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RUBBING MACHINE

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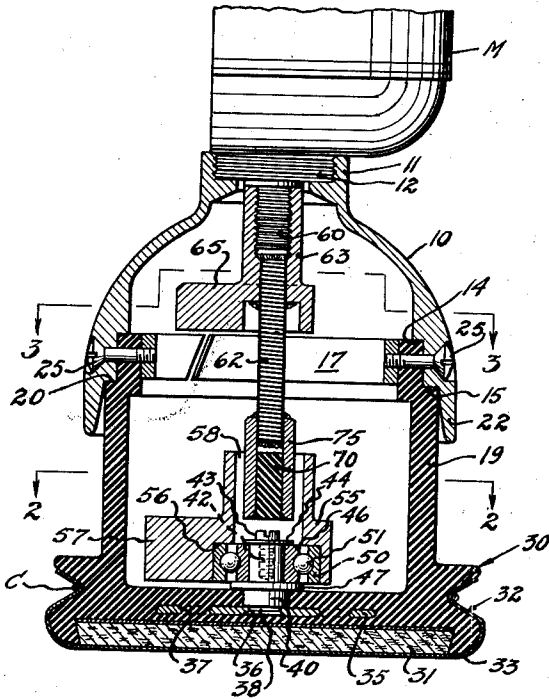


Fig. 1.

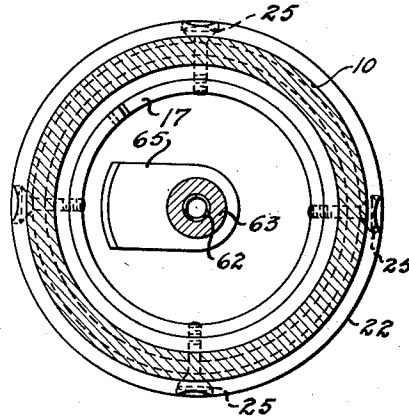


Fig. 3.

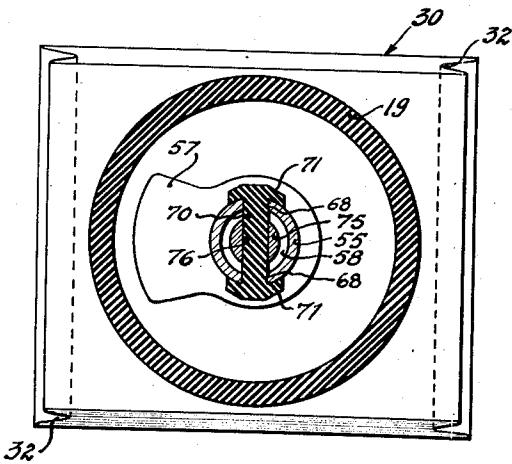


Fig. 2.

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UNITED STATES PATENT OFFICE

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RUBBING MACHINE

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Application September 17, 1940, Serial No. 357,135

3 Claims. (Cl. 51—170)

This invention pertains generally to rubbing machines such as are used for sanding and buffing purposes and, in its major aspects, it deals with improvements in the invention set forth in my copending application Serial Number 303,049, filed November 6, 1939, of which this present application is a continuation in part.

This and my said prior application relate to rubbing machine construction wherein a rubbing pad is oscillated with respect to a stationarily held base by means of an eccentric rotor connected to a power means in the base by a flexible shaft and universal connection, the rubbing pad being suspended from the base by means of a flexible wall.

With particular reference to my present invention, one of its major objects is to provide a flexible, universal connection of the flexible shaft to the eccentric rotor which will have a minimum of wear and which is highly flexible and efficient. For instance, in my said prior device, the lower end of the flexible shaft was connected to the rotor by means of a ball socketted in the rotor and fulcrumed therein by means of pins projecting from the ball into slots in the rotor. While this construction has advantages, I have found that it is subject to wear under certain operating conditions, which wear allows too much play in the connection. By my present invention, this wear has been eliminated without losing any of the necessary high flexibility of the connection.

