Oct. 31, 1950 T. R. BRINK 2,527,791

POLISHING MACHINE FOR BEARING RACES

Filed Dec. 28, 1946 5 Sheets-Sheet 1

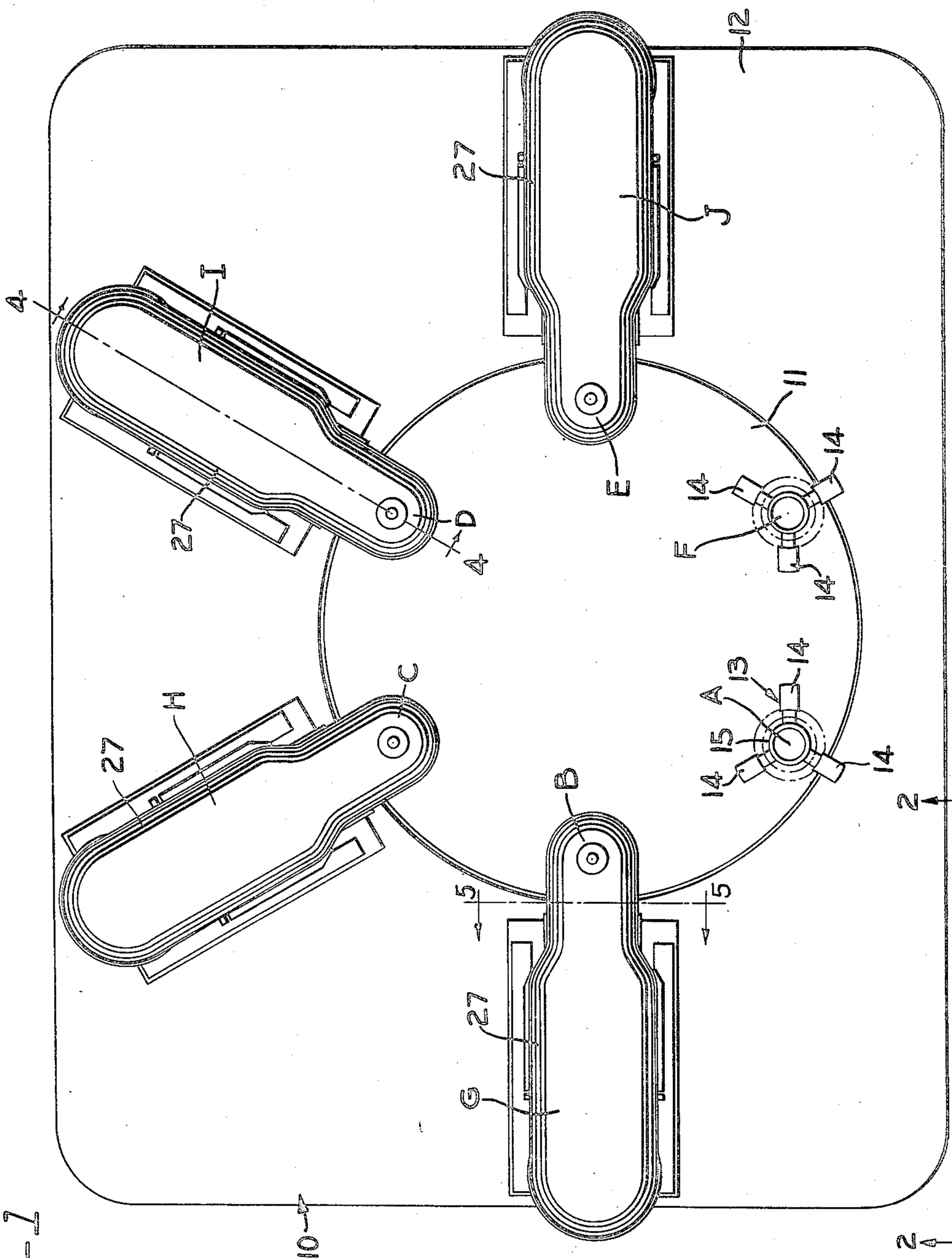

Fig. 1

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Filed Dec. 28, 1946 5 Sheets-Sheet 2

