Feb. 21, 1956 R. W. HILGERS 2,735,241

RUBBING MACHINE

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Fig. 1.

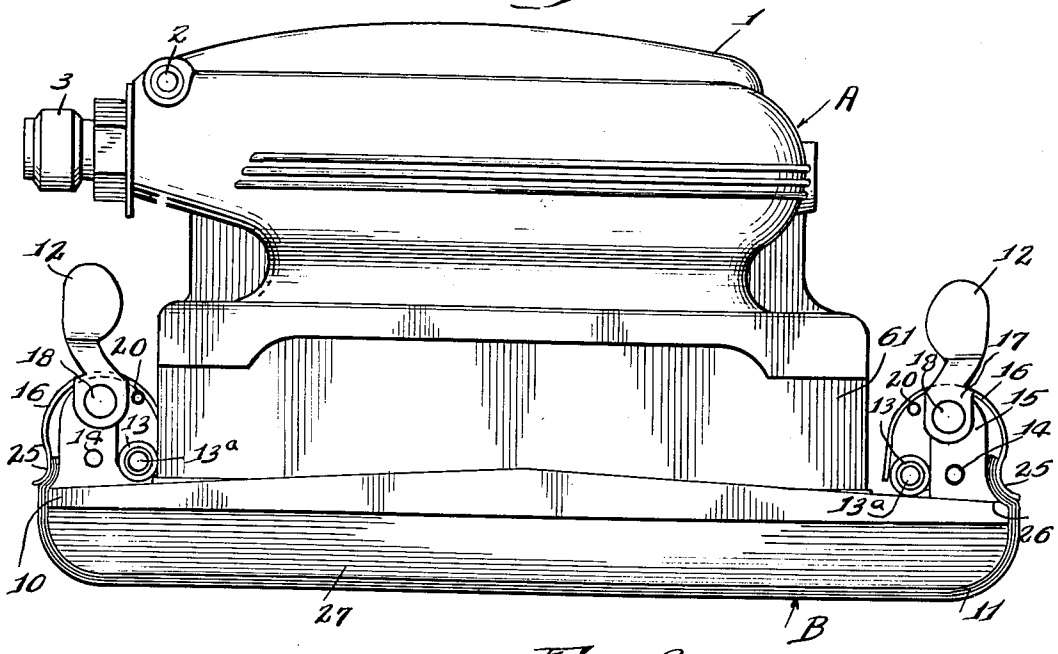
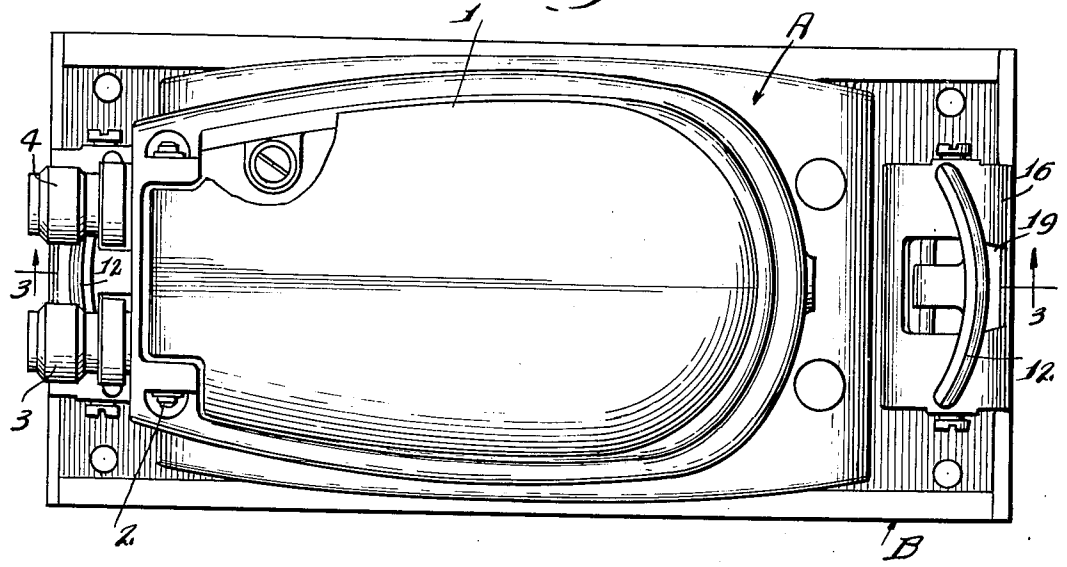


Fig. 2.



