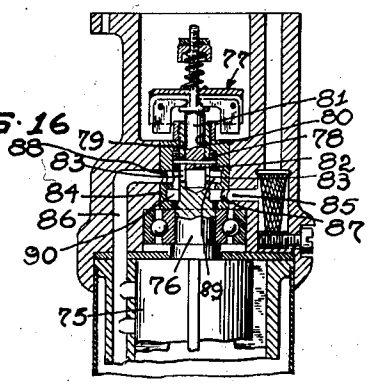


FIG. 19

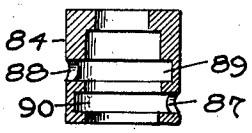
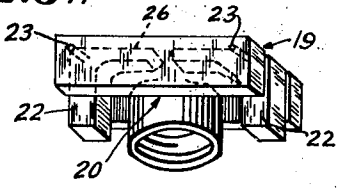


FIG. 3A



INVENTOR.
CHARLES F. OVERLY
BY
Gustav A. Wolff
ATT.

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UNITED STATES PATENT OFFICE

2,375,490

ROTARY POWER TOOL

Charles F. Overly, East Cleveland, Ohio

Application May 20, 1942, Serial No. 443,743

2 Claims. (Cl. 121—34)

This invention relates in general to rotary power tools and more particularly to rotary power tools with pneumatic, governor-controlled motors, in which tools the governor controls the air supply to the motor. In these tools the governors, when constructed as so-called through-governors, effect disturbing turbulent air streams which decrease the efficiency of the power tool, and, when constructed to cooperate with stationary valve elements, are subjected to excessive wear and tear.

The general object of the present invention is the provision of a simplified rotary power tool of the type referred to above, in which tool the rotor of the motor mounts the governor and its valve to decrease wear and tear on the governor and its valve by eliminating rotary movements between these elements.

This general object of the invention is attained by arranging the governor valve within the rotor or its shaft in such a manner that the rotor or its shaft forms the valve body for the governor valve which rotates jointly with rotor and governor.

Another object of the present invention therefore is the provision of a rotary tool embodying a governor directly coupled with the rotor of its motor and a governor valve axially aligned with and arranged with respect to the rotor or its shaft, so that the latter forms the valve body for the governor valve.

In addition, the invention has other marked superiorities which radically distinguish it from presently known structures. These improvements embodying certain novel features of construction are more clearly set forth in the following specification and the appended claims, and two preferred embodiments of the invention are hereinafter shown with reference to the accompanying drawings forming part of the specification.

In the drawings:

Fig. 1 is a longitudinal sectional view, partly in elevation, through a rotary power tool embodying a governor and governor valve arrangement mounted according to the invention.

Fig. 2 is a front-view, partly in section, of the handle member of the tool shown in Fig. 1.

Fig. 3 is a side-view of the governor and Fig. 3a is a perspective view of the governor.

Fig. 4 is a side-view of the rotor and shaft member.

Fig. 5 is a fragmentary side-view, partly in elevation, of the drive shaft.

Fig. 6 is a side-view of the control and handle head.

Fig. 7 is a side-view of the distributing bushing encircling the valve body formed in the shaft of the rotor.

Fig. 8 is a side-view of the assembled cylinder and control head; and

Fig. 9 is a fragmentary side-view of the front head.

Fig. 10 is a transverse sectional view on line 10—10 of Fig. 1.

Fig. 11 is a transverse sectional view on line 11—11 of Fig. 1.

Fig. 12 is a transverse sectional view on line 12—12 of Fig. 1.

Fig. 13 is a transverse sectional view on line 13—13 of Fig. 1.

Fig. 14 is a transverse sectional view on line 14—14 of Fig. 1.

Fig. 15 is a transverse sectional view on line 15—15 of Fig. 1.

Fig. 16 is a fragmentary, longitudinal sectional view of a rotary power tool embodying a somewhat modified governor and governor valve arrangement mounted according to the invention.

