March 20, 1956 L. BLAGG 2,738,627

GRINDER FOR VALVE DECKS OF PUMPS

Filed April 1, 1954 3 Sheets-Sheet 1

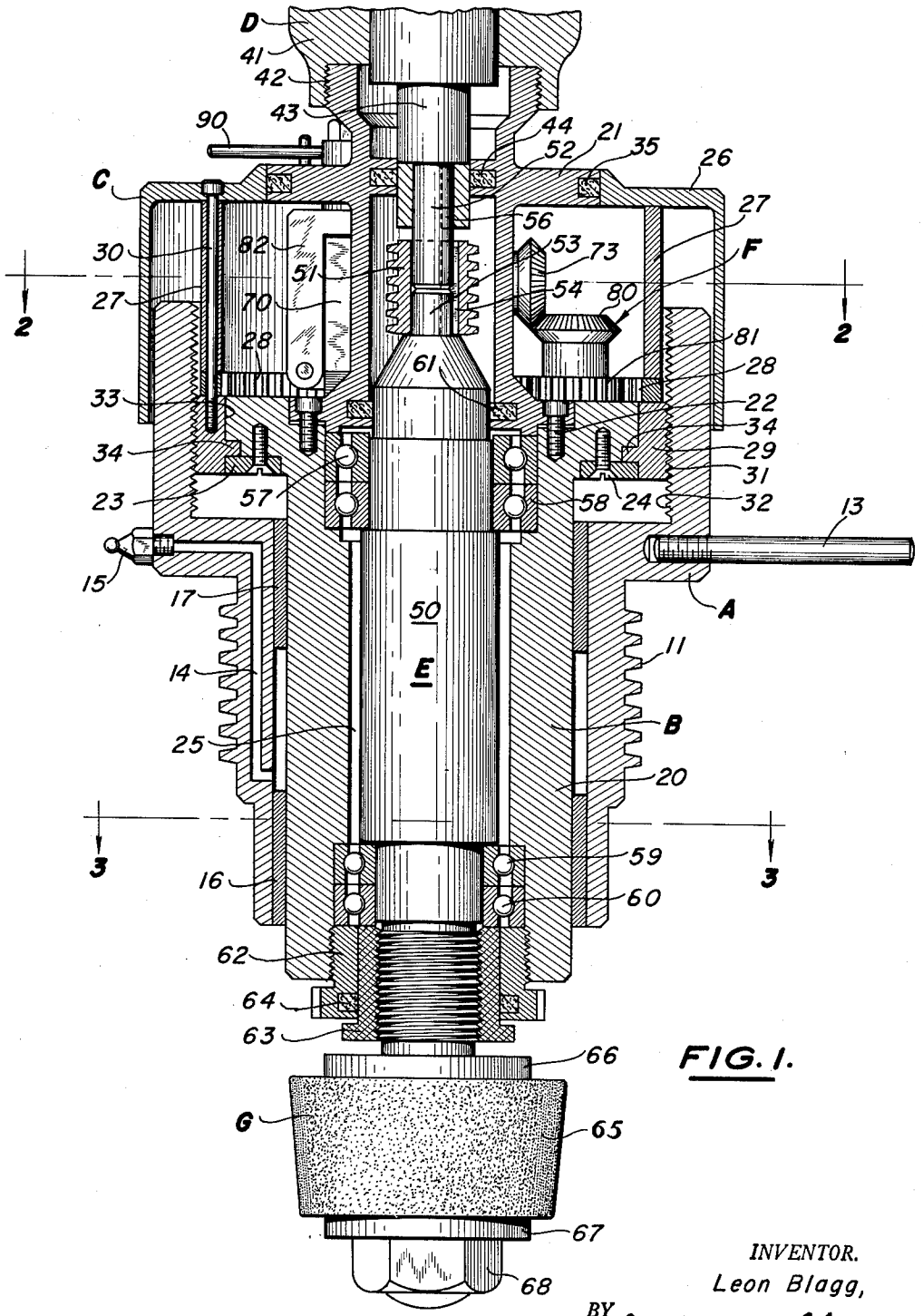



FIG. 1.