Inventor:
Robert W. Hilgers
By Schroeder, Merriam, Hofgren & Brady
Attorneys

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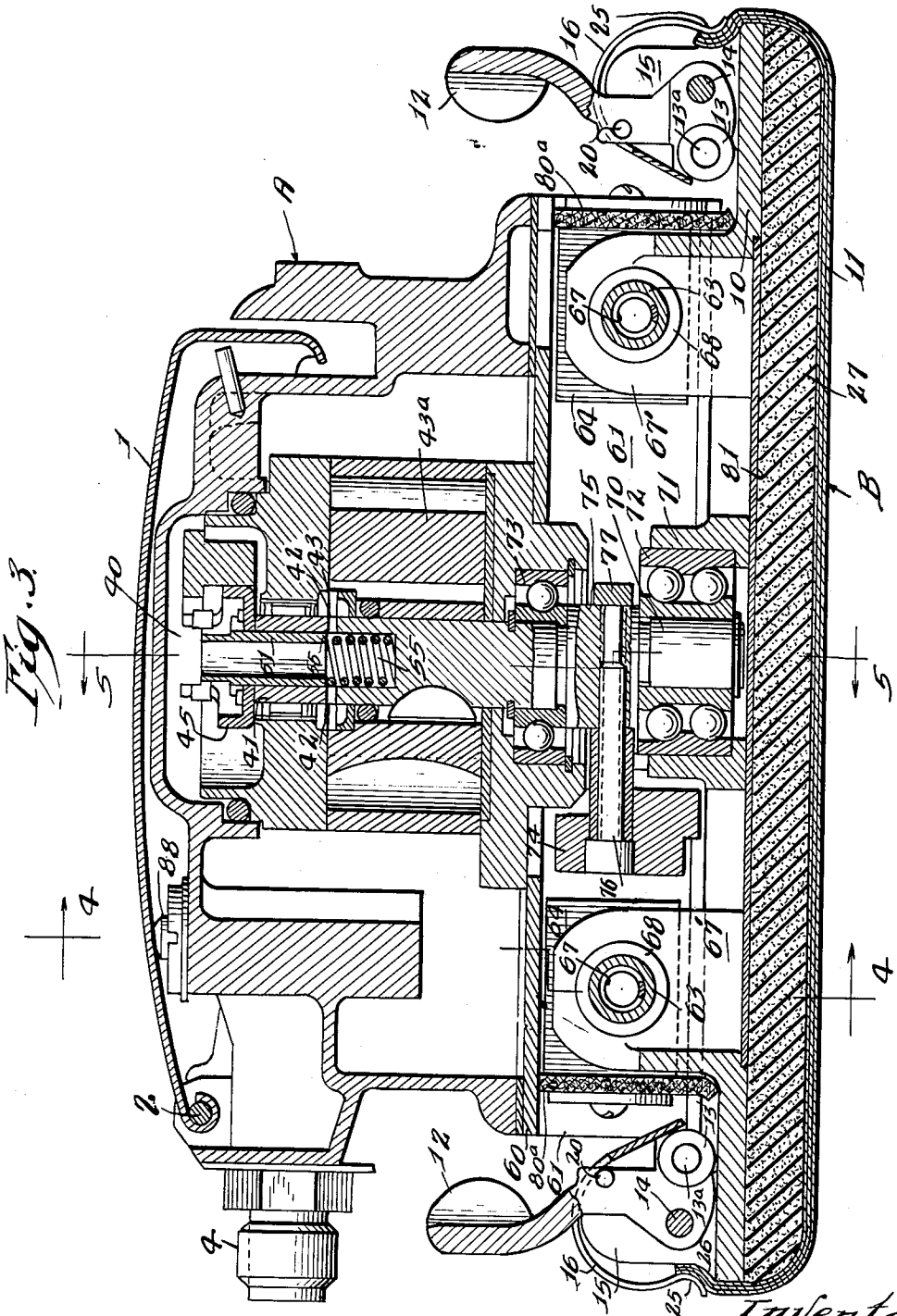


Fig. 3

Inventor.
Robert W. Hilgers
By Schroeder, Kerriam, Hofgren & Brady
Attorneys

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RUBBING MACHINE

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Fig. 5.

