

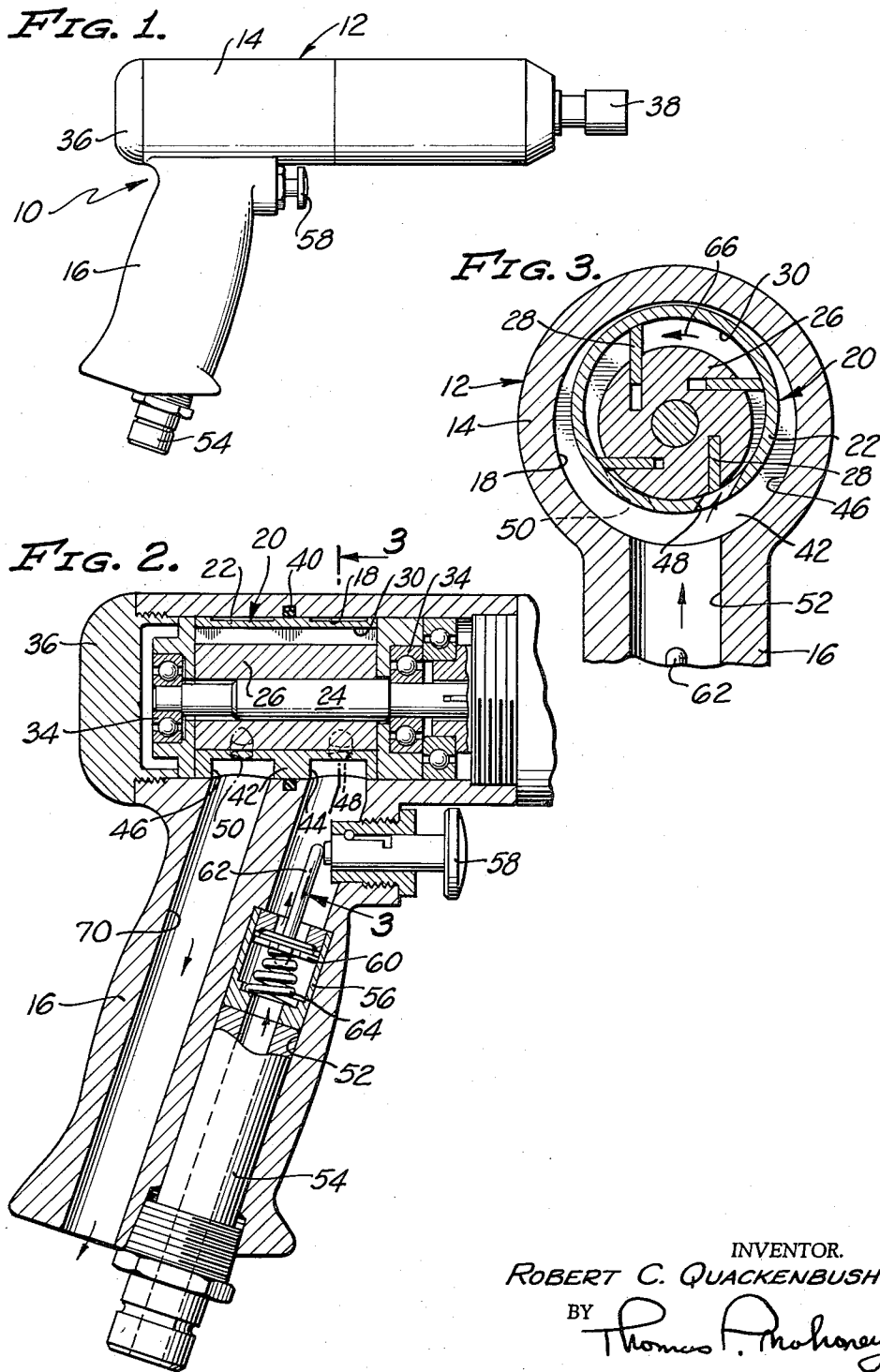
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PNEUMATIC HAND TOOL

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## PNEUMATIC HAND TOOL

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This invention relates to a pneumatic hand tool and, more particularly, to a unitary housing construction for a pneumatic hand tool which is adapted to facilitate the free flow of air under pressure to the motor of the hand tool and, in addition, to facilitate the discharge of exhaust air from the motor of the hand tool to atmosphere.

