

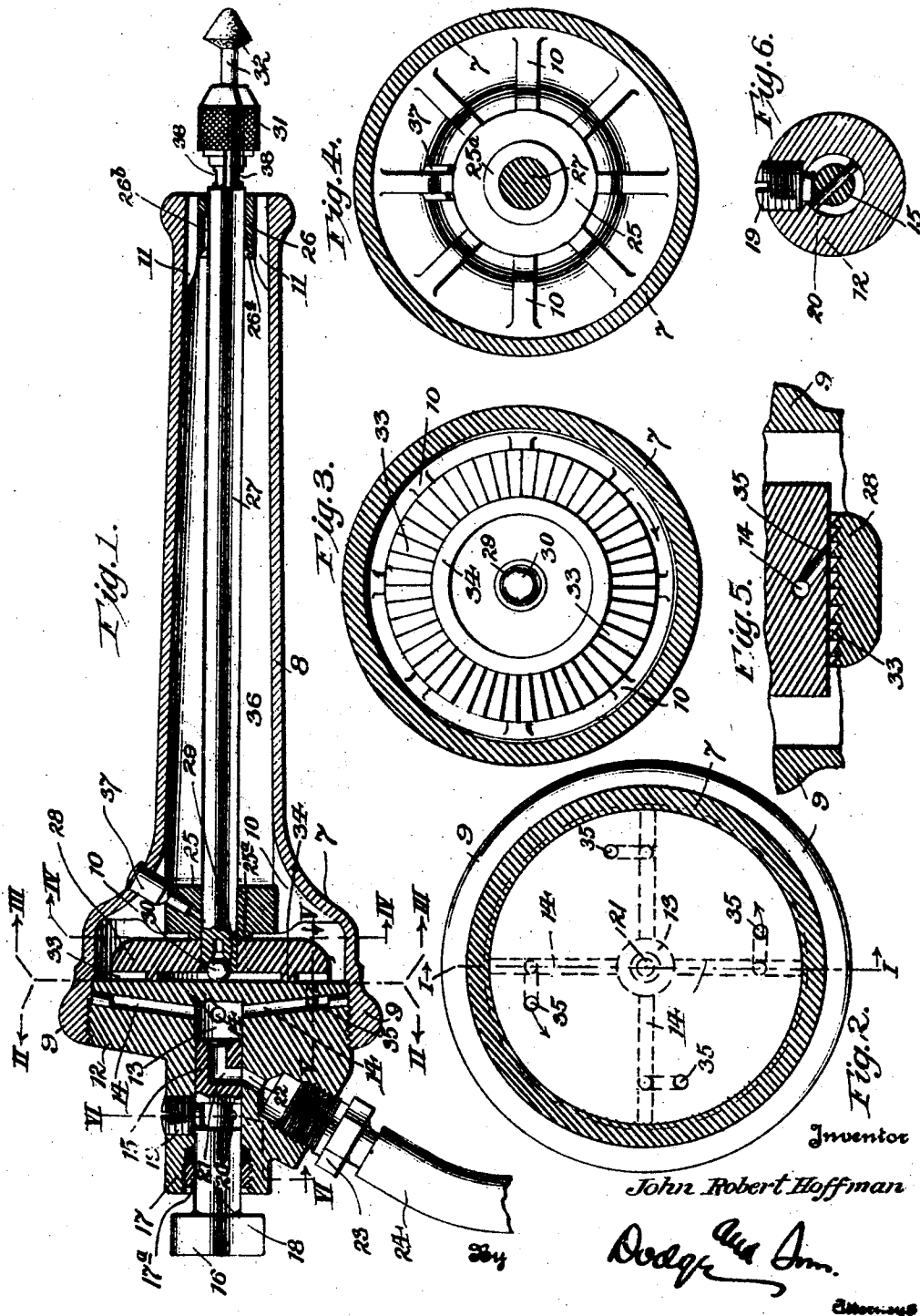
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PORTABLE TOOL

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PORTABLE TOOL

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My invention relates to portable tools and primarily to tools adapted to be driven by fluid pressure.