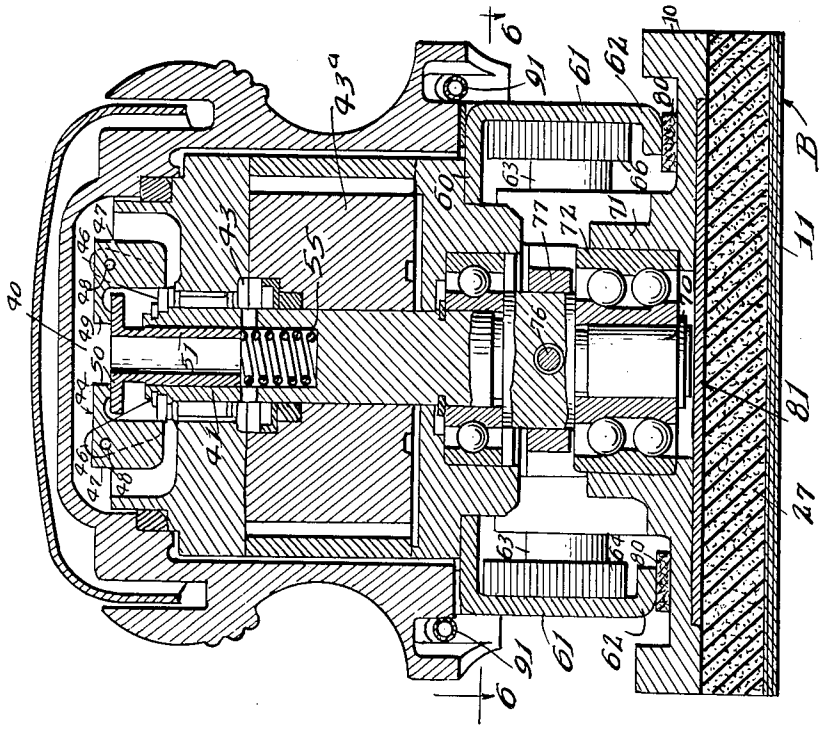
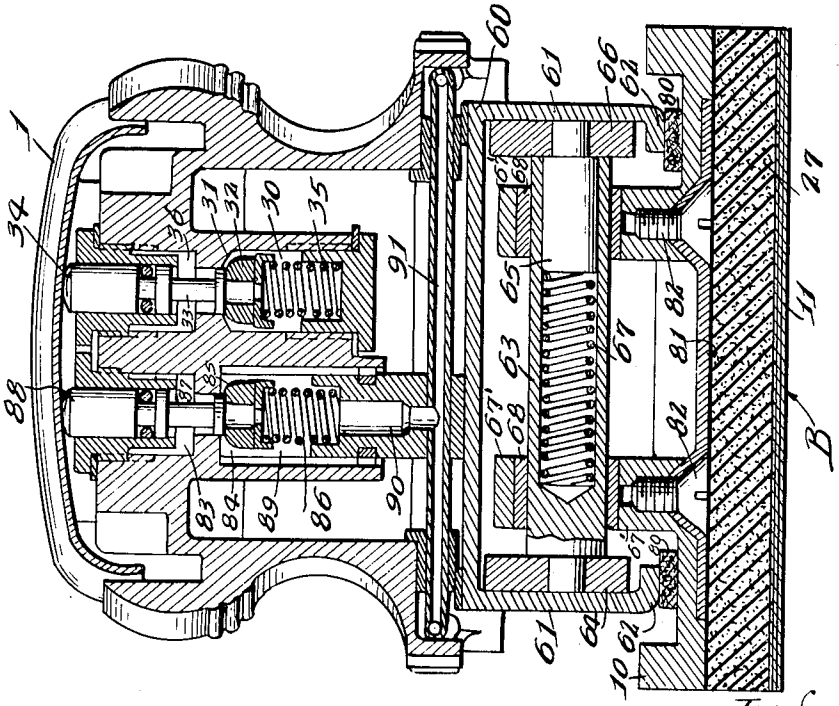


Fig. 4.