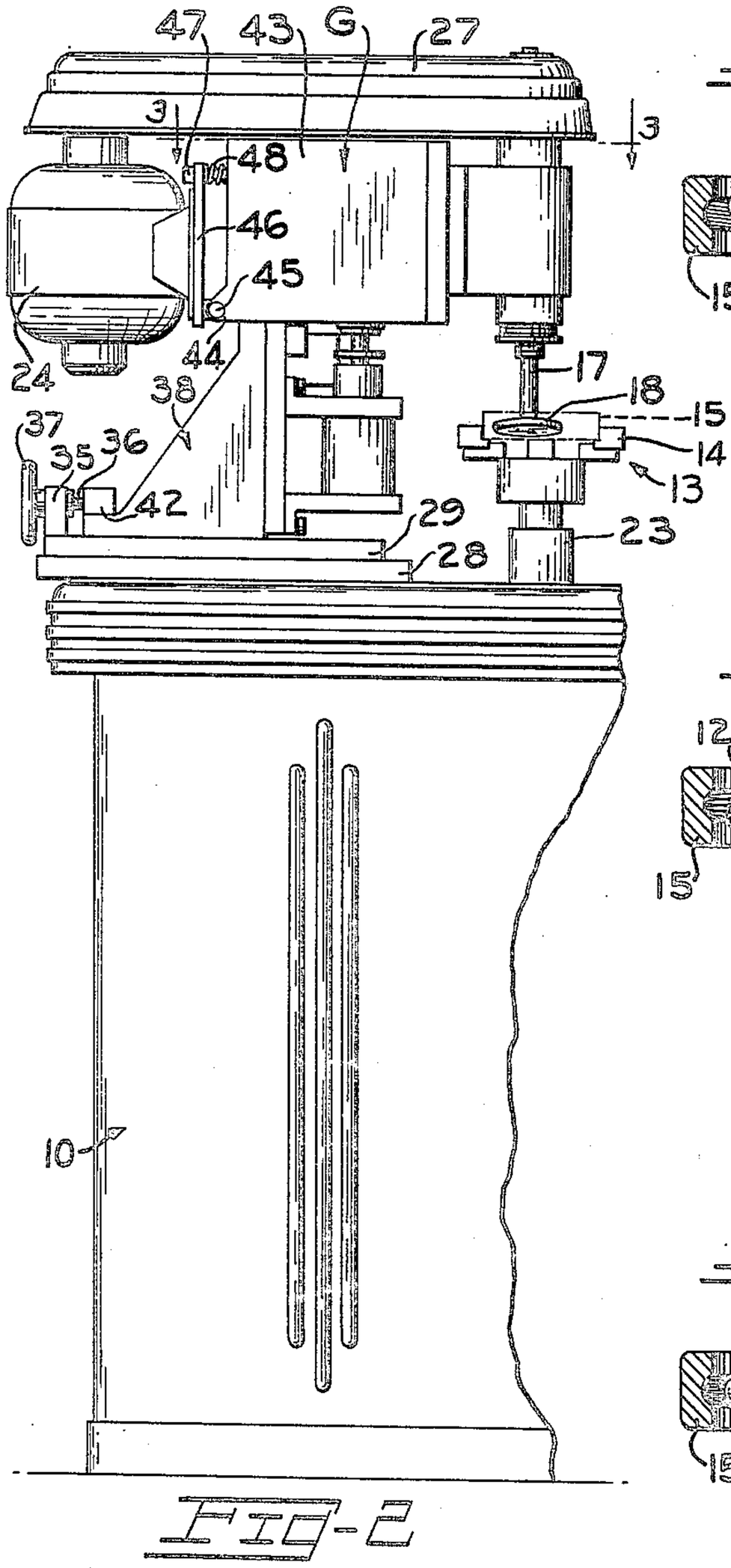


FIG-2

FIG-7

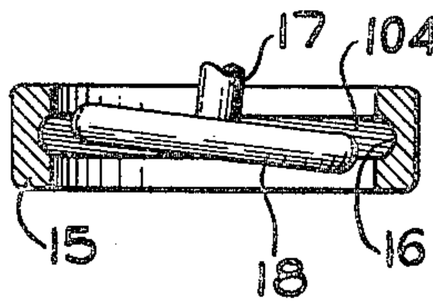


FIG-8

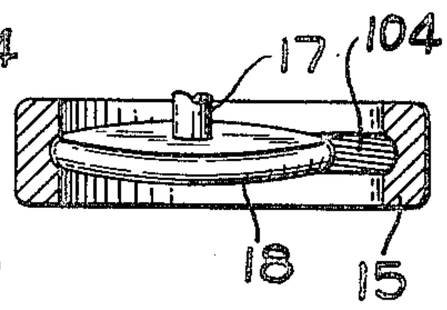


FIG-9

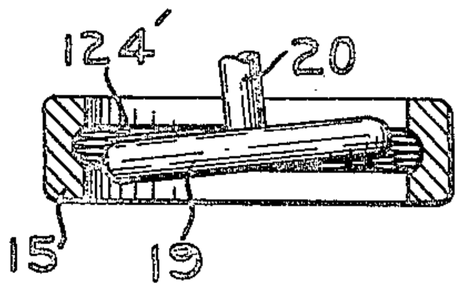


FIG-10

