

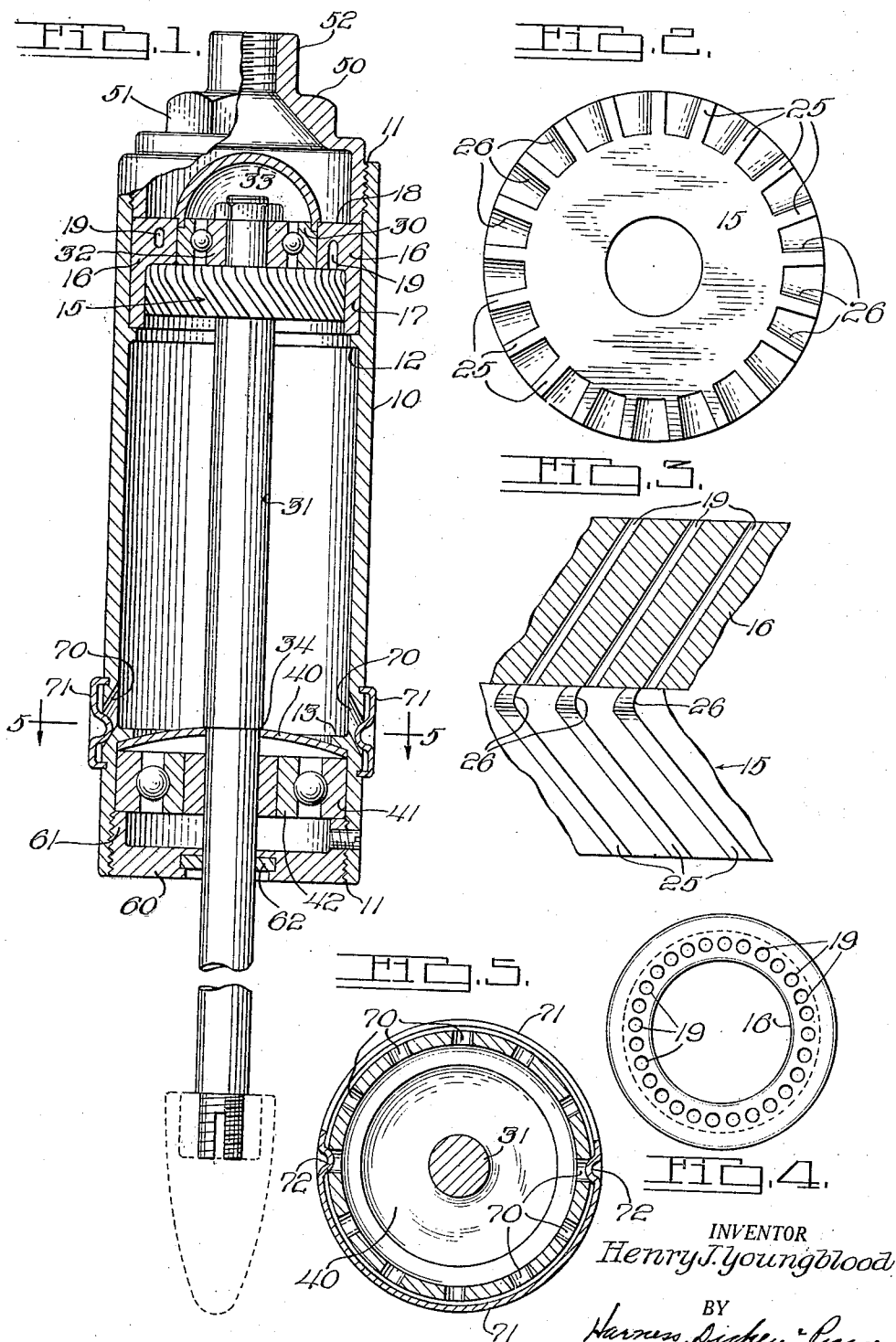
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ROTARY POWER DRIVEN TOOL

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ROTARY POWER DRIVEN TOOL

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My invention relates to rotary power driven tools and particularly to the turbine driven type.

The principal object of my invention is to provide a high speed power driven tool suitable for use in connection with grinding tools.

Another object of my invention is to provide such a tool for use in grinding and forming drawing dies.

Another object of my invention is to provide a tool of the type described which is simple and cheap to manufacture, which consists in the minimum number of parts, and the working parts of which may be readily and easily assembled and disassembled.

Another object of my invention is to provide such a tool in which the motive agency may be used to cool the bearings of the working parts and to maintain them at workable temperatures, regardless of the speed of the parts.

Another object of my invention is to provide such a device from which air may be exhausted at low pressure and thereby substantially eliminate undesirable exhaust noise common to the type of devices now in common use.

Another object of my invention is to provide such a tool adapted to be used with a variety of attachments.

Another object of my invention is to provide a tool of the type described which may be made in various sizes, including those sizes which are readily handled and manipulated by a single operator, such as a hand tool.