It is also an aim of both my said prior invention and my present invention to provide a device which reduces to a minimum the shock and vibration imparted to the hand of the operator and which eliminates the tendency of the rubbing pad to assume a vertical or jumping movement during its oscillation as distinguished from an ideal horizontal circular movement. While this was accomplished by my said prior invention to a degree never before accomplished in this art, it is an object of my present invention to accomplish this result to a still greater degree.

A still further object of my present invention is to provide a device which will operate with a minimum of power. For instance, aside from cost of operation, in devices wherein the motor is secured on the base for easy portability and convenient use, they become cumbersome to use unless the size and weight of the motor are kept at a minimum. By reducing the power requirements, the size and weight of the motor may be correspondingly reduced and the device rendered easier to handle.

All of the above-mentioned features and objects of my invention, as well as further objects, aspects and details thereof, will be best understood from the following description of a typical and illustrative form, for the purposes of which description I make reference to the accompanying drawing, in which:

Fig. 1 is a vertical section, the bottom of the motor element being shown in elevation;

Fig. 2 is a plan section on line 2—2 of Fig. 1; and

Fig. 3 is a plan section on line 3—3 of Fig. 1.

I show in the drawing a device having a rigid, bell-shaped base or casing 10 presenting an internally threaded motor mounting flange 11 at its top end into which the mounting flange 12 of a conventional motor M is threaded. Casing 10 is provided at its bottom interior portion with two vertically-spaced annular shoulders 14 and 15.

In the bottom end of the casing 10 there is secured, by means of a split ring 17, the upper reduced end of a circular flexible wall 19. This wall is preferably composed of relatively soft rubber and its top end rests against shoulder 14 and its annular shoulder portion 20 rests against casing shoulder 15, the bottom peripheral portion of the casing having an annular skirt portion 22. The outer surface of the bell-shaped casing provides a convenient hand gripping surface for manual manipulation of the device on the work and the space between the inner surface of the skirt 22 and the outer surface of the adjacent wall 19 permits wall 19 to move laterally during operation. Four screws 25, which are threaded at their inner ends into ring 17, secure the wall 19 to the casing.

At the bottom end of wall 19 and preferably formed integrally therewith, I provide a flexible rubbing pad 30, which is preferably composed of relatively soft rubber and is preferably rectangular the bottom of pad 30 being recessed to receive padding element 31 of cork or other suitably soft and flexible material. Two of the opposite side walls of pad 30 are grooved at 32 to receive a spring clamp C to hold in place an abrasive sheet 33 stretched over the bottom of the pad. The construction of clamp C is described in my copending application. Preferably moulded in the pad 30, there is a horizontally disposed metal plate 35 having a central opening 36 and a number of circumferentially spaced perforations 37, which perforations are filled by the rubber material of the pad to hold the plate securely in place. Within opening 36 I secure the re-

duced end 38 of a vertical journal shaft 40. A threaded bore 42 is provided in the upper end of the shaft 40 to receive cap screw 43, which, together with washer 44, confines an inner race 46 of a ball-bearing unit against shoulder 47 of shaft 40. Between outer race 50 and the inner race 46, there are a plurality of balls 51 to comprise the ball-bearing unit, the journal shaft 40 fitting into the inner race of the ball-bearing unit. An eccentric rotor 55 has a bottom recess 56 which houses the bearing unit and has an upwardly opening bore 58 to receive the universal connection to be later described. Rotor 55 has an eccentric weight 57 radially offset from the axis of the rotor to cause the center of gravity of the rotor to be to one side of the axis of rotation so that, when rotated, the resultant centrifugal force causes the pad 30 to move about a circular path around its axis, which movement flexes side wall 19 between the pad and its upper end.

For more particular details of the foregoing described elements of my invention, reference is made to my said copending application.