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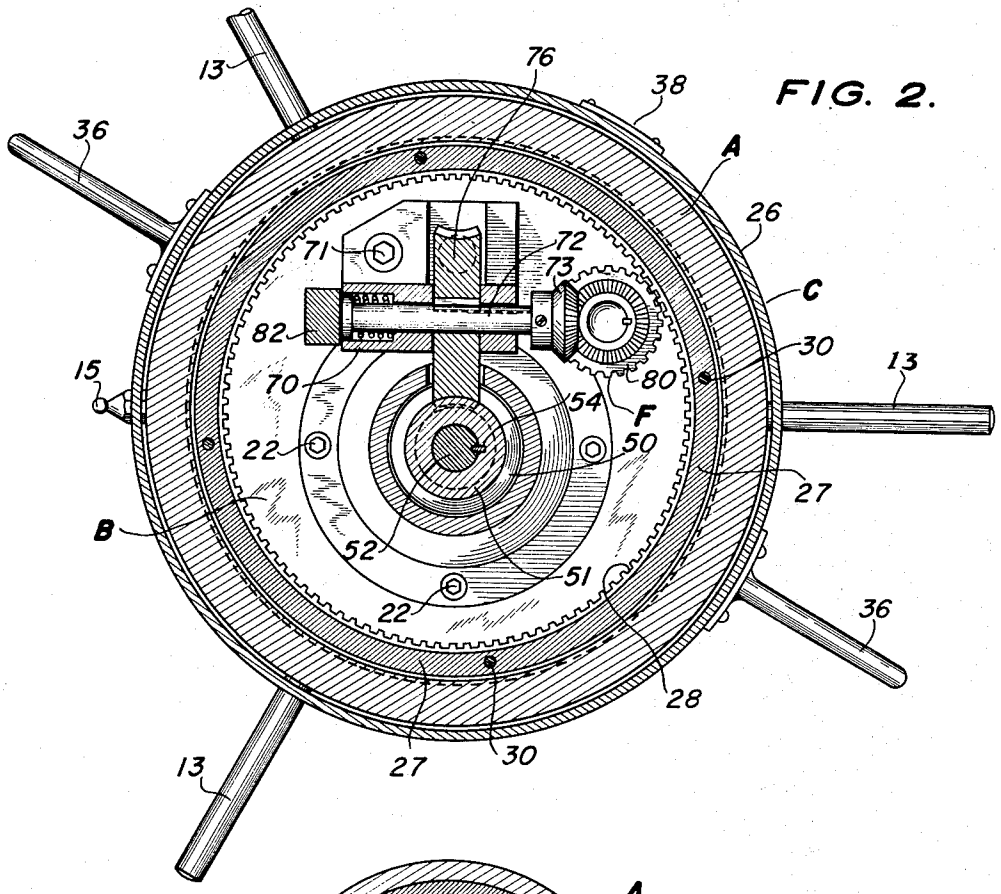



FIG. 2.

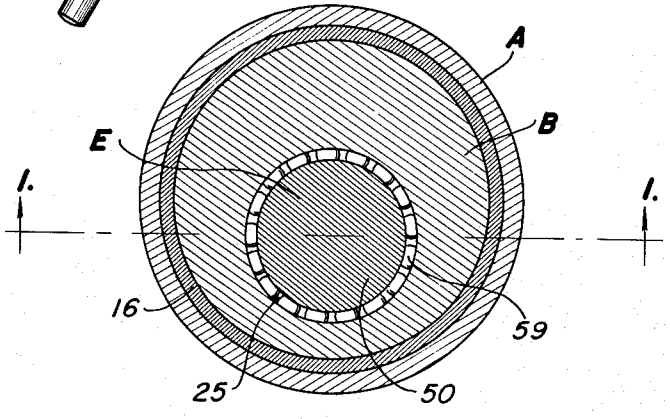



FIG. 3.