With these and other objects in view, my invention consists in the arrangement, construction and combination of the various parts of my improved device as described in the specification, claimed in my claims and shown in the accompanying drawing, in which:

Fig. 1 is a longitudinal sectional view of my device.

Fig. 2 is an enlarged diagrammatic cross section of the turbine rotor embodied in my device.

Fig. 3 is an enlarged fragmentary cross section of the turbine rotor, and the nozzle and casing member embodied in my device,

this section being taken in a longitudinal direction through the members.

Fig. 4 is an elevation of the outer face of the nozzle or rotor casing embodied in my device, the shaft bearing being omitted.

Fig. 5 is a view taken on the line 5—5 of Fig. 1.

The numeral 10 designates a tubular housing having an internally threaded portion 11 at each end, within the housing and inwardly removed from each end are annular ribs 12 and 13 which may be formed integrally with the housing or formed separately and secured therein. Within the housing 10 is positioned a motor element comprising a turbine rotor, and nozzle and casing member. The rotor is designated by the numeral 15 and the nozzle and casing member is designated by the numeral 16. The nozzle and casing member comprises a cup shaped member having a perimetral flange 17 extending laterally from one side thereof. This flange 17 embraces the perimeter of the rotor 15. A plurality of holes or nozzles 19, shown in Fig. 4, and also in Fig. 3, lead transversely and obliquely through the wall 18 of the member 16 and register with the inner ends of the blades of the rotor.

The rotor comprises a disc having radially and transversely extending blades 25 secured to or formed upon its perimeter. These blades, in plan, are shown in Fig. 3. They extend obliquely and transversely across the perimeter of the rotor disc in parallel relation to each other. The inner ends of the blades are turned to form cupped faces 26 which register with the nozzles 19 in the casing member 16. There is a nozzle member provided for each blade. Compressed air is the preferred motive agency for driving this turbine, and the nozzles 19 and the blades 25 are positioned so that the included angle between them is approximately 105 degrees, the nozzles 19 and the blades 25 being positioned at angles of 35 degrees and 40 degrees respectively to the axis of rotation.

In the central portion of the member 16 is secured a ball bearing 30 comprising the usual balls and races. The reduced end of a shaft 31 is journaled in this ball bearing

and secured to the inner race 32. This shaft is also keyed to the turbine rotor 15 and extends entirely through and beyond the remote end of the housing 10. A cap member 33, hemispherical in shape, and formed as a metal stamping, has a flange of reduced thickness around its edge which is adapted to make a spring fit in a circular notch formed in the outer corner of the outer ball race, as shown in Fig. 1. This cap 33 entirely encloses the outwardly exposed portion of the ball bearing and forms a lubricant chamber therefor and protects the bearing from direct contact with compressed air.

The outer face of the annular rib 13 is bevelled, and bearing against the bevelled face is the edge of a spring plate 40 which surrounds the shaft 31 and in its central portion bears against the shoulder 34 formed on the shaft. Outwardly of the spring plate 40 is positioned a second ball bearing 41 comprising the usual balls and races. The inner race 42 may be frictionally secured or slidably keyed to the shaft 31.

A nipple member 50 is provided for the turbine end of the housing 10 and has external threads formed thereon adapted to engage the internal threads 11 of the housing and to turn therein sufficiently to bear against the edge of the member 16 and force its lateral flange 17 tightly against the annular rib 12 in the housing. This nipple member is provided at its exterior end with a squared portion 51 to which a wrench may be applied for attaching or detaching the member relative to the housing 10, and at its extreme outer end is provided with a fitting 52 adapted to receive the end of an air hose. A closure member 60 is provided for the opposite end of the housing 10 and has external threads formed thereon adapted to engage the threads 11 of the housing. This member 60 also has a lateral inwardly extending flange 61 which bears against the side edges of the bearing 41 and forces it and the edges of the spring plate 40 against the annular rib 13. This member 60 forms a lubricant chamber for the bearing 41. The member 60 is formed with a central aperture therein through which the shaft extends and is provided with a recess 62 around this aperture in which a packing washer of felt or other suitable material may be placed to seal the lubricant chamber.

The housing 10 is provided with escape apertures 70, shown in Figs. 1 and 5, which are positioned adjacent and above the spring plate 40 and which permit the air to escape from the housing 10 after passing through the turbine rotor 15. The housing 10 is also provided with spaced grooves, one on each side of the row of escape apertures 70, and a guard member 71 having inwardly extending edge flanges is movably mounted in these grooves. The under side of the guard member 71 is

spaced above the surface of the housing 10 and the apertures 70 and has a portion cut away as shown in Fig. 5, to uncover some of the escape apertures. This guard member 71 is also provided with indented portions 72 which bear in the escape apertures 70 and serve to lock the guard member 71 in desired position. The guard member may be rotated upon the casing 10 to control the direction of flow of the escaping air. The exterior end of the shaft 31 is suitably threaded and slotted as shown, in order that a grinding wheel or pencil may be attached thereto.