Inventor
Robert W. Hilgers
By Schroeder, Harrison, Hofgren & Brady
Attorneys

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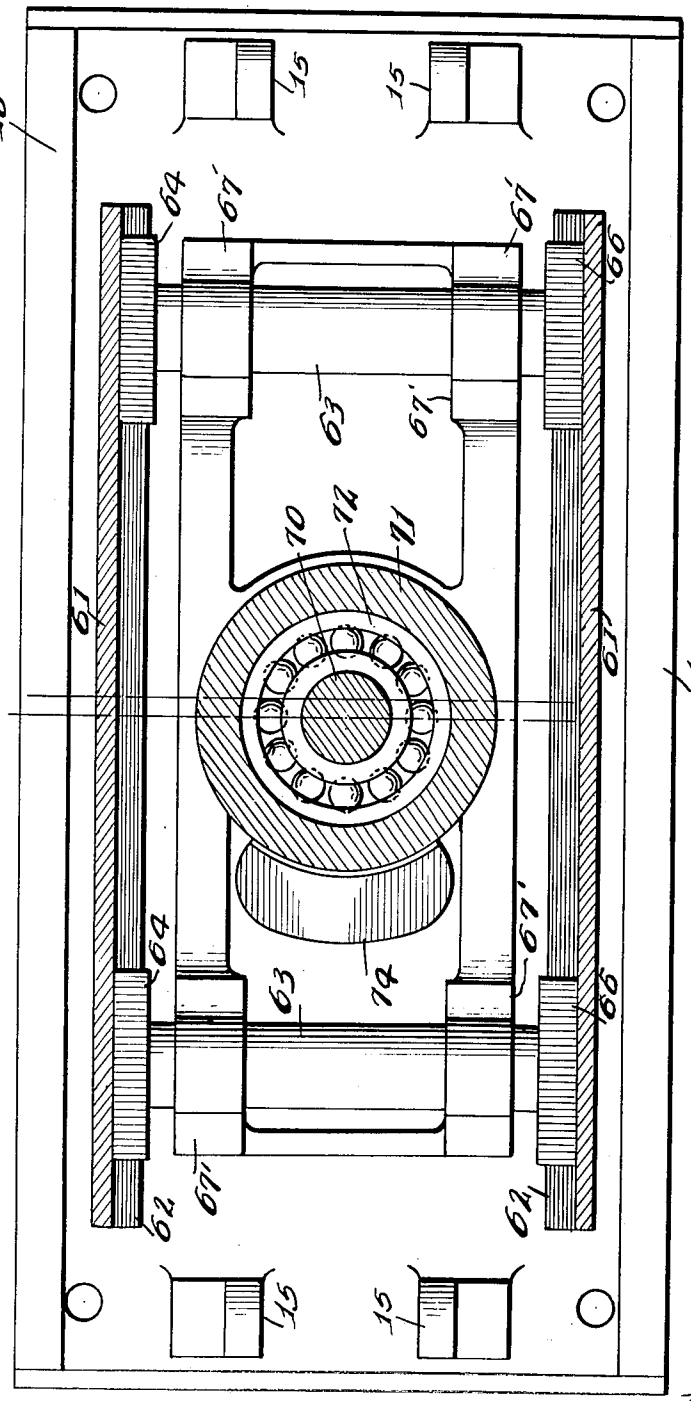


Fig. 6.

Inventor
Robert W. Hilgers
By Schroeder, Kerkam, Hofgren & Brady
Attorneys

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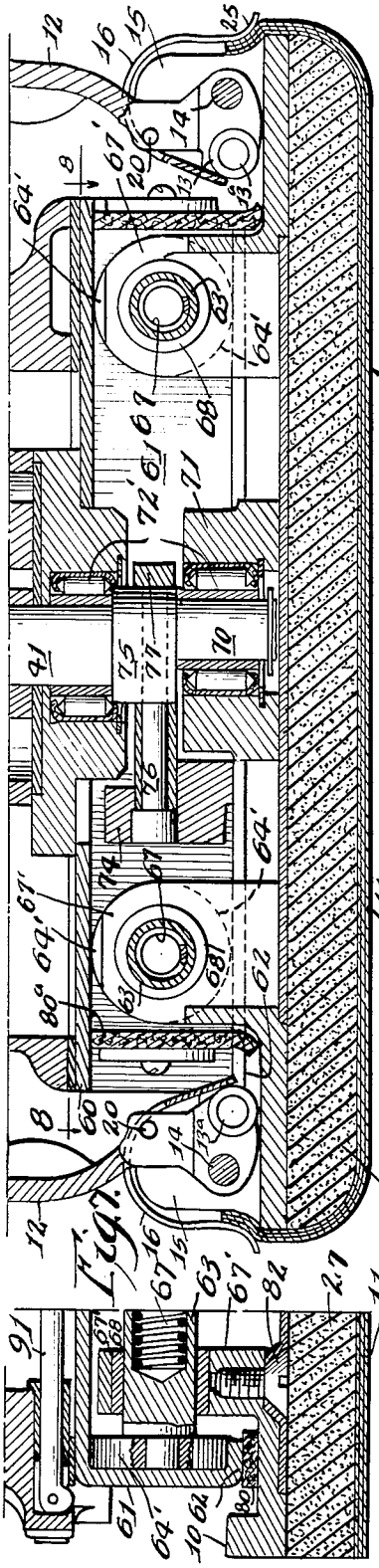


Fig. 8.