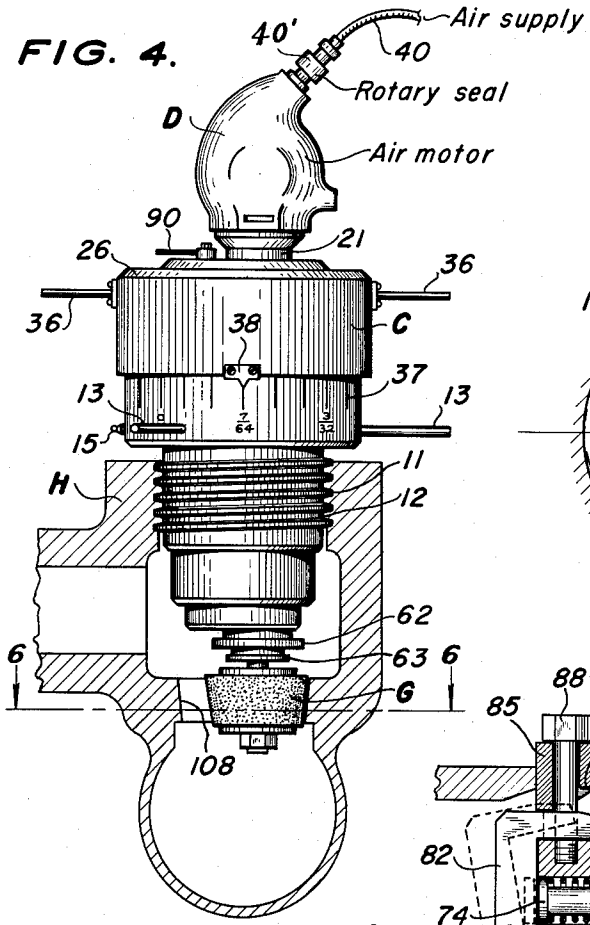
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GRINDER FOR VALVE DECKS OF PUMPS

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FIG. 4.



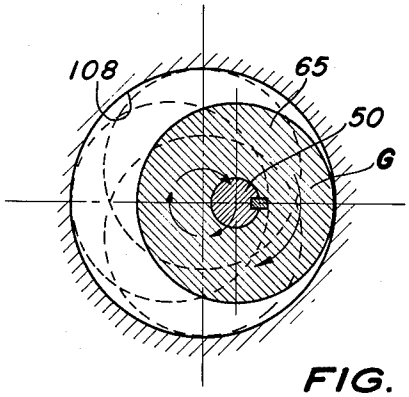




FIG. 6.

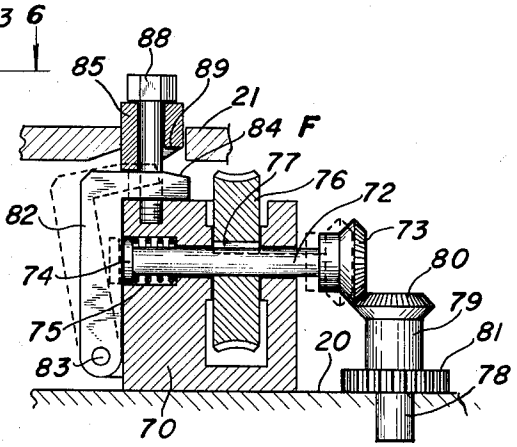



FIG. 5.

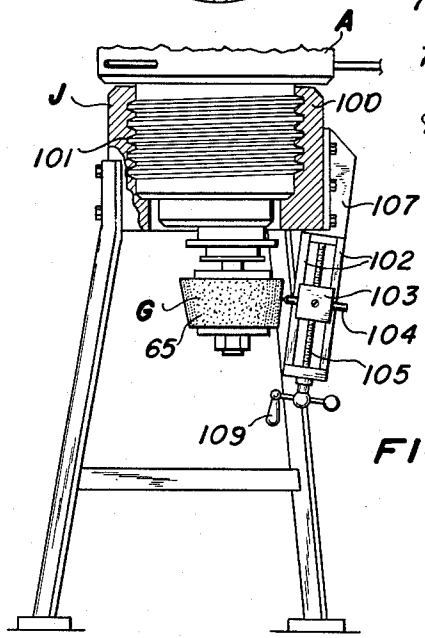



FIG. 7.

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2,738,627

# GRINDER FOR VALVE DECKS OF PUMPS

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Application April 1, 1954, Serial No. 420,389

3 Claims. (Cl. 51—245)

This application is directed to a grinder particularly adapted for grinding an internal tapering surface such as the valve decks of reciprocating mud pumps.