For operatively connecting the motor drive shaft 60 to the rotor, I provide a flexible shaft 62 which is secured at its upper end in a sleeve 63, said sleeve being internally threaded adjacent its top end to receive the threaded motor drive shaft 60. The lower end of sleeve 63 carries, preferably as an integral part thereof, an eccentric weight 65 radially offset from the axis of rotation of the sleeve and positioned directly above the eccentric weight 57. The side wall of the upper portion of the rotor 55 is provided with a pair of diametrically opposite slots 68 in which the respective ends of a transversely disposed flexible anchor bar 70 tightly fit, bar 70 being preferably composed of a relatively soft rubber. The outer ends of bar 70 are flanged at 71 to prevent transverse movement of the bar in the slots. The lower end of the flexible shaft has secured thereto a sleeve 75 having a pair of diametrically opposite longitudinal slots 76 to provide a bifurcated lower end to fit over anchor bar 70.

The center of gravity of the eccentric rotor 55 is positioned in a plane below the plane of the center of gravity of the combined pad 30, side wall 19 and rotor 55, which causes the lines of centrifugal force to act in a horizontal plane when the pad 30 is held against a work surface.

The flexible shaft 62, including the flexible anchor bar 70, is of such relative flexibility that it has the same natural frequency of vibration as does the flexible side wall 19 so that, in operation, those respective exciting and excited elements operate in resonance. By so constructing those elements to obtain resonant operation, I am able, by my invention, to obtain maximum efficiency and can obtain the same amplitude of movement by utilizing a motor of substantially much less horsepower and weight than would be necessary in a construction not having such resonance. This is of extreme importance in a sanding device of this character where, for com-

pactness and easy portability, it is desirable to mount the motor directly on the sanding device and use a direct drive as distinguished from mounting a relatively heavier motor on some remote support and driving the sander by a long flexible shaft as has heretofore been found necessary.

In operation, the upper eccentric weight 65, which is relatively smaller and lighter than the lower weight 55, counteracts the tendency of the upper end of the flexible shaft to move in a direction opposite to the direction of lateral movement of the lower end of the flexible shaft. This not only increases the efficiency of the device but also reduces the vibration which would otherwise result.

While, in the foregoing description, I have resorted to various details of structure and association of parts, I wish it understood that I do not thereby confine my invention to such specific details. Rather, various modifications and adaptations may be made within the broader scope of the invention as defined by the appended claims.

I claim:

1. In a rubbing device, a base including operating means, a rubbing pad, a flexible wall spacing the rubbing pad from and suspending it below the base, an eccentric weight rotatably mounted on the rubbing pad, a shaft member operatively connecting the operating means to the eccentric weight, and a second eccentric weight secured to said shaft member and spaced above the first-mentioned eccentric weight.

2. In a rubbing device, a base including operating means, a flexible pad, a flexible wall of circular cross-section spacing and suspending the pad from the base, a rotor rotatably mounted on the pad, an eccentric weight carried by and offset from the axis of rotation of the rotor, a shaft operatively connecting the operating means to the rotor, said shaft having an upper rigid portion and a lower flexible portion, and a second eccentric weight carried by said rigid portion and offset from the axis of rotation thereof, said second eccentric weight being positioned directly above and spaced from the first-mentioned eccentric weight.

3. In a rubbing device, a base including operating means, a rubbing pad, a flexible wall spacing and suspending the rubbing pad from the base, a rotor on the rubbing pad for vibrating the same, said rotor having walls defining a socket opening towards the base, a pair of opposite slots in said walls, a flexible anchor bar mounted transversely of the socket, said anchor bar having end flanges engaging the exterior surface of the side walls of the rotor adjacent said slots whereby to prevent transverse movement of the anchor bar in the slots, and a flexible shaft secured at its top end to the operating means and being bifurcated at its lower end, said bifurcated portion engaging over and establishing connection to said anchor bar.

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