My device may be very cheaply manufactured and may be very readily assembled and disassembled. The nozzle and turbine casing member 16, the rotor 15, and the shaft 31 may be removed from the housing 10 as a unit, by releasing the nipple member 50 and by removing the grinding wheel or pencil from the exterior end of the shaft. The motor element, comprising a turbine rotor 15 and the casing and nozzle member 16, are very easily and simply assembled relative to each other and relative to the housing 10. The bearing member 41 is also easily removed from the casing 10 by turning out the closure member 16, and it may be removed independently of the shaft 31. The same applies to the shield plate 40. The cap member 33 which is applied to the nozzle and turbine casing member 16 provides a closed lubricant chamber for the bearing 30 and protects the bearing from direct contact with the compressed air which is introduced through the nipple 52. It does not, however, prevent the cooling of the bearing and lubricant by compressed air as it flows into the nipple member 50 and through the nozzle apertures 19 in the casing member 16. The shield plate 40 having the edges of its central opening bearing against the shoulder 34 of the shaft 31 protects the bearing member 42 from direct contact with escaping air, but does not prevent the cooling of the bearing by such air. In fact the cooling effect is quite pronounced on both bearings and will hold them at proper temperatures during all normal conditions of operation. The shield plate 40 being slightly dished, insures a tight bearing against the shoulder 34. The housing member 10 in addition to providing assembly support for the other parts of the device forms an expansion chamber for the air that has passed through the turbine, and substantially eliminates the undesirable exhaust noise common to other such tools now used.

I prefer to construct the turbine rotor of aluminum, which, on account of its lightness, is more easily actuated by compressed air than a rotor of heavier material. It will also stop rotating quickly upon shutting off of the compressed air supply, as it is not of sufficient weight to carry on of its own momentum against the inertia of the shaft and the

grinding wheel, and it enables me to obtain greater speed and quicker action than would be possible with a heavier rotor. I have, with the device in operation, obtained 32,000 R. P. M., where the best of other devices of similar nature, of which I am aware, have only been able to obtain a speed of 28,000 to 30,000 R. P. M.

What I claim is:

1. A device of the class described comprising a tubular housing, annular ribs positioned therein adjacent each end, a turbine rotor, a casing for said rotor embracing one side and the perimeter thereof and having a laterally extending perimetral flange abutting against one of said ribs in said housing, nozzles formed in said casing registering with the blades of said rotor, a shaft bearing in said casing, a cap member covering the outer end of said bearing and forming a closed lubricant chamber therefor, a shaft journaled in the bearing in said casing and keyed to said rotor and extending beyond the opposite end of said housing, a second bearing member supporting said shaft and positioned in the opposite end of said housing from said rotor, a shield plate interposed between said second bearing and said rotor and surrounding said shaft and bearing inwardly against a shoulder thereon and having its outer edges engaged between said second bearing and one of said annular ribs, an end closure for said housing having an inwardly extending perimetral flange for holding said second bearing and said plate against one of said annular ribs and forming a lubricant chamber for said bearing, a cap member for the opposite end of said housing having a nipple formed thereon and having a perimetral lateral flange abutting said turbine casing and holding the same against one of said annular ribs in said housing, and forming a fluid supply chamber for the nozzles in said turbine casing, said housing having a series of escape apertures formed therein adjacent said shield plate, and an adjustable guard for controlling the direction of flow of escaping fluid covering said escape apertures.
2. A device of the class described comprising an air driven turbine, a shaft connected to said turbine, a bearing for said shaft spaced from said turbine, a housing enclosing said turbine and bearing and forming an expansion chamber therebetween for air leaving said turbine, said housing provided with air outlet ports remote from said turbine, and regulatable means for controlling the direction of flow of escaping air having an opening for uncovering at least one of said ports and projections engaging other of said ports for positioning said regulatable means.
3. In a device of the class described, a shaft, and a housing having spaced internal abutment collars therein, a motor organization supported against one of said collars and engaging said shaft, a shaft bearing

member positioned adjacent the other of said collars, and a concave guard plate interposed between said motor and said bearing member and surrounding said shaft and clamped between said bearing member and the last mentioned abutment collar.

4. In a device of the class described, a housing having an internal abutment collar, a shaft in said housing, a bearing member for said shaft positioned adjacent said abutment collar, and a concave guard plate surrounding said shaft and clamped between said bearing member and said internal collar.

5. A fluid driven turbine having an inlet port for the fluid, a plurality of outlet ports therefor to permit the escape of the fluid after passing through the turbine, a guard element associated therewith for controlling the escape of the fluid from the outlet ports having projections which engage said ports for positioning said guard and an opening which uncovers at least one of said ports for permitting the escape of the fluid therefrom.

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