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EXHAUST MEANS FOR ROTORS

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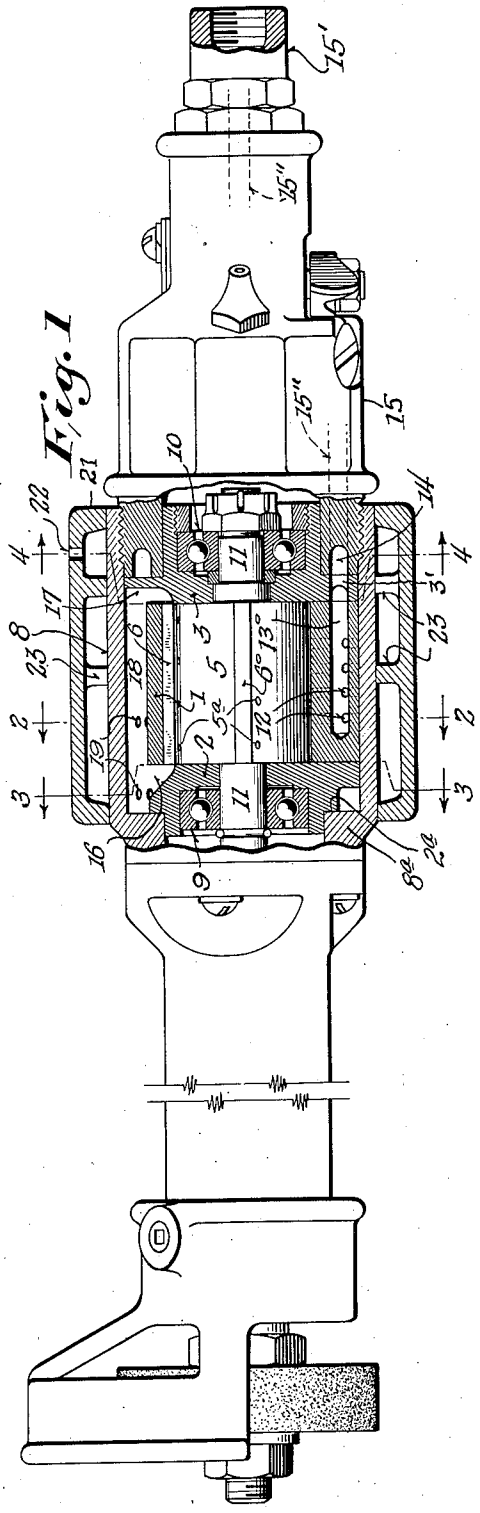


Fig. 1

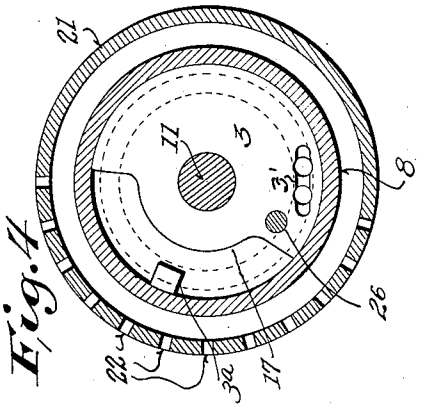


Fig. 4

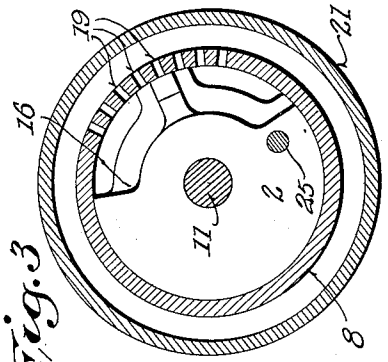


Fig. 3

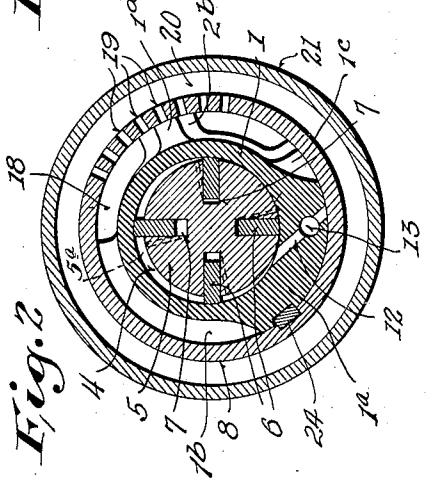


Fig. 2

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EXHAUST MEANS FOR ROTORS

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4 Claims. (Cl. 121—34)

This invention relates to rotors for portable grinders and other portable rotary tools.