Other objects and advantages of the present invention will be seen from the following description taken with the drawing in which

Fig. 1 is an elevation partly in section of an embodiment of the present invention with a showing of only a portion of the prime mover which supplies the rotating force;

Fig. 2 is a view taken along the line 2—2 of Fig. 1;

Fig. 3 is a view taken along the line 3—3 of Fig. 1;

Fig. 4 is in the form of an elevation of the embodiment of Figs. 1 to 3, inclusive, shown in position for grinding the valve deck of a pump body;

Fig. 5 is a view showing details of construction of a portion of the assembly of Figs. 1 to 4 inclusive;

Fig. 6 is a fragmentary view taken along line 6—6 of Fig. 4 illustrating the movement of the grinding wheel in relation to the surface of the valve deck; and,

Fig. 7 is in the form of an elevation partly in section showing the grinding mechanism mounted on a fixture for dressing the grinding wheel to the proper taper.

In Fig. 1 particularly the principal parts of the grinder consist of a cylindrical base A, cylindrical rotatable body B, cylindrical housing C, prime mover D, cylindrically shaped drive shaft assembly E, gear train F and grinding assembly G. In Fig. 4 the grinder is shown mounted in pump body H and in Fig. 7 the grinder is shown mounted in fixture J.

As will be seen by reference to Fig. 4, base A is provided with external screw threads 11 which mate with corresponding screw threads 12 of pump body H so that base A may be screwed into a known position in pump body H and may be removed therefrom and returned to this exact position. Base A is concentric with the surface 108 of the valve. Base A is provided with handles 13 for the convenience of an operator in moving the device and in placing it in a valve body or in a fixture as desired. It will be understood that in some designs of pumps, instead of employing a single thread 12 to hold the valve cap down, studs are used and in such a case an adapter (not shown) may be provided to engage with screw threads 11 of body A, and in turn be fastened to pump body H by studs

As shown in Fig. 1, base A is provided with a passage 14, one end of which extends through the outer surface of the body and is provided with a grease fitting 15 while its other end extends through the inner wall and discharges into a space between bronze bearings 16 and 17 to allow the introduction of lubricant between base A and rotatable body B.

Rotatable body B consists of a member 20 of a generally tubular shape with its upper end terminating in an outwardly extending flange, member 21 of a generally tubular shape mounted on and secured to member 20 by machine screws 22 and ring member 23 fastened to member 20 by screws 24. Rotatable body



B and base A are concentric. However, body B is provided with a central passage 25 which is eccentric with regard to body B and arranged within passage 25 is the drive shaft assembly E. Thus, when body B rotates, drive shaft assembly E carried thereby is given orbital movement.

Housing C consists of cap member 26, cylindrical spacing member 27, ring gear member 28, and annular shaped member 29, these members being secured together by means of bolts 30. Annular member 29 has its outer surface provided with screw threads 31 which mate with corresponding screw threads 32 of base A. The inner circular surface 33 of member 29 is provided with an inwardly extending circular ledge 34. Ledge 34 is slidable with respect to member 20 and ring 23 of rotatable body B so that rotatable body B may rotate while housing C remains stationary; however, rotatable body B cannot move axially with regard to housing C. The space between the outer shoulder of member 21 of body B and cap 26 of housing C is sealed by seal 35. Handles 36 are mounted on cap member 26 of housing C for convenience in handling and also for convenience in allowing an operator to give housing C angular motion. With screw threads 31 and 32 engaged, as seen in Fig. 1 of the drawing, rotation of housing C causes it to move axially with regard to base A.

As shown more clearly in Fig. 4, base A is provided with a scale 37 and housing C is provided with an index or pointer 38. If desired, the position of the scale and housing may be reversed with the scale placed on housing C and the index on base A. In any event, base A and housing C cooperate to provide scale and index means. Since rotatable body B is mounted on housing C for rotatable movement but is held against axial movement, the axial movement of both housing C and supported rotatable body B with regard to base A may be adjusted as desired by the operator's changing the axial position of housing C and the axial position of housing C as well as that of rotatable body B may be instantly determined by visual examination.

