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2,367,668

RUBBING MACHINE

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Fig. 1

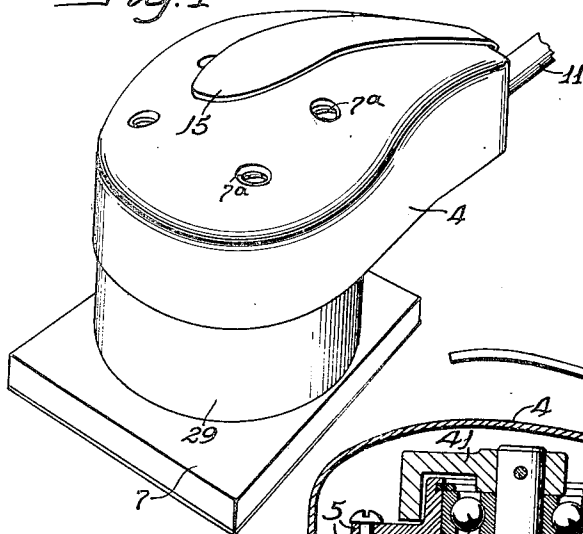


Fig. 2

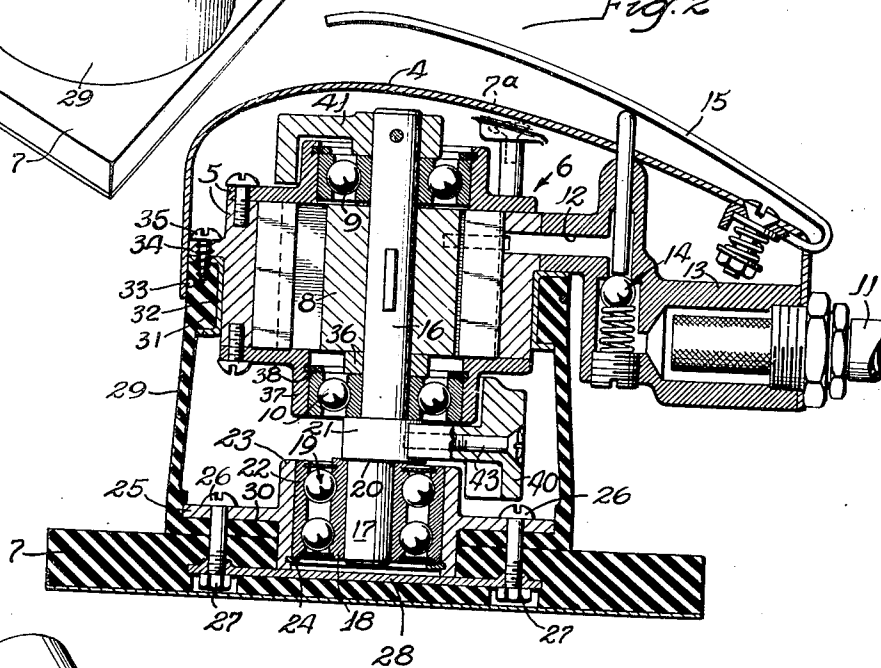
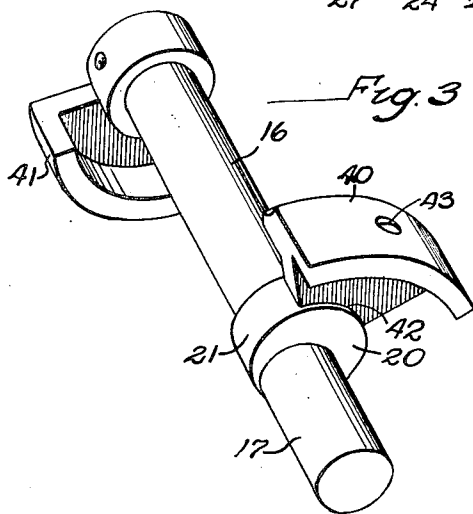


Fig. 3



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RUBBING MACHINE

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8 Claims. (Cl. 51-170)

This invention relates to rubbing machines of the type in which the rubbing element is power driven with a positive gyratory motion.

One object is to improve the efficiency of a rubbing machine of the above character by balancing the rotating and gyrating parts in a novel manner such as to insure that the rubbing element will gyrate in a truly circular path.

Another object is to provide a rubbing machine of the above character in which the parts are held together in a novel manner and a constant thrust is applied to the means for sustaining the shoe pressure.

Other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawing, in which

Figure 1 is a perspective view of a rubbing machine embodying the present invention.