The general purpose and object of the invention is to provide an end exhaust for the rotor chamber as in the end plates of the chamber, whereby the exhaust ports are eliminated from the rotor bushing as heretofore. This reduces bushing breakage as it is unnecessary to drill exhaust holes through the bushings to weaken them, and moreover the bushings last longer because no opportunity is afforded for the piston elements or blades of the rotors to wear the inner surfaces of the bushings unevenly.

In the accompanying drawing:

Fig. 1 is a side elevational view of a portable grinder having a rotor having an end exhaust in accordance with my invention, the rotor assembly being shown in section and elevation, respectively; and

Figs. 2, 3, and 4 are transverse sectional views taken on lines 2—2, 3—3, and 4—4, respectively, of Fig. 1 to illustrate details of the rotor construction.

As shown in Fig. 1, the rotor assembly of the tool has a rotor bushing or casing 1 closed at its opposite ends by end plates 2, 3, which plates provide with the bushing 1 a rotor chamber 4 for a rotor 5. The latter, in the construction shown in the drawing, is eccentrically mounted in the bushing 1 and has contact with the inner surface of the bushing at one portion only in the circumference of the bushing. The rotor 5 is substantially as long as the bushing and has its ends against the end plates 2, 3 as shown.

The piston elements of the rotor are in the form of blades 6, which are carried by the rotor in radial slots 7 therein. The blades 6 extend the full length of the rotor and the slots 7 are of like length. The slots open through the ends of the rotor and the ends of the blades work against the end plates 2, 3, as shown. The blades have the desired working fit in the slots and in the construction shown are forced outwardly of the slots against the inner surface of the bushing 1 on the pressure side of the rotor to prevent leakage of the pressure fluid from the rear to the front sides of the blades in the operation of the rotor. On the exhaust side of the rotor, the blades are movable into the slots to compensate for the decreasing space between the rotor and the inner surface of the bushing 1 as the blades approach the contact point between the rotor and the bushing. In the particular construction shown, the blades are forced outwardly on the pressure side of the rotor by connecting the bottoms of the slots to the pressure fluid supply for the tool. On the exhaust side of the rotor, the bottoms of the slots are connected with the exhaust of the rotor. This is accomplished by porting the rotor in advance of each of the slots 7 in the manner shown in dotted lines in Fig. 2. As illustrated, the porting comprises passages 5a, 5a which open at their outer ends through the periphery of the rotor in advance of the blades 6 and connect at their inner ends with the bottoms of the slots 7 for the blades.

The bushing 1 is supported in a supporting casing 8 and is fixed against rotation therein by key, as shown in Fig. 2 or other suitable holding means. The end plates 2, 3 are clamped against the ends of the bushing in the manner shown in Fig. 1 and are held from turning by being dowelled or otherwise fixedly secured to the bushing 1 or to the casing 8. The end plates support anti-friction bearings 9, 10 for the shaft extensions 11, 11 with which the rotor 5 is provided at its opposite ends as shown in Fig. 1. The shaft extension 11 at the front end of the rotor is connected in a suitable manner to the spindle of the tool for rotating the grinding wheel or other working element with which the tool is provided.

The fluid pressure, for example, compressed air, for rotating the rotor is admitted into the rotor chamber 4 through the inlet ports 12 in the bushing 1. These ports supply the pressure fluid to the rear sides of the blades 6 on the pressure side of the rotor and this fluid acting on the blades rotates the rotor. The ports 12 are spaced axially along the bushing 1 and connect with a common supply passage 13 which by a port 3' in the end plate 3 connects with a supply groove or channel 14 in the tool head 15 which screws into the casing 8 for clamping the end plates 2 and 3 against the bushing 1. The head 15 is provided at its outer or rear end with an inlet fitting 15' for connecting the tool with the source of pressure fluid supply and said head has a suitable passage arrangement indicated generally by 15'' for connecting the inlet fitting with the supply groove or channel 14. The head 15 is equipped with a suitable manually operable throttle valve (not shown) for controlling the flow of pressure fluid through the passageway 15'' to the rotor of the tool as in structures of this general character.