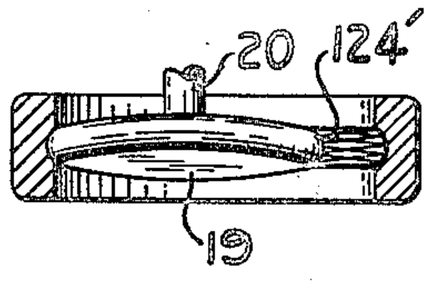


FIG-11

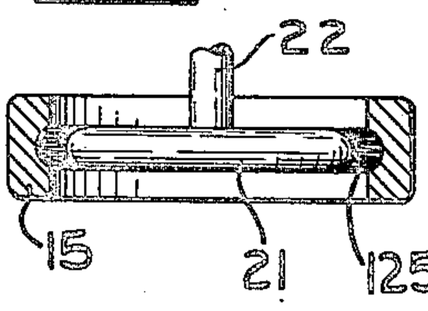
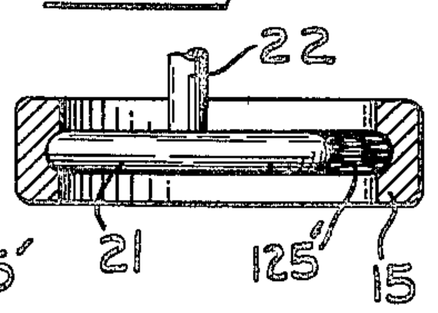


FIG-12



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POLISHING MACHINE FOR BEARING RACES