In conventional pneumatic hand tools the air under pressure is most frequently fed to the pneumatic motor of the hand tool through an inlet bore incorporated in the depending hand grip portion of the hand tool housing. However, such conventional tools usually discharge or exhaust the air from the pneumatic motor through a complex series of exhaust ports and passages formed in the housing of the hand tool by drilling, machining or similar operations.

Not only does the formation of such exhaust passages entail the performance of expensive machining operations, but the conventional labyrinthine exhaust passages also create considerable back pressure which prevents the free egress of exhaust air and thus materially reduces the operative efficiency of the pneumatic motor since a certain proportion of the output of the motor is expended in driving or pumping the exhaust air through the restricted exhaust passages.

It is, therefore, an object of my invention to provide a pneumatic hand tool which is characterized by the fact that the customary restrictive exhaust passage construction is eliminated and a relatively unimpeded, non-restricted exhaust passage substituted therefor. Consequently, the excessive back pressure characteristic of prior art constructions is eliminated and the fact that the exhaust air is more effectively discharged from the exhaust outlets of the pneumatic motor materially increases the efficiency of said motor.

Moreover, as will be apparent from the description of the invention appearing hereinbelow, the unrestricted nature of the exhaust passage provided in the hand tool of the invention eliminates the expensive and complex machining operations entailed by the formation of the relatively complex exhaust passages of prior art constructions and thus achieves considerable economies in manufacture which are reflected in attendant reductions in the cost of manufacture of the hand tool and a lower price to the ultimate consumer.

Other objects and advantages of the invention will be apparent from the following specification and the accompanying drawing, which is for the purpose of illustration only and in which:

FIG. 1 is a side elevational view of a pneumatic hand tool incorporating the teachings of the invention;

FIG. 2 is an enlarged, fragmentary sectional view of the relevant portion of the hand tool of FIG. 1; and

FIG. 3 is a transverse sectional view taken on the broken line 3-3 of FIG. 2.

Referring to the drawing, and particularly to FIGS. 1-2 thereof, I show a pneumatic hand tool 10 constructed in accordance with the teachings of my invention and incorporated in a housing 12 which has an elongated horizontal body portion 14 and an integral depending grip portion 16 thereupon. The housing 12 may be fabricated as a unit by conventional die casting processes from aluminum, zinc or similar materials adapted to the die casting process.

The horizontally extending body portion 14 of the

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housing 12 defines a substantially cylindrical motor chamber 18 in which is located a pneumatic motor 20. The pneumatic motor 20 includes a casing 22 through which extends a shaft 24 having a rotor 26 mounted thereupon and adapted to cause rotation of said shaft. A plurality of reciprocable blades 28 is mounted in the rotor 26 for engagement with the inner surface 30 of the motor casing 22. The opposite extremities of the shaft 24 are journaled in bearings 34 and the end of the motor chamber 18, defined by the horizontal portion 14 of the housing 12, has a cap 36 threadedly engaged therein. The shaft 24 is connected to a chuck 38 or similar device, for the reception of an appropriate tool to be driven by the hand tool 10.

The interior wall of the motor chamber 18 incorporates an annular sealing ring 40 intermediate its extremities, said sealing ring being engageable with the adjacent perimetrical surface of the motor casing 22. It will be noted that the motor casing 22 is provided with a rib 42 intermediate its extremities which is engaged by the sealing ring 40 and which serves to divide the motor chamber 18 into two separate compartments, namely, an inlet compartment 44 and an exhaust compartment 46.