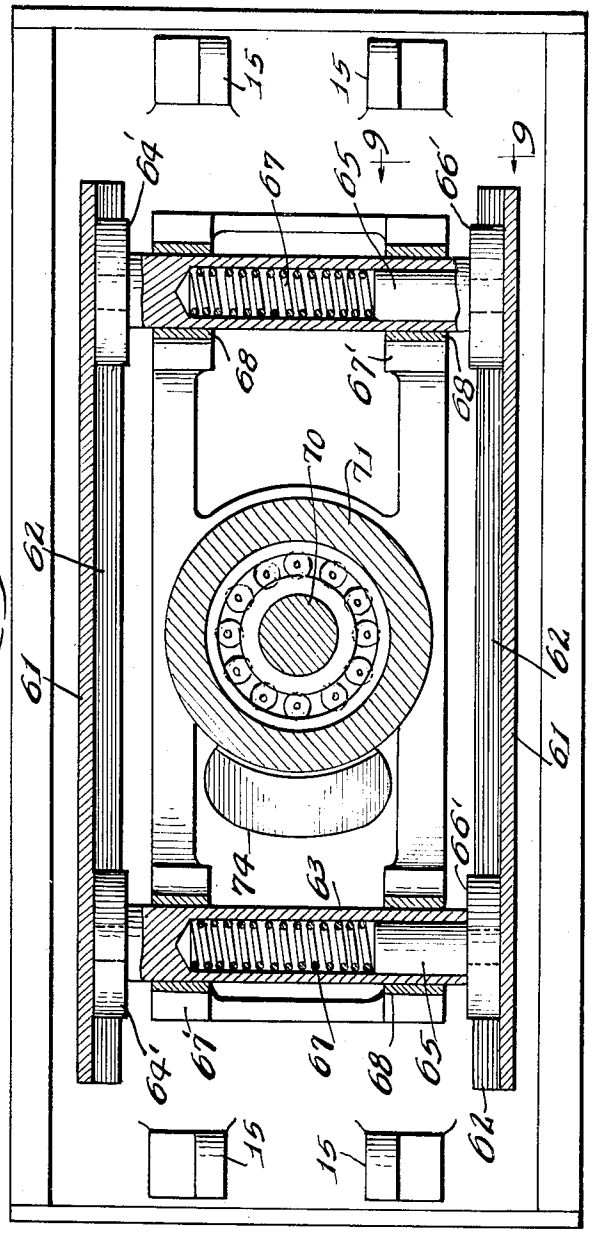


Fig. 7.

Fig. 9.

Inventor
Robert W. Hilgers
Schroeder, Kiernan,
By Hofgren & Brady
Attorneys

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2,735,241

RUBBING MACHINE

Robert W. Hilgers, Rockford, Ill., assignor to Sundstrand Machine Tool Co., a corporation of Illinois

Application January 26, 1953, Serial No. 333,141

9 Claims. (Cl. 51—170)

This invention relates to rubbing machines and more particularly to a rubbing machine having a shoe mounted for movement in an orbital path.

A general object of this invention is to provide a new and novel rubbing machine.

Another object of this invention is to provide a rubbing machine having a shoe which is mounted for movement in an orbital path.

Another object of this invention is to provide a rubbing machine having a generally rectangular shoe slidably mounted on supporting members which are themselves slidably mounted on guide tracks secured to the housing of the rubbing machine.

Another object of the invention is to provide a rubbing machine of the type described in the preceding paragraph in which the supporting members are provided with guide members at their ends which travel in the guide tracks and the shoe is slidably mounted on the supporting members by means of upstanding arms which slidably receive the supporting members.

Another object of this invention is to provide a rubbing machine having a downwardly extending drive shaft with an eccentric end for moving a shoe assembly through the intermediary of a thrust bearing and in which the shoe assembly comprises a shoe adapted to receive sheets of abrasive material on its underside, a pair of tubular members constructed of slidably interfitting parts having square blocks at their ends for slidably mounting the tubular members in guide tracks secured to the housing, and a generally rectangular shoe having upstanding arms slidably mounted on said tubular members for movement transverse to the path of movement of the tubular members.

The objects of the invention thus generally set forth together with other and ancillary advantages are attained by the construction and arrangement shown by way of illustration in the accompanying drawings, in which:

Fig. 1 is a side elevation of the rubbing machine;

Fig. 2 is a plan view of the rubbing machine;

Fig. 3 is a vertical section along line 3—3 of Fig. 2;

Fig. 4 is a vertical section along the line 4—4 of Fig. 3;

Fig. 5 is a vertical section along the line 5—5 of Fig. 3;

Fig. 6 is a horizontal section along the line 6—6 of Fig. 5;

Fig. 7 is a vertical section of an alternative construction of the shoe assembly;

Fig. 8 is plan section along the line 8—8 of Fig. 7; and

Fig. 9 is a vertical section along the line 9—9 of Fig. 8.

While this invention is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail the preferred embodiment, together with a modification thereof, with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiments illustrated. The scope of the invention will be pointed out in the appended claims.

A rubbing machine embodying the principles of this

invention comprises a generally rectangular housing A and a shoe B mounted for orbital movement with respect to the housing A. The housing A, as shown in Figs. 1 and 2 is shaped to fit within the palm of the operator's hand and permit an easy gripping of the unit. A movable cover 1 is pivotally mounted on the housing by pivot pin 2 and is arranged to control the operation of the unit in response to pressure applied thereto as more fully described hereinafter.

The housing is provided with an air inlet 3 leading to an air motor and a coolant fluid inlet 4. Hose connections leading from outside sources may be attached to these inlets.