In prior art devices of this character, the working mechanism has generally consisted of many parts and the construction of the tool has been such as to make it unsuitable for one-hand manipulation. Many such devices have also been objectionable because of their noisy operation or because they required special muffling structure to reduce the noise.

In the device of my invention, the number of parts has been reduced to a minimum, and the construction so modified and improved as to adapt it to use in one hand, without undue interference from the hose which supplies the fluid pressure for operating the turbine. Furthermore the casing is composed of only two parts and the construction is such that the tool operates noiselessly without the provision of a special muffling device.

The accompanying drawing illustrates one embodiment of my invention, and in this drawing,

Fig. 1 is a longitudinal section of the complete device, the section being taken substantially on the line I—I of Fig. 2;

Fig. 2 is a section on line II—II of Fig. 1 showing the position of the fluid pressure inlet ports;

Fig. 3 is a section on line III—III of Fig. 1 showing the construction of the turbine runner and its relation to the casing;

Fig. 4 is a section on line IV—IV of Fig. 1 illustrating the inner construction of the exhaust casing;

Fig. 5 is a broken view on the line V—V of Fig. 1 showing the relation of one of the inlet ports to the runner; and

Fig. 6 is a section on line VI—VI showing the details of the fluid pressure control valve.

Referring to the drawing, the reference character 7 designates a hollow casing having an elongated forward portion 8 and an enlarged rear portion 9. Preferably formed integrally with the casing 7 are a plurality of spaced radial ribs 10 and 11

in the rear and forward portions respectively of this casing.

Threaded into the enlarged end 9 of casing 7 is a closure member 12 containing an inner chamber 13 and a series of radial fluid pressure ducts 14 which extend from chamber 13 to the front face of member 12 and terminate in ports 35. The chamber 13 extends to the rear end of closure 12 and contains a fluid pressure control valve 15.

The closure 12 also contains a duct 22 adapted to be at times connected with the chamber 13, and this duct is preferably threaded to receive a short nipple 23, to which pressure fluid from a suitable source may be supplied through a flexible hose 24. The nipple 23 and duct 22 are preferably angularly disposed with respect to the axis of the tool so as not to interfere with the manipulation of the control valve 15.

The valve 15, as best shown in Figs. 1 and 6, comprises a stem 18 terminating at its outer end in a handle 16. This stem 18 contains a duct 21 which is adapted, in one position of the valve, to connect chamber 13 with duct 22. In rear of the duct 21, the stem 18 is reduced in diameter to receive a stop screw 19 which is threaded into the closure 12. A pin 20 passing diametrically through the stem 18 engages the stop screw 19 in both the open and closed positions of the valve, the rotation of stem 18 being thereby limited to approximately 90 degrees. The closure 12 is threaded at 17 to receive a packing 17a which prevents leakage of fluid from the rear of the valve.

The valve may be rotated by the handle 16. When the parts occupy the position shown in the drawing the end of duct 21 registers with the end of duct 22 so as to connect the source of pressure fluid with chamber 13, but upon rotation of handle 16 until pin 20 strikes stop screw 19 on the opposite side from that shown, the opening of duct 22 is closed. It will be clear that by suitably adjusting the handle 16 the amount of pressure fluid supplied to the tool may be regulated as desired.

The ribs 10 and 11 in casing 7 define annular spaces adapted to receive bearings 25 and 26 for a shaft 27. Bearing 25 has a reduced

annular portion 25a and is lubricated by an oil cup 37. The bearing 26, however, contains a countersunk annular oil groove 26a on the inside adjacent to shaft 27. Groove 26a communicates with a small longitudinal groove 26b. When the tool is operating, the pressure fluid escaping through portion 8 of casing 7 forces oil along the shaft 27, and causes it to collect in grooves 26a and 26b in sufficient quantity to lubricate the bearing.