Prime mover D, as seen in Fig. 4, may be a conventional type. In the embodiment shown an air motor is illustrated with compressed air being supplied from a source not shown from hose 40 through a conventional rotary seal 40' to the motor As seen in Fig. 1, a portion of motor D is shown with motor body 41 attached to the upper end of member 21 of rotatable body B by screw threads 42. The shaft 43 of motor D passes through a central opening in member 21 rotatable body B with a seal 44 providing a seal between body and shaft 43.

Drive shaft assembly E which transmits power from prime mover D to grinding assembly housing C consists of mandrel 50, worm gear 51, and shaft 52. As seen in the drawing, the upper end of mandrel 50 has a reduced section 53 which fits within the central passage of gear 51 and is keyed thereto by key 54. The lower end of shaft 52 extends into the gear 51 and is also keyed thereto by key 54, the gear 51 serving as a connection means between the mandrel 50 and shaft 52. The upper end of shaft 52 extends into a recess in the lower end of shaft 43 of motor D and is keyed thereto by key 56.

Drive shaft assembly E is mounted in body B for rotation with respect to body B with bearing assemblies 57 and 58 supporting its upper end and bearing assemblies 59 and 60 supporting its lower end. The space between the upper portion of the mandrel and member 21 of body B is sealed by seal 61 and the space between the lower end of drive shaft assembly E and body B is sealed by a sealing assembly consisting of sleeve 62 secured to member 20 by screw threads, sleeve 63 secured to mandrel 50 by screw threads and seal 64 arranged in a recess

in member 62 with its inner circular surface in contact with sleeve 63.

Mounted on the lower end of mandrel 50 of drive shaft assembly E is grinding assembly G consisting of conical grinding wheel 65 held in position by washers 66, 67 and nut 68.

The gear train assembly which causes body B to be given rotative movement from energy supplied by prime mover D is shown in Figs. 1, 2, and 5. A supporting block 70 is secured to the upper surface of member 20 by cap screw 71. A shaft 72 is mounted for rotation and also for longitudinal movement on member 70 with a bevelled gear 73 secured to one end and a projecting circular shoulder 74 at its other end. A spring 75 fits into a suitable recess provided in block 70 and exerts a bias to the left on shaft 72 as seen in Fig. 5. Worm wheel 76 adapted to engage with the teeth of worm 51 is slidably mounted on shaft 72 and is keyed thereto for rotation therewith by key 77. A shaft 78 is secured to the upper end of member 20 of assembly B and rotatably mounted thereon is member 79 which has its upper end terminating in bevelled gear teeth 80 and its lower portion terminating in a pinion gear 81 which engages with the teeth of ring gear 28. A clutch for the gear train is provided by an L-shaped lever 82 pivoted by pivot 83 to block 70 and having its upper surface 84 in the form of a cam surface. A camming member 85 is secured to block 70 by cap screw 88 and is provided with a cam surface 89 which cooperates with the cam surface 84 of member 82 and is provided with a handle 90 which is outside of housing C as seen in Figs. 1 and 4.

As will be seen in Fig. 5, the gear train may be disengaged. The bevelled gear 73 is shown in its disengaged position by dashed lines. This disengagement results when the operator moves handle 90 in the clockwise direction as when looking down on Fig. 5. This allows spring 75 to bias shaft 72 to the left as seen in Fig. 5, which in turn moves bent lever arm 82 to the left position as indicated by dashed lines in Fig. 5. This causes bevelled gear 73 to be drawn out of contact with bevel gear 80. Rotation of handle 90 in the counterclockwise direction, as when looking down on Fig. 5, forces bent lever arm 82 into its position as shown in full lines in Fig. 5 by the cam surface 89 frictionally contacting cam surface 84 and pushing lever arm 82 which in turn forces shaft 72 to the right and locks it in the position shown by full lines in this figure. When the bevelled gears 73 and 80 are engaged, body B is caused to rotate simultaneously with the rotation of drive shaft assembly E but at a lower rate, the rate depending upon the gear ratios used. A satisfactory ratio has been found to be 100 revolutions of drive shaft E for each revolution of body B and the orbital speed of body B of about 60 R. P. M. The simultaneous rotation of body B and drive shaft assembly E causes grinding assembly G simultaneously to rotate and move orbitally. The disengagement of bevelled gears 73 and 80 by the use of the clutch mechanism shown terminates rotation of body B so that the only movement given shaft assembly E and grinding assembly G is rotative movement.