The exhaust from the rotor chamber 4 is through the end plates 2, 3 in accordance with my invention. This is accomplished by providing each end plate with an exhaust port, marked

16 for plate 2 and 17 for plate 3. These ports extend circumferentially of the rotor chamber and have a length to take in approximately the entire exhaust or low pressure side of the rotor chamber as shown in Figs. 3 and 4. These ports, as shown in these figures, are at the outer edges of the plates, being formed by cutting away the peripheral portions of the plates to the desired extent.

The exhaust ports 16, 17 are exteriorly of the bushing 1 and connect with an exhaust chamber 18, which as shown in Fig. 2 comprises the space between the bushing 1 and its supporting casing 8. This casing has a group of exhaust ports 19 which connect with a chamber 20 provided by a muffler casing 21 which fits about the casing 8 in spaced relation thereto. The muffler casing 21 is provided with one or more ports 22 which open to the atmosphere, as shown in Figs. 1 and 4. The muffler casing 21 is suitably secured in place about the outer side of the rotor assembly and may be provided with a number of interior partitions 23 to space the muffler from the casing 8 and to provide a tortuous path for the exhaust fluid to silence its discharge from the tool.

With the exhaust means at an end of the rotor chamber and removed from the bushing 1, as herein disclosed, the objection to the bushing wearing out and also breaking on account of the exhaust holes drilled in the bushing as herefore, is overcome. The bushing is not weakened as heretofore and moreover a continuous and uninterrupted working surface is provided in the bushing 1 for the blades. Thus, no opportunity is afforded for the blades to produce a wash board effect in the bushing as heretofore because none of the metal of the bushing is removed in the working surface for the blades. With this surface intact, bushing breakage is reduced and longer lasting bushings result.

As shown in the drawing and more particularly in Fig. 1, it will be noted that the end plates 2 and 3 fit within the casing 8 and have their peripheral edges, except where cut away to provide the exhaust ports 16, 17 in contact with the inner cylindrical surface of the casing 8 beyond the ends of the bushing 1. The end plates 2, 3 are clamped against the ends of the bushing 1 by the casing 8 and the tool head 15. The latter is screwed into the casing 8 against the end plate 3 and clamps said end plate against the adjacent end of the bushing 1. The opposite end of the casing 8 has an inwardly extending flange 8a which engages a shoulder 2a on the end plate 2 to draw said plate tightly against the bushing 1 when the head 15 is tightened against the end plate 3. This provides an effective clamp for the end plates, requiring the use of only one turnable member. The channel 14 in the head 15 connects with the supply passage 13 in any rotative position of the head 15.

The bushing 1 is supported in the casing 8 by contact with the inner cylindrical surface of the casing along the longitudinal portion 1a of the bushing and at the peripheral edges of its end flanges 1b, 1c and lugs 1d. The flanges and lugs are duplicated at the opposite ends of the bushing, the flanges being on opposite sides of the longitudinal portion 1a, and the lugs being intermediate the ends of the flanges, which terminate at the ends of the adjacent exhaust ports 16, 17 as shown in the drawing. The flanges and the lugs are integral with the bushing and project radially outward from the body of the bushing to support the bushing in the casing in the spaced relation required to provide the exhaust chamber 18. The flanges and the lugs are co-planar with the ends of the bushing, and have the end plates 2, 3 clamped against them. The end plate 2, as shown in Fig. 2, has a lug portion 2b which seats against the associated bushing lug 1d. The peripheral portion of the end plate 2 is cut away on opposite sides of the lug 2b to provide the exhaust port 16. The end plate 3 as shown in Fig. 4, has a lug 3a to seat against its bushing lug 1d. The exhaust port 17 in the end plate 3 is formed by reducing the thickness of the end plate on its inner side on opposite sides of and below the lug 3a as indicated in Figs. 1 and 4. This gives the end plate 3 continuous peripheral contact with the inner surface of the casing 8 to receive the tool head 15 and close the adjacent end of the exhaust chamber 18. The other end of the exhaust chamber 18 is closed by the end plate 2 and the flange 8a of the casing 8.