The shaft 27 is rotatably mounted in these bearings and carries at its inner end a turbine runner 28. The inner end of shaft 27 also contains a conical seat 29 adapted to receive and support a ball bearing 30 which contacts with the front face of closure 12 when this closure is secured in position. The forward end of shaft 27 carries a chuck 31 in which may be mounted any suitable tool 32, the shaft having flat portions 38 to which a wrench may be applied when chuck 31 is tightened or loosened. During normal operation of the tool, shaft 27 is supported by the bearings 25 and 26, but when the tool 32 is forced against the work, ball bearing 30 contacts with the front face of closure 12 and forms a thrust bearing therefor.

The runner 28 carries on its rear surface a series of buckets 33 having their faces toward the inlet ports 35. The inner radial portions of buckets 33 are closed by an annular rim-like extension 34, so that pressure fluid cannot escape inwardly of the buckets, but is directed outwardly in the enlarged portion 9 of the casing. A runner construction of this general type is described and claimed in a copending application of Axel Pedersen, Ser. No. 563,202, filed September 16th, 1931, and entitled "Pressure fluid tools". It will be apparent that the runner 28, in combination with the ducts 14, comprises a simple single-action impulse turbine of the axial-flow type. When any suitable source of fluid pressure, such as a source of compressed air, is connected to the hose 24 and the control valve 15 is moved to the open position as shown in Fig. 1, pressure fluid passes through the nipple 23, ducts 22 and 21, chamber 13, ducts 14 and ports 35, whence it is directed against the buckets 33 so as to set the runner 28 in motion and together with it, shaft 27 and tool 32.

The fluid after expending a substantial portion of its kinetic energy by impact against the buckets 33, escapes outwardly in a radial direction and then longitudinally of the casing 7 through the openings between the ribs 10, space 36 and between ribs 11 where it exhausts around the tool 32, so as to blow away any chips which are collected on the work during operation of the tool. Inasmuch as the runner 28 is mounted in over-hung bearings and the shaft 27 is of substantial length, the parts are well balanced and operate smoothly and with a minimum of vibra-

tion. When no axial thrust is being exerted on the tool 32, the entire weight of the rotating parts is carried by bearings 25 and 26, the axial thrust caused by the fluid pressure impact being taken up by engagement of the runner 28 with the reduced rear face 25a of bearing 25. When, however, an axial thrust is brought to bear against tool 32, the ball bearing 30 resists it and reduces the resulting friction to a negligible amount.

It will be seen that this tool is composed of a very small number of parts and the speed of rotation of the runner 28 may be controlled readily by manipulation of the handle 16, so as to open or close the valve 15 and thus vary the amount of pressure fluid which is brought to bear against the buckets 33. This tool is well adapted for one-hand operation and can be made in very small sizes. By making the nipple 23 very short and using a flexible hose 24, the fluid pressure inlet will not interfere appreciably with the handling of the device, the only need for another hand being to turn the control valve on or off.

Another substantial advantage of this construction is that it operates noiselessly without the provision of a muffler, the fluid pressure exhausted between the ribs 11, escaping in such manner that muffling devices are unnecessary.

The durability of the device is greatly enhanced by mounting the fluid pressure control valve directly in the rear closure so as to protect the operating parts from injury, and yet to render them readily accessible for repair or replacement. Likewise the entire tool may be readily disassembled by removing the chuck 31 and then unscrewing the rear closure 12 so as to permit the runner 28 and associated parts to be removed.

This tool is well adapted for use as a pencil type of grinder, and as such may be employed advantageously in removing excess metal from small die-cavities or die-castings, as a dentist's tool, and for numerous other uses which will be apparent to those skilled in the art to which this invention relates.

Subject matter disclosed in this case and not claimed herein, or in the Pedersen case referred to above, is claimed in my copending application, Ser. No. 548,245, filed July 1st, 1931, and entitled "Hand tools".

Although I have herein shown and described only one form of portable tool embodying my invention, it will be obvious that various changes and modifications may be made, within the scope of the appended claims, without departing from the spirit and scope of my invention.