Fig. 2 is a diametrical cross-sectional view.

Fig. 3 is a perspective view of the drive shaft.

While the invention is susceptible of various modifications and alternative constructions, I have shown in the drawing and will herein describe in detail the preferred embodiment. It is to be understood, however, that I do not intend to limit the invention by such disclosure, but aim to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

In the form shown in the drawing, the improved rubbing machine comprises generally a downwardly opening housing 4 enclosing the casing 5 of a rotary motor 6 on which a work performing element or rubbing shoe 7 is supported for bodily gyration. The housing 4 has a rounded top and vertical sides so that it may be held conveniently in the operator's hand. The motor casing and the housing 4 are secured together by screws 7a.

In the present instance, the motor 6 is of the pneumatic type having a rotor 8 whose shaft 16 is journaled in ball bearings 9 and 10 at opposite ends of the casing 5 and impelled in a well known manner by compressed air delivered through a hose 11 and a passage 12 extending through a casting 13 rigid with the motor casing and constituting the body of a control valve 14. The latter is spring closed and adapted to be opened by depression of a handle 15 which is disposed above the housing 4 so that the valve may be actuated by the user's hand that supports the tool. The shaft 16 projects beyond the flanged lower end of the casing 5 and the

bearing 10, and its end 17 is disposed eccentrically approximately $\frac{3}{4}$ of an inch relative to the shaft proper. This end fits into the inner race ring 18 of a double ball bearing 19 which 5 ring abuts against a shoulder 20 on an enlargement 21 of the shaft. The outer bearing ring 22 is received in a tube 23 and seated against a snap ring 24 therein. A flange 25 on the tube is clamped to the top of the rubbing shoe 7 by 10 bolts 26 whose nuts 27 are tightened against a plate 28 molded in the shoe and abutting against the lower end of the tube 23. Thus, the eccentric 17 is journaled in the shoe so as to cause bodily gyration of the latter during rotation of 15 the shaft by the motor.

To hold the shoe against turning during such gyration, a skirt 29 composed of leather, rubber, or other flexible material is secured at its lower end to the shoe 7 and at its upper end to the 20 motor casing 5 which constitutes a non-rotatable support. For this purpose, the skirt has an intumed flange 30 at its lower end clamped between the flange 25 and the top of the shoe. At its upper end, the skirt is formed with an 25 intumed annular rib 31 which fits into the outwardly opening channel of a metal ring 32 which may be split and tightened around the exterior of the casing 5 by a wire 33 encircling the upper end of the skirt. The ring is drawn upwardly 30 against a flange 34 on the motor casing by an annular series of sheet metal screws 35. Preferably the spacing of the shoe 7 and the flange 34 is greater than the axial length of the skirt as the latter is formed initially. Thus, after 35 the skirt is clamped against the shoe 7, the ring 32 is spaced somewhat below the flange 34. Then, by tightening the screws 35 to bring the ring against the flange, the skirt is stretched axially and placed under tension. This draws 40 the shoe upwardly and constantly applies an upward thrust which is transmitted to the shaft 16 through the bearing 19 and to the motor casing 5 through the bearing 10 which is a ball thrust bearing having an inner race ring bearing 45 against a washer 36 at the end of the rotor 8 and an outer ring feeding in the end flange 37 of the casing and seating against a snap ring 38. By thus holding the parts together, proper gyration of the rubbing shoe takes place without the necessity of pressing the shoe firmly against the work surface thereby increasing the versatility of the tool in rubbing various kinds of work.

I have discovered that the efficiency of a tool of the above character is dependent upon the 50 trueness of the gyration of the rubbing shoe

which, in turn, is governed by the balance of the rotary parts. If these parts are unbalanced, a point on the active face of the rubbing shoe will gyrate in an elliptical or oval path of smaller radius than the throw of the eccentric. On the other hand, if the parts are perfectly balanced, each abrasive particle will traverse a truly circular path of the full radius of the eccentric with a consequent increase in cutting efficiency.