Figs. 17 and 18 are side-views of the governor valve stem and governor valve of the tool shown in Fig. 16; and

Fig. 19 is a longitudinal sectional view of the distributing bushing of such tool.

Referring now more particularly to the exemplified form of the invention shown in Figs. 1 through 15, reference numeral 2 represents a rotary power tool embodying a handle member 3, a control head 4, a cylinder section 5 and a front head 6. This power tool has arranged in its cylinder section 5 a pneumatic motor 7 embodying a cylinder 8 with inlet and outlet passages 9 and 9'. Cylinder 8 which is eccentrically related to the axis of the tool carries in its working chamber 10 a rotor 11 arranged concentrically with respect to said axis, which rotor is provided with a plurality of blades 12 slidably arranged in slots 14 for oscillation in said slots during rotation of the rotor, all as customary in the art. The rotor 11 is formed with two shafts 15 and 16 integrally extended from its opposite end faces, which shafts are axially aligned with each other and support the rotor in ball bearings 17 and 18 mounted in control head 4 and front head 6 respectively. The shaft 15, which is extended into control head 4, carries at its end a governor 19 embodying a base member 20 having a tubular, threaded portion, threaded upon the threaded end 21 of shaft 15, and weighted governor arms 22 pivotally cou-

pled with the base member 20 by pins 23. This governor actuates upon a piston-like governor valve 24 which is slidably arranged in a bore 25 in shaft 15 to permit its upward shifting when air under pressure enters said bore and its downward shifting when centrifugal force shifts levers 26 of the governor arms toward the end of shaft 15. The bore in shaft 15 forms a valve chamber for governor valve 24 and is provided with openings 27, 28 arranged below valve 24 in spaced relation with respect to each other lengthwise of shaft 15. Governor valve 24 is provided with a head portion 29 and dimensioned to partly or fully close opening 27 in shaft 15 to decrease or fully shut off air feed to the working chamber 10 of motor 7, so as to fully control the rotary speed of rotor 11 by governor 19.

Air is fed to motor 7 through an air passage 30 in handle member 3, which member carries at its outer end a connecting bushing 31 for a hose connection not shown. This air passage is controlled by a spring-pressed shut-off valve 32, the ball 33 of which is pressed on its seat 34 by a spring 35 and actuated by a push pin 36 slidably arranged in a bushing 37 and shiftably coupled with a trigger 38. This trigger is pivotally mounted in a slot 39 in handle member 3 by means of a pivot pin 40 and embodies a cam-shaped inner portion 41 arranged opposite the push pin 36 and two operating arms 42, 43 dimensioned and arranged so that either arm, when in inoperative position, is fully extended into slot 39 and, when in operative position, is fully extended outside of said slot (see Figs. 1 and 2). The inner cam-shaped portion 41 of the trigger includes at the end of its lifting cam 44 a recess 44' cooperating with the push pin 36 in locking the shut-off valve 32 in its open position, as will best be understood from an inspection of Fig. 2 of the drawings.

When shut-off valve 32 is in open position air flows through passage 30 and bore 45 in control head 4 to a cone-shaped strainer 46 from where the cleaned air is fed through a passage 47 into and through a distributing bushing 48 centrally arranged within a bore 49 in control head 4 and finally to the inlet passages 9 of cylinder 8. Thus, bushing 48 has extended through its central bore 50 the shaft 15 and is provided with two inner circular recesses 51 and 52 aligned with openings 27 and 28 in shaft 15 and in communication with the passage 47 and a passage 53 by means of bores 54 and 55, which latter passage is in open communication with inlet passages 9. The air thus fed to the working chamber of the motor is discharged from said chamber through outlet passages 10 into a deflector chamber 56 and finally discharged from said latter chamber through elongated openings 57.