The rib 42 is formed eccentrically with respect to the longitudinal axis of the motor casing 22 and is thus of reduced height on one side of the motor casing 22, as best shown in FIGS. 2 and 3 of the drawing. Thus, the exterior surface of the motor casing is spaced by the rib from direct engagement with the interior surface of the motor chamber 18 in order that air may circulate freely about the exterior of the motor casing 22. Therefore, the rib 42 is engaged upon the sealing ring 40 at all times, no matter what the orientation of the motor casing 22 may be, and the free flow of inlet air to inlet ports 48 in any orientation of the motor casing 22 is assured.

The motor casing 22 incorporates one or more inlet or intake openings 48 which communicate with the inlet compartment 44 and which are adapted to feed air under pressure to the interior of the motor casing 22 at one side of the rotor 26. The motor casing also includes one or more exhaust or outlet openings 50 disposed in communication with the interior of the motor casing 22 and adapted to receive and transmit exhaust air from the interior of said motor casing to the exhaust compartment 46 within the chamber 18.

The depending grip portion 16 of the housing 12 includes an inlet bore 52 having its lower extremity at the lower end of the grip portion 16 and its upper extremity in communication with the inlet compartment 44 of the motor chamber 18. A hose fitting 54 is threadedly secured within the lower extremity of the inlet bore 52 and retains a valve assembly 56 within the upper extremity of the bore 52 in juxtaposition to a valve plunger 58.

The valve assembly includes a valve member 60 having an upwardly directed stem 62 and a compression spring 64 which biases said valve member onto its associated seat. The inward depression of the valve plunger 58 against the stem 62 of the valve member 60 urges the valve member 60 off its associated seat and permits the upward flow of air under pressure through the hose fitting 54 into the intake or inlet compartment 44 of the motor chamber 18. From the intake compartment 44 of the motor chamber 18 the air under pressure flows through the inlet openings 48 in the motor casing 22 and serves to drive the rotor and its associated shaft 24 in a counterclockwise direction, as indicated by the arrow 66 of FIG. 3 of the drawing.

An exhaust bore 70 is formed in the grip portion 16 of the housing 12 and is disposed in substantial parallelism with the inlet bore 52. Therefore, exhaust air

flows from the interior of the motor casing 22 through the exhaust openings 50 and the exhaust compartment 46 into the exhaust bore 70 from which it exits at the lower extremity of the grip portion 16 of the housing.

Therefore, the flow path established by the inlet bore 52, the inlet compartment 44 and the inlet openings 48 into the interior of the motor casing 22 is an unimpeded and unobstructed path which imposes a minimum amount of restriction on the air under pressure flowing to the motor 20. Of greater importance, however, is the fact that the flow of exhaust air is even less impeded since the exhaust air is discharged directly from the motor casing 22 to the exhaust compartment 46 of the motor chamber 18 and thence into the large unrestricted exhaust bore 70.

Among the desirable and beneficial results achieved by the practice of the teachings of the invention is the more effective operation of the motor 20 since the back pressure imposed upon such pneumatic motors by conventional exhaust ports and passages prevents the operation of said pneumatic motors at optimum efficiency. In addition, the complex coring, machining and boring entailed in the use of die cast housings, when such housings must be modified to provide the conventional exhaust passages incorporated therein, are eliminated and considerable economies in the manufacture of pneumatic hand tools incorporating the teachings of the invention are achieved.

Moreover, the simple flow path established by the construction of the invention eliminates devious and small diameter ports and passages which, in conventional pneumatic hand tool constructions, are subject to clogging by foreign matter such as dust, dirt and the like. Because of the operation of the motor 20 at greater efficiency the working life thereof is materially prolonged and servicing expenditures incident to the use thereof are considerably curtailed.