The shoe assembly B comprises a shoe 10 and other structure described more fully hereinafter. A plurality of sheets of abrasive material 11 may be attached to the shoe 10 by manually operable clamps which are secured to the upper side of the shoe 10. A clamp is provided at each end of the shoe and each unit is identical. The clamp comprises a lever 12 having a roller 13 secured to a shaft 13*a* mounted thereon. The lever 12 is pivoted intermediate its ends on a pin 14 extending between brackets 15 secured to the top of the shoe 10. A strip 16 of resilient material is provided intermediate its ends with down-turned lugs 17 pivotally connected to a screw 18. It will be noted that the screw 18 is eccentric to the longitudinal axis of the strip 16. The strip is provided intermediate its ends with a slot 19 through which the lever 12 passes. The lever also carries a pin 20 which engages with the under surface of the strip 16.

With the clamp in the closed position shown in Fig. 1 the shaft 13*a* of roller 13 is lower than the pivot 14 for the lever and roller 13 is bearing against the inner side of the strip 16 to bring the other edge 25 of the strip into engagement with the abrasive material 11 positioned against a recess 26 in the shoe. In this position the shaft 13*a* is also lower than the edge 25 of the strip and the lever is thus in "over center" position to lock the lever. The material may be released by movement of the lever about its pivot 14 which carries pin 20 around to a position in which it flexes strip 16 to a position whereby edge 25 of the strip no longer tightly holds the sheets of material.

In order to provide a yielding backing for the sheets of abrasive material, a rubber pad 27 may be secured to the under side of the shoe.

The shoe assembly B is actuated by a vane-type air motor. This motor forms no part of the present invention and, therefore, will only be described sufficiently to give a general understanding thereof. The air for driving the motor enters through the inlet 3 and travels through passages provided within the housing (not shown) to a valve chamber 30 (Fig. 4). The valve chamber is provided with a seat 31 for a valve 32. The valve 32 is connected by a stem 33 to a plunger 34 and urged to the closed position by a compression spring 35 operating thereagainst. When it is desired to initiate operation of the machine, the cover may be depressed by the palm of the operator's hand to move the plunger 34 downwardly and move the valve 32 away from its seat 31. The air will then pass into chamber 36 and out through a passage in the housing (not shown) to an internal recess 40 (Figs. 3 and 5) provided in the body of the housing.

The compressed air which enters the recess 40 travels downwardly through the interior of a drive shaft 41 and outwardly through the openings 42 in the drive shaft to an annular chamber 43 surrounding the drive shaft 41. The compressed air then passes to an inlet port plate which controls the entry of air into the vane-type air motor 43*a*.

In order to meter the flow of air passing through the openings 42 in the drive shaft, a speed governor 44 is

provided. This governor comprises a bracket 45 secured to the drive shaft 41. The bracket is formed with ear portions 46 to which weights 47 are secured by pins 48. Each of the weights 47 is provided with a flange portion 49 operating against a flange 50 formed on the upper end of a tubular shaft 51 which extends downwardly within and co-axially with the drive shaft 41. In the non-rotating position shown in Fig. 5 the weights 47 bear against the bracket 45 and are held thereagainst by means of a compression spring 53 which urges the shaft 51 upwardly to the position shown. The lower edge 56 (Fig. 3) of the shaft 51 serves to control the plurality of openings 42. These openings are not covered by the edge 56 of the shaft 51 when the machine is not in operation.

As the speed of the drive shaft increases, the weights 47 by swinging outwardly, serve to move the shaft 51 downwardly to cause the lower edge 56 thereof partially to close the openings 42 and, thus, meter the flow of air passing therethrough.

The housing is formed with a bottom plate 60 having downwardly turned sides 61 and inturned ends 62 forming guide tracks in which parts of the shoe assembly B are slidably mounted.

The shoe assembly B, as shown in Figs. 3 to 6, includes, in addition to the shoe 10, a pair of shoe supporting members comprising tubular members 63 having a square block 64 mounted at their closed ends. The members 63 are open at their opposite ends and slidably receive therein plungers 65. The exposed ends of the plungers 65 have square blocks 66 attached to their ends. Positioned between the solid end of the tubular member 63 and the plunger 65 is a coil spring 67 which urges the blocks 64 and 66 against the sides 61 of the plate 60 forming the guide tracks.

The shoe 10 is slidably mounted upon the tube 63 by means of upstanding arms 67' which are located in approximately the four corners of the generally rectangular shoe. The tubes 63 pass through openings in the arms 67' which may be lined with a suitable bearing material 68.

In this construction, the shoe 10 travels in an orbital path. This movement is the resultant of two components of movement one of which is parallel to the length of the guide tracks and the other of which is normal thereto. The movement of the shoe supporting members along the guide tracks produces the first component of movement. The other component of movement is produced by the sliding movement of the upstanding arms 67' along the shoe supporting members.