The movement of tapered grinding member 65 with respect to tapered internal surface 108 is indicated by the showing in Fig. 6. In this figure the solid arrows indicate the rotation of member 65 with simultaneous orbital movement of shaft 50, possible paths of movement of member 65 being indicated by the dashed lines.

The proper taper is given grinding wheel 65 by the use of fixture J shown in Fig. 7. As shown in Fig. 7, fixture J consists of body 100 provided with screw threads 101 identical to the screw threads 12 of the mud pump body H as shown in Fig. 4. Carried by body 100 are guide means 102 upon which is slidably arranged a carriage 103 carrying a diamond dressing tool 104. Carriage 103 is provide with a threaded bore engaging with a traversing screw 105 which is mounted on member 107 carried by guides 102 wtih the end of the screw being provided with a hand crank 109. It will be seen that the guide members 102 make an angle with the axis of the threaded opening 101, this angle being the exact angle required for the grinding wheel 65. By ones mounting the grinder in fixture G as shown in Fig. 7, then disengaging the clutch mechanism so that body B remains stationary while drive shaft E and grinding assembly G rotate, the grinding wheel may be dressed to the exact taper desired. When the wheel dressing operation is carried out, base A is mounted in a known predetermined position on body 110 of fixture J. As material is removed from wheel 65 by diamond dressing tool 104, the wheel 65 must be lowered by rotation of housing C on base A. When the dressing operation is completed, the pointer 38 of housing C has been moved to some position on scale 33 of base A. For convenience, the pointer is then left in this position while base A is removed from fixture J and mounted in position on pump body G, as shown in Fig. 4. The clutch assembly is then engaged so that operation of prime mover C causes grinding wheel 65 to progress as well as rotate. Since the grinding wheel 65 is tapered, the diameter it cuts will be increased as it is advanced into the valve deck, the desired diameter of tapered surface 108 being obtained by advancement of the wheel into the deck the desired axial distance.

I claim:

1. A grinding device for grinding a conical surface for the valve deck of a pump comprising, in combination, a cylindrical base member having external screw threads for fastening it in a fixed predetermined position on said pump concentric with the conical surface, a cylindrical housing including a peripheral ring gear concentric with said base and mounted on said base for axial movement, said housing cooperating with said base to provide scale indexing means for indicating the axial position of said housing, a cylindrical body concentrically and rotatively carried by said housing, a first drive shaft rotatively mounted on said body with its axis eccentric with the axis of said body, a prime mover mounted on said body with a second drive shaft arranged to transmit rotative movement to the said first drive shaft, a conically surfaced grinding member secured to said first drive shaft member and a gear train assembly arranged to transmit rotative movement from said first drive shaft to said ring gear whereby rotation of said prime mover causes simultaneous rotation of said first drive shaft and said body member to give said shaft and attached grinding member rotative and orbital movement.

2. A device in accordance with claim 1 in which said gear train assembly includes a disengageable clutch adapted to terminate rotation of body B when disengaged.

3. A grinder adapted for grinding an internal tapering surface for the valve deck of a pump comprising, in combination, a cylindrical base member provided with annular external screw threads formed integrally therewith for mounting it in a predetermined fixed position on said pump with its axis concentric with the axis of the tapered internal surface, a cylindrical housing member carried by the base member concentric therewith and capping said base member, said housing and said base member having annular mating screw threads to permit axial movement of said housing member along said base member, a scale indexing means provided by said base member and housing for indicating the axial position of said housing, a cylindrical body rotatably carried by said housing concentric with said housing and said base, a drive shaft assembly rotatably mounted on said housing having an axis eccentric with the axis of said body, a prime mover mounted on said housing having a motor shaft aligned with and rigidly connected to said drive shaft assembly,

a conically tapered grinding means carried by said shaft assembly, and gear means arranged to transmit power from said drive shaft assembly to said body to cause rotation of said body when said shaft assembly rotates whereby said grinding member is simultaneously given rotative and orbital movement.




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