Filed Dec. 28, 1946 5 Sheets-Sheet 3

Fig-3

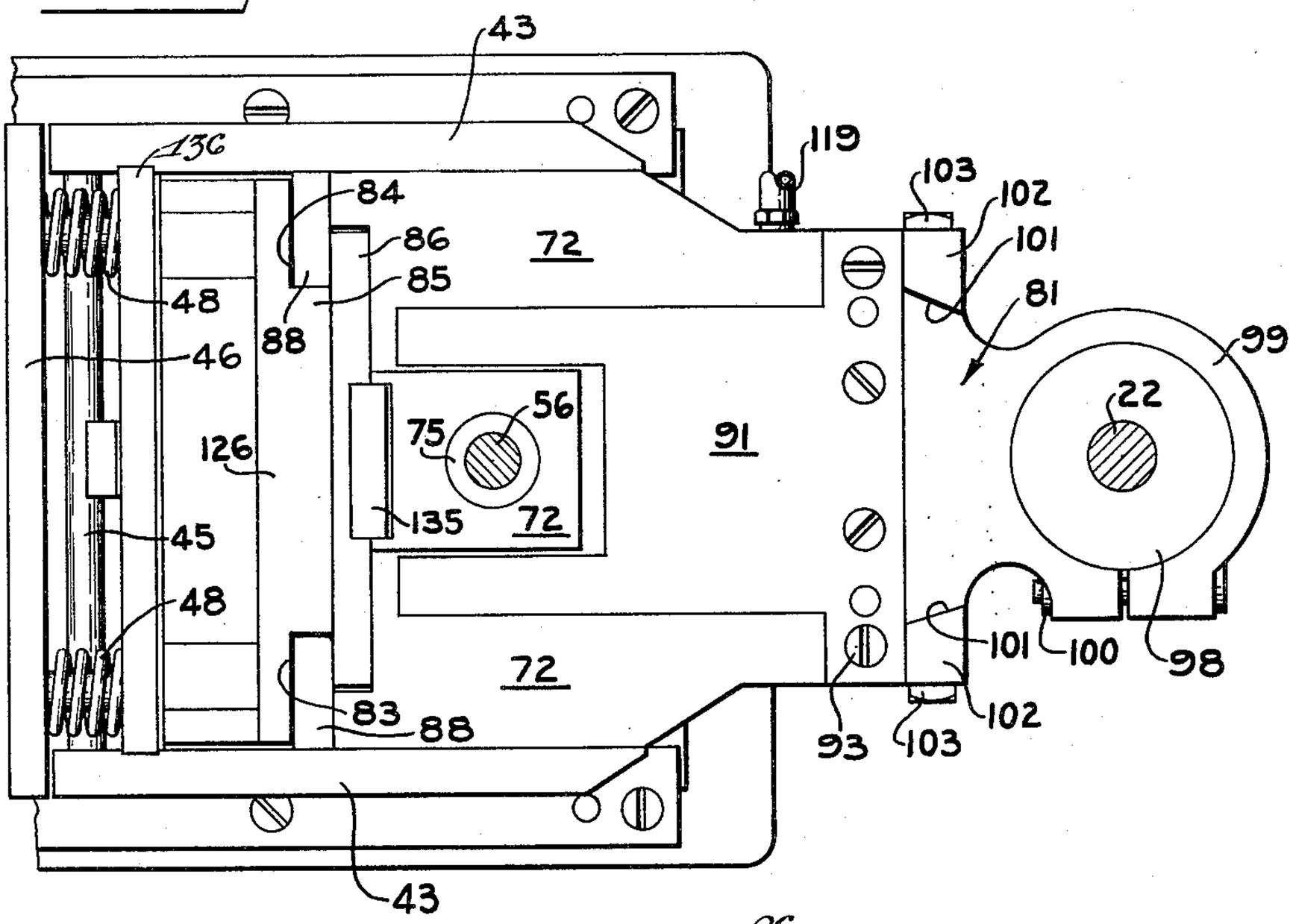
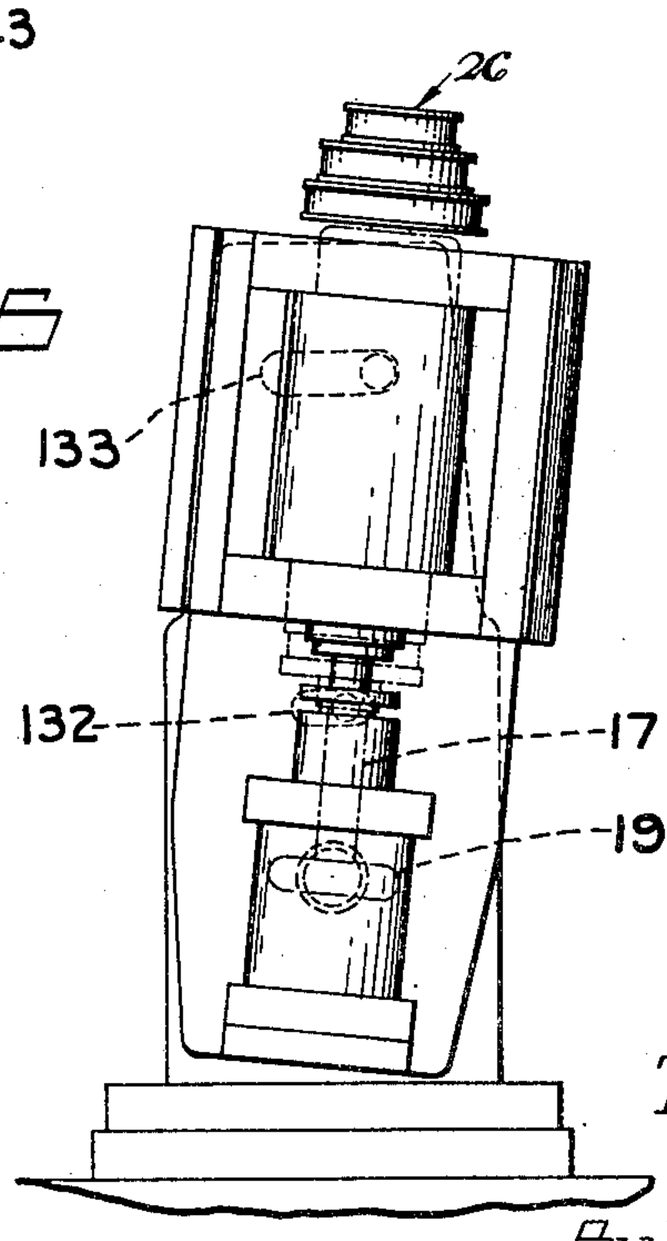