In order to actuate the shoe, the drive shaft 41 has an eccentric end 70 which is rotatably mounted within an upstanding annular flange 71 of the shoe 10. A thrust ball bearing 72 is mounted between the flange 71 and the eccentric end 70 of the drive shaft 41. The drive shaft 41 is rotatably supported in the housing by the thrust ball bearing 73. These thrust bearings counteract the thrust produced during the operation of the machine.

In order to dynamically balance the drive shaft 41, a counterweight 74 is secured to an enlarged portion 75 of the drive shaft by a bolt 76 and sleeve 77 in a position diametrically opposed to the eccentric end 70 of the drive shaft.

In order to enclose the mechanism, strips 80 of suitable material are positioned between the inturned edges 62 of the guide tracks and the top face of the shoe 10 and strips 80*a* are secured to the front and rear edges of the shoe and are in sliding engagement with the underside of the bottom 60 of the housing.

As shown in Fig. 4, a cover plate 81 may be secured to the shoe 10 by screws 82 and is removable to permit access to the shoe driving mechanism.

The rubbing machine is provided with a built-in water attachment whereby the coolant may be distributed over the surface which is being worked by the rubbing machine. The water enters through the inlet 4 and passes through a passage in the housing (not shown) to a valve chamber 83. A valve 84 is normally held against its seat 85 by a spring 86. A stem 87 connects a plunger 88 with the valve 84. When the plunger 88 is depressed by the movable cover 1, the water will flow from chamber 83 into the chamber 89 and down through passage 90 into outlet pipe 91 which carries the water along the sides of the housing and directs the water downwardly and outwardly against the surface being sanded. If it is desired, to use the machine without the coolant, it is only necessary to detach the lead-in connection for the coolant from the inlet 4.

Another modification of the shoe assembly B is shown in Figs. 7, 8, and 9. In this modification the shoe supporting members have rollers at their ends rather than square blocks, which roll upon the plate 60.

Parts of this construction which are similar to those shown in the other figures of the drawings are identified by like reference numerals. It is believed that the description of substantially similar parts need not be repeated.

The rollers 64' and 66' are rotatably mounted at the ends of the shoe supporting members comprising the tubular members 63 and plungers 65 and are mounted for movement along the guide tracks formed by the plate 60. In this modification, the rollers engage the inturned edges 62 and also the plate 60 and thus counteract the thrust incurred during the rubbing action. Since the rollers take up the thrust, a pair of needle bearings 72' may be used for rotatably mounting the drive shaft 41 in the housing A and the eccentric end 70 of the drive shaft in the upstanding flange portion 71 of the shoe 10, respectively.

I claim:

1. In a rubbing machine having a generally rectangular housing shaped to fit the hand of an operator, a fluid motor mounted in said housing and having a drive shaft with an eccentric portion at one end for actuating a shoe and an opposed counterweight, said housing having a fluid inlet connected with said motor, a valve mounted in said housing for controlling the flow of fluid to the motor, said housing having a movable cover in engagement with said valve to control the positioning thereof, and a generally rectangular plate secured to the base of the housing and having downwardly extending portions with inturned edges forming guide tracks for slidably mounting a shoe assembly, said shoe assembly comprising a generally rectangular shoe adapted to receive sheets of abrasive material on its under side, a pair of tubular members each having an open end and a closed end, a square block attached to each tubular member at its closed end, a cylindrical member slidably mounted in the open end of each tubular member, a square block on the exposed end of each of said cylindrical members, said square blocks being slidably mounted in said guide tracks for rectilinear movement, a coil spring urging said members apart and said blocks against said guide tracks, a plurality of arms upstanding from the shoe and slidably supporting the shoe on said tubular members for movement in a direction normal to the direction of movement of said tubular members, a thrust bearing disposed between said shoe and the eccentric portion of the drive shaft to counteract the thrust on the shoe as a result of the rubbing action, rotation of the drive shaft causing movement of the shoe on the tubular members and movement of the tubular members along the guide tracks to produce an orbital path of movement of the shoe, and coolant means for the shoe including an inlet mounted on the housing and a valve positioned to control the flow of the coolant and to be operated by the movable cover.

2. In a rubbing machine having a generally rectangular housing shaped to fit the hand of an operator, a fluid motor mounted in said housing and having a drive shaft with an eccentric portion at one end for actuating a shoe and an opposed counterweight, said housing having a fluid inlet connected with said motor, a valve mounted in

said housing for controlling the flow of fluid to the motor, said housing having a movable cover in engagement with said valve to control the positioning thereof, and a generally rectangular plate secured to the base of the housing and having downwardly extending portions with inturned edges forming guide tracks for slidably mounting a shoe assembly, said shoe assembly comprising a generally rectangular shoe adapted to receive sheets of abrasive material on its under side, a pair of tubular members each having an open end and a closed end, guide means attached to each tubular member at its closed end, a cylindrical member slidably mounted in the open end of each tubular member, guide means attached to the exposed end of each of said cylindrical members, said guide means being slidably mounted in said guide tracks, a coil spring urging said members apart and said guide means against the guide tracks, a plurality of arms upstanding from the shoe and slidably supporting the shoe on said tubular members for movement in a direction normal to the direction of movement of said tubular members, the eccentric portion of the drive shaft causing movement of the shoe with respect to the tubular members and movement of the tubular members along the guide tracks to produce an orbital path of movement of the shoe, and coolant means for the shoe including an inlet mounted on the housing and a valve positioned to control the flow of the coolant and to be operated by the movable cover.