The shaft 16 which extends into the front head 6 is coupled with a drive shaft 58 by means of a U-shaped key member 59. This drive shaft is rotatably mounted in front head 6 by means of a ball bearing 60 and has its inner end shaped to an enlarged head 61 which is formed with a central bore 62 including in its inner wall oppositely arranged elongated key slots 63. The key member 59 which is seated in these key slots and held in proper position by a split ring 64 engages the similarly slotted end of shaft 16 and thus effects a proper driving connection between the rotor and drive shaft 58, which latter carries at its lower end a grinding wheel 65 secured thereto, as customary, by inner and outer wheel washers 66 and 67 forced toward each other by a nut member 68.

Preferably, as shown, cone-shaped strainer 46 is closed at its lower end by a readily removable set screw 69, so as to permit of proper cleaning and blowing out of the strainer by air when said set screw 69 has been removed.

The thus constructed rotary power tool which can readily and easily be assembled and disassembled permits of ready access to pneumatic motor 7 and its governor 19. Thus, by unscrewing bolts 70 connecting handle member 3 with control head 4, the handle member may be removed to permit of ready removal of governor 19 and governor valve 24; and, by unscrewing bolts 71 connecting the cylinder section 5 with the front head 6, the front head may be removed to expose the front end of rotor 11. Removal and reassembly of the handle member of the tool is facilitated by arrangement of a cylindrical sealing member 72 which prevents leakage of air passing through passage 30 without the use of a gasket between handle member 3 and control head 4, and removal and reassembly of the front head of the tool is facilitated by attachment of the front end plate 73 to front head 6 by a bolt 74, so that removal of said front head freely exposes rotor 11 for repair and exchange of blades 12.

The modified governor and governor valve arrangement shown in Figs. 16 through 19 embodies a rotor 75, the shaft 76 of which mounts a governor 77 which controls and actuates a sleeve valve 78 slidably mounted on the bored end 79 of said shaft. For this purpose the bore 80 in shaft 76 slidably mounts a valve stem 81 which is coupled by means of a pin 82 with sleeve valve 78. This pin extends through oppositely arranged slots 83 in the wall of the bored end 79 of the shaft and permits shifting of the sleeve valve through valve stem 81 by governor 77. Shaft 76 is encircled by a distributing sleeve 84 communicating with air passages 85 and 86 through bores 87 and 88. This sleeve includes circular recesses 89 and 90 in its inner wall effecting communication between passages 85 and 86 when sleeve valve 78 is in its open position and preventing such communication when said sleeve valve is in its closed position. Otherwise the structure shown in Figs. 16 through 19 closely resembles the structure previously described and therefore further description thereof is superfluous.

Having thus described the invention what I claim is:

1. In a rotary power tool with a pneumatic motor, a housing having two interconnected chambers, a rotor arranged in one of said chambers, a shaft mounting said rotor having one end extended into the other of said chambers and said end portion provided with an axial bore, a solid valve axially shiftably extended into said bore, a lateral air inlet passage for said bore arranged below said valve and not controlled thereby, a lateral air outlet passage for said bore arranged above said inlet passage and controlled by said valve, a valve sleeve encircling the bored end of said shaft and formed with recesses effecting communication between said inlet and outlet passages, said valve sleeve and said valve cooperating with said shaft in sealing the said one chamber, and a governor on said end of said shaft within said other chamber engaging said valve and adapted to shift same against air pressure in said bore for controlling the said outlet passage at predetermined speeds of said shaft.

2. In a rotary power tool with a pnuematic motor, a housing having a rotor chamber and a governor chamber, a rotor in said rotor chamber, a shaft mounting said rotor and having one end extended into said governor chamber and provided with an axial bore, a solid valve axially shiftably extended into said bore, a lateral air inlet passage for said bore arranged below said valve and not controlled thereby, a lateral air outlet passage for said bore arranged above said outlet and controlled by said valve, a bearing sleeve between said two chambers; encircling the bored end of said shaft and formed with recesses in its inner wall communicating with said inlet and outlet passages, said bearing sleeve and said valve cooperating with said shaft in sealing said governor chamber from said bore in said shaft and said rotor chamber, and a governor on said end of said shaft engaging said valve and adapted to shift same against air pressure in said bore for control of said outlet passage at predetermined speeds of said shaft.

CHARLES F. OVERLY.