Fig-6



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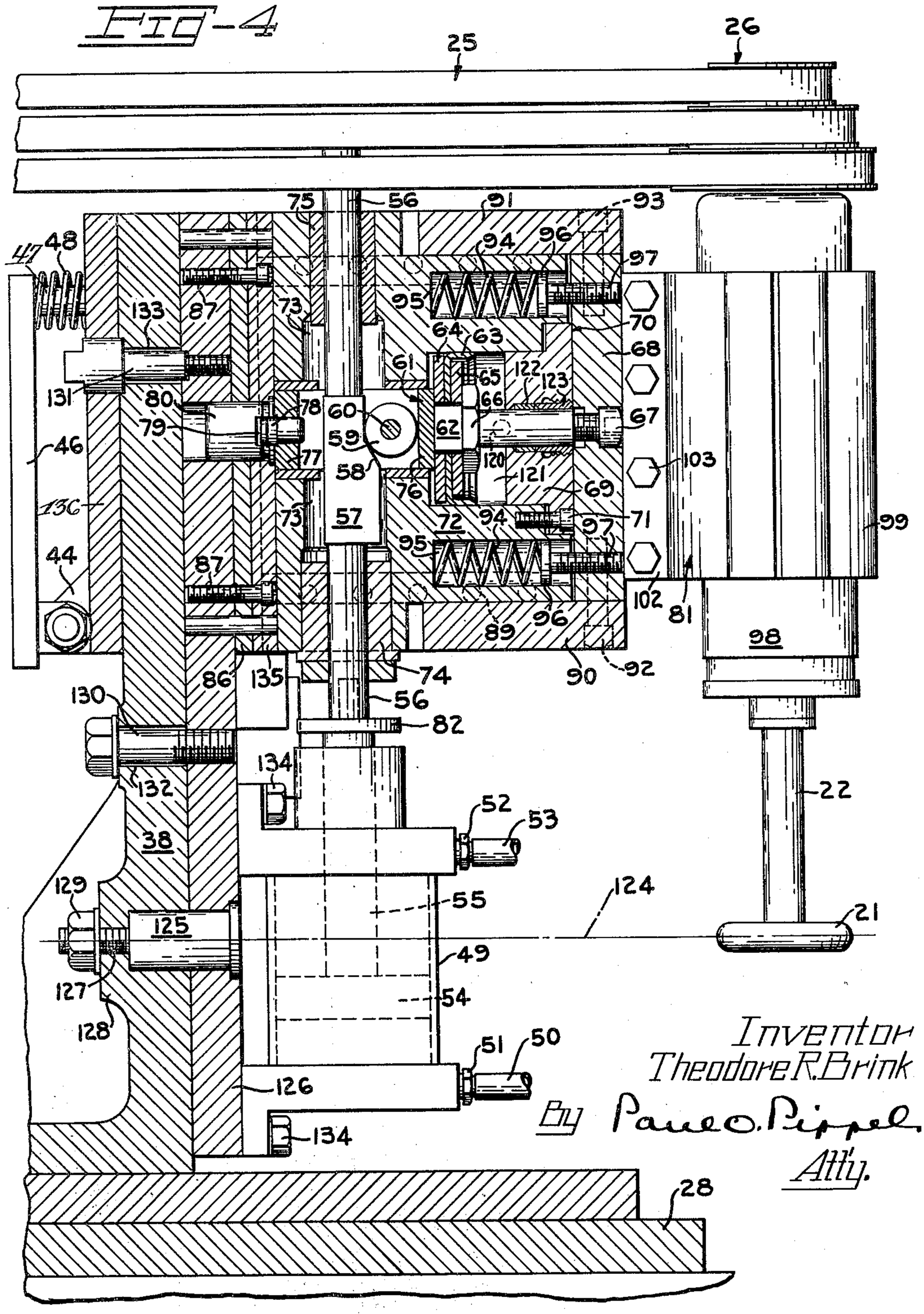
POLISHING MACHINE FOR BEARING RACES