#### I claim:

1. In a pneumatic hand tool, the combination of: a housing having a grip portion formed integrally therewith, said housing defining an elongated chamber and said grip portion having an inlet port communicating with one portion of said chamber and an exhaust port communicating with an adjacent portion of said chamber, said inlet and exhaust ports terminating at the lower extremity of said grip portion; seal means mounted in the wall of said chamber between said inlet and exhaust ports; and a pneumatic motor mounted in said chamber including a casing having an inlet opening in communication with said inlet port and an exhaust opening in communication with said exhaust port, said sealing means being engageable with the perimeter of said casing to prevent direct communication between said inlet and exhaust ports.

2. In a pneumatic hand tool, the combination of: a unitary housing having a substantially horizontal portion defining a motor receiving chamber and having a hand grip portion formed integrally with and depending from said horizontal portion, said hand grip portion incorporating a substantially straight pressure inlet bore and a substantially straight exhaust bore disposed in parallelism therewith, said inlet and exhaust bores being disposed in communication with said motor receiving chamber at the upper extremities thereof and having their lower extremities at the lower extremity of said hand grip portion; and a pneumatic motor mounted in said motor receiving chamber having an intake opening juxtaposed to and in communication with the upper extremity of said pressure inlet bore and an exhaust opening located adjacent and juxtaposed to the said exhaust bore; and means operatively associated with the wall of said chamber intermediate said inlet bore and exhaust bore and said intake opening and exhaust opening respectively preventing direct fluid

communication between said inlet bore and said exhaust bore.

3. In a pneumatic hand tool, the combination of: a unitary housing having a substantially horizontal portion defining a motor receiving chamber and having a hand grip portion formed integrally with and depending from said horizontal portion, said hand grip portion incorporating a pressure inlet bore and an exhaust bore disposed in parallelism therewith, said inlet and exhaust bores being disposed in communication with said motor receiving chamber at the upper extremities thereof and having their lower extremities terminating at the lower extremity of said hand grip portion; and a pneumatic motor mounted in said motor receiving chamber having an intake opening juxtaposed to and in communication with the upper extremity of said pressure inlet bore and an exhaust opening located adjacent and juxtaposed to the said exhaust bore; and means operatively associated with the wall of said chamber intermediate said inlet bore and said exhaust bore and said intake opening and exhaust opening for respectively preventing direct fluid communication between said inlet bore and said exhaust bore, said last mentioned means being constituted by a seal interposed between the wall of said housing and the external surface of said motor.

4. In a pneumatic hand tool, the combination of: a unitary housing having a substantially horizontal portion defining a motor receiving chamber and having a hand grip portion formed integrally with and depending from said horizontal portion, said hand grip portion incorporating a substantially straight pressure inlet bore and a substantially straight exhaust bore disposed in parallelism therewith, said inlet and exhaust bores being disposed in communication with said motor receiving chamber at the upper extremities thereof; and a pneumatic motor mounted in said motor receiving chamber, said motor having a casing incorporating an intake opening juxtaposed to and in communication with the upper extremity of said pressure inlet bore and an exhaust opening located adjacent and juxtaposed to said exhaust bore; and means operatively associated with the wall of said chamber intermediate said inlet bore and exhaust bore and said intake opening and exhaust opening respectively, preventing direct fluid communication between said inlet bore and said exhaust bore.

5. In a pneumatic hand tool, the combination of: a housing having a grip portion, said housing defining an elongated chamber and said grip portion having an inlet port communicating with one portion of said chamber and an exhaust port communicating with an adjacent portion of said chamber, said grip portion including straight inlet and outlet bores having their upper extremities communicating, respectively, with said inlet and outlet ports and their lower extremities in the lower extremity of said grip portion; seal means mounted in the wall of said chamber between said inlet and exhaust ports; and a pneumatic motor mounted in said chamber including a casing having an inlet opening in communication with said inlet port and an exhaust opening in communication with said exhaust port, said seal means being engageable with the perimeter of said casing to prevent direct communication between said inlet and exhaust ports.

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