The key for holding the bushing from turning in the casing 8 is shown at 24 in Fig. 2. The dowels which connect the end plates to the bushing are shown at 25, 26 in Figs. 3 and 4.

The details of construction and arrangement of parts shown and described may be variously changed and modified without departing from the spirit and scope of my invention, except as pointed out in the appended claims.

What I claim as my invention is:

1. In a motor assembly of the character described, a bushing providing a rotor chamber, a casing surrounding and supporting the bushing and spaced therefrom to provide an exhaust chamber between them, end plates for the opposite ends of the bushing, said end plates fitting within the casing beyond the ends of the bushing and having peripheral contact with the casing, means for clamping the bushing in the casing and the end plates against the bushing, a rotor in said bushing and having piston blades engageable with the inner surface of the bushing, and inlet and exhaust ports for the rotor chamber, said inlet ports being in the bushing and said exhaust ports being in the end plates, said exhaust ports being formed in the peripheral portions of the end plates and disposed to connect the exhaust side of the rotor chamber with the exhaust chamber about the opposite ends of the bushing, whereby the inner surface of the bushing is free of exhaust ports to provide a smooth and continuous working surface for the piston blades.

2. In a motor assembly of the character described, a bushing providing a rotor chamber, a casing surrounding the bushing, said bushing having radial end extensions in peripheral contact with the casing to support the bushing in the casing and to space the bushing from the casing to provide an exhaust chamber between them, end plates for the opposite ends of the bushing, said end plates fitting within the casing beyond the ends of the bushing and having peripheral contact with the casing, means for clamping the bushing in the casing and the end plates against the bushing, a rotor in said bushing and having piston blades engageable with the inner surface of the bushing, and inlet and exhaust ports for the rotor chamber, said inlet ports being in the bushing and the exhaust ports being in the end plates, said exhaust ports being formed in the peripheral portions of the end plates, and disposed to connect the exhaust side of the rotor chamber with the exhaust chamber about the opposite ends of the bushing, the end

extensions on the bushing being formed to register the exhaust ports with the exhaust chamber.

3. In a motor assembly of the character described, a bushing providing a rotor chamber, a casing surrounding and supporting the bushing and spaced therefrom to provide an exhaust chamber between the bushing and the casing, end plates for the opposite ends of the bushing, said plates fitting within the casing beyond the ends of the bushing and having peripheral contact with the casing, said casing having an inwardly extending portion at one end overlapping and engaging the adjacent end plate, a member screwed into the other end of the bushing against the other end plate for clamping the bushing in the casing and the end plates against the bushing, a rotor mounted in the bushing and having piston blades engageable with the inner surface of the bushing, and inlet and exhaust ports for the rotor chamber, said inlet ports being in the bushing and the exhaust ports being one in each end plate, said exhaust ports being formed by cutting away the peripheral portions of the end plates and disposed to connect the exhaust side of the rotor chamber with the exhaust chamber about the opposite ends of the bushing, whereby the inner surface of the bushing is free of exhaust ports to provide a smooth and continuous working surface for the piston blades.

4. In a motor assembly of the character described, a bushing providing a rotor chamber, a casing surrounding the bushing, said bushing having radial end extensions in peripheral contact with the casing to support the bushing in the casing and to provide an exhaust chamber between the bushing and the casing, end plates for the opposite ends of the bushing, said plates fitting within the casing beyond the ends of the bushing and having peripheral contact with the casing, means for clamping the bushing in the casing and the end plates against the bushing, a rotor in said bushing and having piston blades engageable with the inner surface of the bushing, inlet and exhaust ports for the rotor chamber, said inlet ports being in the bushing and the exhaust ports being in the end plates, said exhaust ports being formed in the peripheral portions of the end plates and disposed to connect the exhaust side of the rotor chamber with the exhaust chamber about the opposite ends of the bushing, the exhaust port in one end plate being formed by cutting away the peripheral portion of said end plate, and the exhaust port in the other end plate being formed by reducing the thickness of the end plate on the side facing the bushing, whereby said last named end plate has continuous peripheral contact with the casing.

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