Filed Dec. 28, 1946 5 Sheets-Sheet 4

Fig-4



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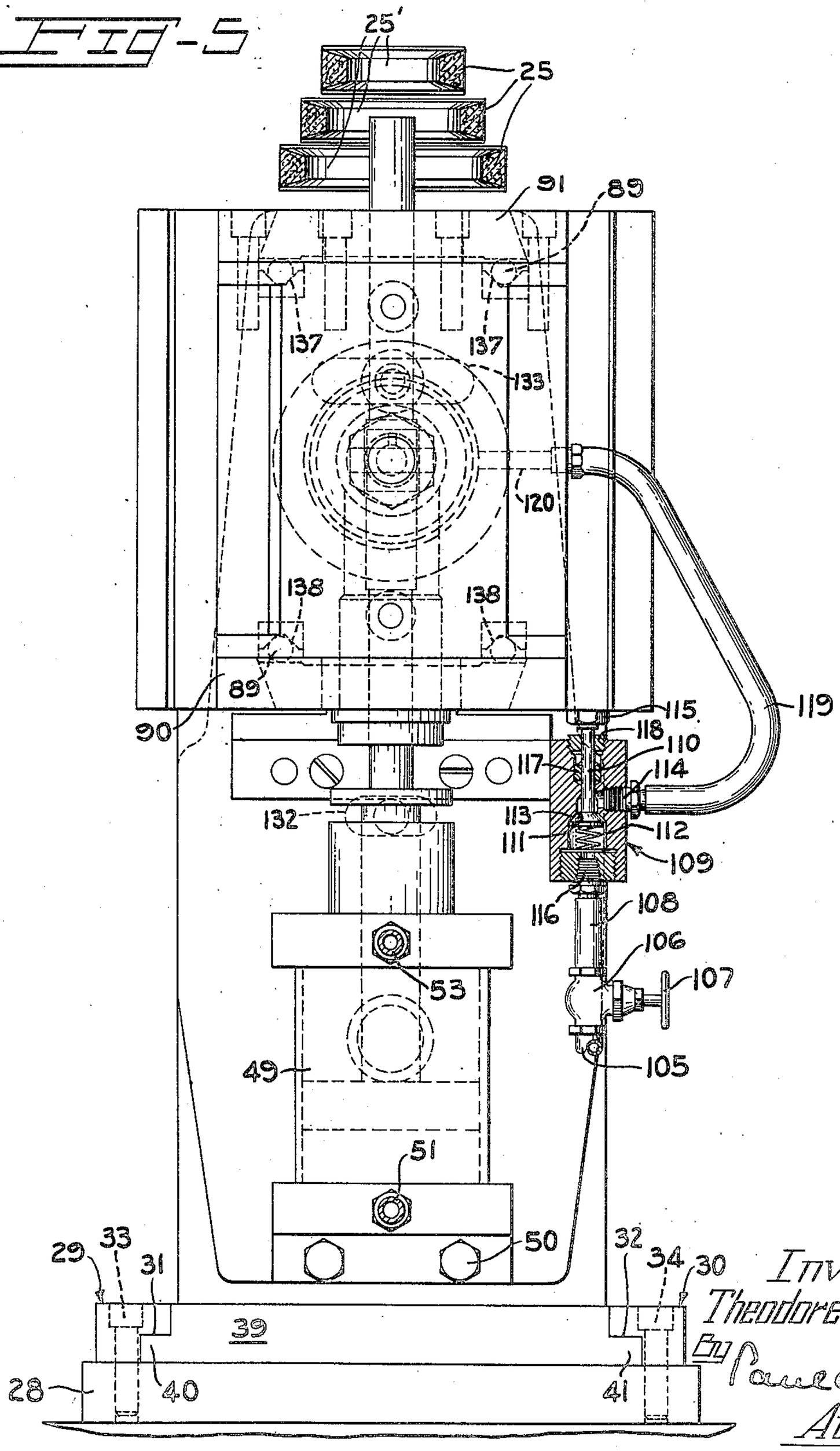
POLISHING MACHINE FOR BEARING RACES

Filed Dec. 28, 1946 5 Sheets-Sheet 5

Fig-5



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Patented Oct. 31, 1950

2,527,791

UNITED STATES PATENT OFFICE

2,527,791

POLISHING MACHINE FOR BEARING RACES

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Application December 28, 1946, Serial No. 718,916

6 Claims. (Cl. 51—108)

1

This invention relates to a new and improved polishing machine for ball bearing races and has for one of its principal objects the provision of means for relatively completely removing ridges from ball bearing races caused by grinding.