To balance the parts both statically and dynamically, and in view of the inconvenience of locating a balancing weight in the plane of gyration, it is desirable to employ two counterweights 40 and 41 disposed on opposite ends of the motor shaft and on opposite sides of the latter, the lower weight 40 having its center of mass disposed eccentrically of the shaft axis and opposite to the eccentric 17. As herein shown, this weight comprises an arcuate casting having an inner surface 42 which is clamped against the enlargement 21 by a screw 43. The weight 41 has a similarly constructed arm pinned to the upper end of the shaft 16 on the opposite side of the latter so as to produce an effect which counterbalances that eccentricity of the shoe 7 which tends to oscillate the shaft 16 about the bearing 10 as a fulcrum. In practice, the masses of the weights 40 and 41 are varied in magnitude until, by observing the path traversed by a point such as an abrasive particle on the underside of the shoe 7, this point describes a perfect circle. Such balance of the parts will result in a substantial increase in the speed of gyration and a corresponding improvement in the rubbing efficiency.

I claim as my invention:

1. A rubbing machine having, in combination, a rubbing shoe, a rigid support, a power driven shaft journaled in said support to turn about an axis fixed relative thereto, means providing a driving connection between said shaft and said shoe and operable to effect positive gyration of the shoe during rotation of said shaft, means operable to transmit to said support the thrust applied to said shoe and directed endwise of said shaft, and flexible connecting means between said support and said shoe maintaining a constant end thrust on the latter and holding said shoe against turning during gyration thereof.

2. A rubbing machine having, in combination, a rubbing shoe, a rigid support, a power driven shaft journaled in said support to turn about an axis fixed relative thereto, means providing a driving connection between said shaft and said shoe and operable to effect positive gyration of the shoe during rotation of said shaft, means operable to transmit to said support the thrust applied to said shoe and directed endwise of said shaft, and a flexible skirt around said shaft stretched axially between said shoe and said support and acting to hold the shoe against turning during gyration thereof while maintaining a constant end thrust on said thrust transmitting means.

3. A rubbing machine having, in combination, a rubbing shoe, a rigid support, a power driven shaft journaled in said support, means providing a driving connection between said shaft and said shoe and operable to effect positive gyration of the shoe during rotation of said shaft, bearing means sustaining the thrust applied to said shoe and directed endwise of said shaft, and flexible means for maintaining said bearing means under

constant thrust and holding said shoe against turning during gyration thereof.

4. A rubbing machine having, in combination, a rubbing shoe, a rigid support means flexibly connecting said shoe and support, to prevent turning of the shoe while permitting of bodily gyration of the shoe relative to the support, a power driven shaft journaled in said support to turn about an axis fixed relative thereto, means providing a driving connection between said shaft and said shoe operable to effect positive gyration of the shoe during rotation of said shaft, and means operable to transmit to said support the thrust applied to said shoe and directed endwise of said shaft, said flexible connecting means being held under tension and maintaining a constant end thrust on said thrust transmitting means.

5. A rubbing machine having, in combination, a rubbing shoe, a rigid support, a power driven shaft rotatable on said support and having one end projecting toward and disposed adjacent the top of said shoe, an eccentric on said end journaled in said shoe to cause gyration of the latter during rotation of said shaft, a weight rotatable with said shaft and carried eccentrically on said projecting end opposite said eccentric, and a second weight carried by said shaft at a point spaced from said first weight and disposed eccentrically on the side of the shaft opposite said first weight.

6. A rubbing machine having, in combination, a power actuated motor having a rotatable shaft with oppositely projecting ends, a rubbing shoe disposed beyond one end of said shaft, means providing an eccentric driving connection between said latter end and said shoe for bodily gyrating the shoe, an eccentric weight carried by and rotatable with said last mentioned shaft end and counterbalancing the eccentricity of said connection, and a second eccentric weight carried by the other of said shaft ends on the opposite side of the shaft and proportioned to counterbalance said shoe during gyration thereof.

7. A rubbing machine having, in combination, a power rotated shaft, two weights carried by said shaft at spaced points and eccentrically disposed on opposite sides of said shaft, a rubbing shoe beyond one end of said shaft, and a connection between said shaft and said shoe axially spaced from one of said weights producing bodily gyration of the shoe during rotation of said shaft, said counterweights being proportioned and disposed to balance the eccentricity of said shoe and rotating parts and cause gyration of the shoe in a perfect circle.

8. A rubbing machine having, in combination, a power driven motor having a shaft with its end portions projecting from opposite sides of the motor, a rubbing shoe, an eccentric on one of said end portions journaled in said shoe to cause gyration of the latter during rotation of the shaft, an eccentric weight carried by said shaft and disposed between said eccentric and said motor and on the side of the shaft opposite said eccentric so as to counterbalance the latter, and a second eccentric weight carried by the other end portion of said shaft and disposed on the same side of the latter as said eccentric, said second weight being proportioned in size to cause accurate gyration of said shoe.

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