3. In a rubbing machine having a housing shaped to fit the hand of an operator, a drive shaft extending downwardly from said housing and having an eccentric portion at one end and an opposed counterweight, and a generally rectangular plate secured to the base of the housing and having downwardly extending portions with inturned edges forming guide tracks for slidably mounting a shoe assembly, said shoe assembly comprising a generally rectangular shoe adapted to receive sheets of abrasive material on its under side, a pair of tubular members each having an open end and a closed end, a guide member attached to each tubular member at its closed end, a cylindrical member slidably mounted in the open end of each tubular member, a guide member attached to the exposed end of each of said cylindrical members, said guide members being mounted for movement along said guide tracks, a spring urging said cylindrical member away from the closed end of said tubular member, and a plurality of arms upstanding from the shoe and slidably supporting the shoe for movement along said tubular members, the eccentric portion of the drive shaft causing movement of the shoe along the tubular members and movement of the tubular members along the guide tracks resulting in orbital movement of the shoe.

4. A shoe assembly for a rubbing machine provided with guide tracks comprising a pair of tubes having a closed end and an open end, a pair of cylindrical plungers slidably mounted within said tubes at the open end thereof, a coil spring mounted within each of said tubes and urging said plungers away from the closed end of said tubes, a square block mounted at the closed end of each of said tubes and at the exposed end of said plungers, said blocks being slidably mounted in said guide tracks, a shoe adapted to receive a sheet of abrasive material on its underside, a plurality of arms upstanding from said shoe slidably mounted on said tubes for movement of said shoe in a direction transverse to the path of movement of the blocks in the guide tracks, the sliding movement of the blocks and arms enabling said shoe to travel in an orbital path.

5. A shoe assembly as claimed in claim 4 adapted to be driven by a downwardly extending drive shaft having an eccentric end including a thrust bearing between said eccentric end of the drive shaft and shoe to counteract the thrust on the shoe during operation of the machine.

6. A rubbing machine provided with guide surfaces and a shoe assembly comprising, a pair of tubes having a closed end and an open end, a pair of cylindrical plungers slidably mounted within said tubes at the open end thereof, a coil spring mounted within each of said tubes and urging said plungers away from the closed end of said tubes, a roller mounted at the closed end of each of said tubes and at the exposed end of said plungers, said rollers being movable along said guide surfaces, a shoe adapted to receive abrasive material on its underside, pairs of arms upstanding from said shoe slidably mounted on said tubes for movement of said shoe in a direction transverse to the path of movement of the rollers in the guide surfaces, the sliding movement of the rollers and arms enabling said shoe to travel in an orbital path.

7. A shoe assembly for a rubbing machine provided with guide tracks comprising, a pair of tubes each having a first end and a second open end, a pair of cylindrical plungers slidably mounted within said tubes at the open end thereof, guide means mounted at the first end of each of said tubes and at the exposed end of said plungers, said guide means being slidably mounted in said guide tracks, a spring mounted within each of said tubes and urging said guide means against said guide tracks, a shoe adapted to receive abrasive material on its underside, a plurality of arms upstanding from said shoe slidably mounted on said tubes for movement in a direction transverse to the path of movement of the blocks in the guide tracks, the sliding movement of the blocks and arms enabling said shoe to travel in an orbital path.

8. A portable rubbing machine having a housing provided with rectilinear guide tracks and a shoe assembly comprising, a pair of shoe supporting members spaced apart along the length of the housing and each extending transversely of and directly between said guide tracks, each of said members having guide means at their ends slidably mounted in said guide tracks and a shoe having upstanding arms slidably mounted on said members intermediate their ends for movement transverse to the path of movement of said members to enable said shoe to travel in an orbital path.

9. A portable rubbing machine having a housing provided with rectilinear guide tracks and a shoe assembly comprising, a pair of spaced parallel shoe supporting members extending directly between said guide tracks and having guide means at their ends mounted for movement along said guide tracks, a shoe adapted to receive abrasive material on its underside, and upstanding arm means on said shoe slidably engageable with said members between their ends for securing the shoe to said members and slidably mounting said shoe on said members for movement transverse to the path of movement of said members, said movements enabling movement of the shoe in an orbital path.

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