What is claimed is:

1. A hand tool comprising a two-part casing; a turbine runner rotatably mounted in one of said parts, said one part containing a plurality of radial ribs forming longitudinal channels connecting the chamber adjacent said runner with atmosphere; and fluid pres-

sure controlling and directing means within the other of said parts.

2. A hand tool comprising an elongated casing; a turbine runner rotatably mounted in said casing in overhung relation thereto; a plurality of spaced radial ribs on the interior of said casing and forming longitudinal channels around the mounting for the turbine runner; a closure member for said casing, said member having fluid pressure supply ducts therein; and a fluid pressure control valve within said closure.

3. A hand tool comprising an elongated casing containing a plurality of radial ribs defining longitudinal channels terminating in exhaust ports and said casing having a shaft mounted therein; a runner on said shaft; a closure member for the rear end of said casing, said member containing pressure fluid ports in operative relation to said runner; and a fluid pressure control valve within said closure.

4. A fluid pressure operated tool comprising a two-part casing made up of an elongated portion, and a closure portion; a turbine runner rotatably disposed in said elongated portion; a plurality of radial ribs in said elongated portion and spaced to form pressure fluid exhaust channels; a pressure fluid control valve disposed within said closure portion, said portion containing radial ducts adapted to supply pressure fluid to said runner; and valve operating means on said closure portion.

5. A fluid pressure operated tool comprising a two-part casing made up of an elongated portion and a closure portion, said elongated portion having one end enlarged and the other contracted; a plurality of radial ribs disposed within said elongated portion and spaced to form fluid exhaust channels connecting said enlarged end and said contracted end; a turbine runner rotatably mounted in said enlarged end; and fluid pressure controlling and directing means disposed within said closure portion, said directing means being operatively associated with said runner.

6. A fluid pressure operated tool comprising a hollow casing having one end enlarged and the other contracted; a shaft revolvably mounted within said casing; a turbine runner on said shaft within said enlarged end; clutching means on said shaft adjacent to said contracted end; a plurality of radial ribs within said casing and spaced to form pressure fluid exhaust channels terminating adjacent said clutching means; a closure member for said casing, said member containing fluid supply ducts terminating in ports adjacent to said runner; and a valve within said closure member, constructed and arranged to control the supply of pressure fluid to said runner.

7. In a fluid pressure operated tool; a cas-

ing; a bearing in each end of said casing; a turbine runner mounted in said casing in overhung relation to said bearings; a closure for said casing; fluid pressure controlling and directing means within said closure, and adapted to supply pressure fluid to said runner to operate the tool; means for lubricating one of said bearings from the outside of the casing; and lubricating means on the other bearing constructed and arranged to have lubricant supplied to it by the escaping pressure fluid, when the tool is operating.

8. In a fluid pressure operated tool; a casing; a bearing in each end of said casing; a turbine runner mounted in said casing in overhung relation to said bearings; a closure for the casing adjacent to said runner; fluid pressure controlling and directing means within said closure; lubricating means on the bearing adjacent to said runner; and an oil collecting groove in the other bearing, constructed and arranged to have lubricant supplied to it by the escaping pressure fluid, when the tool is operating.

9. A fluid pressure operated tool comprising a hollow casing; a plurality of spaced radial ribs in said casing, said ribs being cut away to form bearing supports adjacent each end of the casing; a bearing in each of said supports; a turbine runner having a shaft rotatably supported in said bearings; and a closure member containing fluid pressure supply ducts for delivering pressure fluid to said runner.

10. A fluid pressure operated tool comprising an elongated casing; a turbine runner rotatably mounted in said casing; a plurality of spaced radial ribs forming longitudinal channels connecting the interior of the casing adjacent to said runner with atmosphere, said ribs being cut away to form bearing receiving recesses for the mounting of said runner; a closure member containing fluid pressure supply ducts terminating in ports adjacent said runner; and a pressure fluid controlling valve in said closure member.

In testimony whereof I have signed my name to this specification.

JOHN ROBERT HOFFMAN.