An important object of this invention is to provide a polishing machine having a plurality of rotatable polishing wheels adapted to successively and automatically operate on ball bearing races as they are fed into the machine.

Another important object of this invention is the provision of a plurality of polishing wheels placed at different angles and adapted to successively polish a bearing race.

Still another object of this invention is the provision of a machine for polishing the internal annular surfaces of outer ball bearing races.

A further object is to provide a work head carrying a polishing wheel to automatically move into and out of position within an outer ball bearing race, and further to move laterally of the first movement so that the polishing wheel contacts the internal annular bearing surface.

Another and still further object is to provide a machine with a plurality of work heads carrying polishing wheel spindles adapted to automatically and simultaneously move the polishing wheels into a position within an outer bearing race and thereupon against the bearing surface within the race, all in combination with a turntable adapted to carry a plurality of the bearing races and to move the races successively from one work head to another.

Still another object of this invention is to provide a fluid pressure means for effecting movement of a polishing wheel into position against the internal annular bearing surface of an outer ball bearing race, and further to vary the amount of pressure at which the polishing wheel contacts the bearing surface to be polished.

Other and further important objects of this invention will become apparent from the disclosures in the following specification and accompanying drawings, in which:

Figure 1 is a top plan view of the bearing race polishing machine of this invention.

Figure 2 is a partial side elevational view taken on the line 2—2 of Figure 1.

Figure 3 is a sectional view taken on the line 3—3 of Figure 2.

Figure 4 is a vertical sectional view taken on the line 4—4 of Figure 1 and with parts thereof in elevation.

Figure 5 is a view partially in section taken substantially on the line 5—5 of Figure 1 and

2

showing one of the individual work heads employed in this device.

Figure 6 is a front elevational view of one of the work heads in tilted position.

Figure 7 is a front sectional detail of the first of a series of polishing wheels shown in engagement with the race to be polished.

Figure 8 is a side sectional detail of the polishing wheel engaging the internal ball bearing race as shown in Figure 7.

Figure 9 is a front sectional detail of the second in the series of polishing wheels shown in working engagement with the bearing race.

Figure 10 is a side sectional detail of the device as shown in Figure 9.

Figure 11 is a front sectional detail of the third in the series of polishing wheels employed on this device and showing the polishing wheel operatively engaging the bearing race to be polished.

Figure 12 is a side sectional detail of the device as shown in Figure 11.

As shown in the drawings:

The reference numeral 10 indicates generally a supporting structure. A turntable 11 is mounted for rotation within the supporting structure 10 and is substantially flush with a table top platform 12 of the supporting structure. The turntable is equipped with mechanism (not shown) to effect rotation thereof. A plurality of work holders is provided in an annular path around the surface of the turntable at regular intervals. The work holders shown at 13 are best illustrated in Figures 1 and 2. Each holder, consisting of three jaws 14 arranged in a circular fashion, is adapted to receive a bearing race member 15. The bearing race is of the type adapted to be positioned on the outside of a bearing and is commonly called an outer bearing race. The outer bearing race has an internal annular bearing path 16.

The machine set forth in this application is for the purpose of polishing the internal annular surfaces of outer bearing races. There are six work holders 13 placed around the turntable 11. Each of these work holders occupies a particular station on the table designated by the letters A, B, C, D, E, and F. The A station is the position where the bearing races to be polished are inserted into the machine. One of the three jaws 14 of the holders 13 is moved radially outwardly in both of the stations A and F. In all the other stations B, C, D, and E, the slidable jaw is in an inward position firmly clamping the race held therein. As previously stated, an outer bearing race 15 is placed in the holder 13 at the station

A when the jaws are in a non-clamping position. The turntable 11 is arranged to automatically index or move one-sixth of a revolution at regular time intervals. These intervals, of course, can be controlled so that the amount of polishing required will be accomplished. As the turntable 11 rotates, the outer bearing race 15 in the holder 13 moves from the station A to the station B, and during this movement the sliding jaw comes inwardly to grip and firmly hold the bearing race 15. Each of the holders 13 is rotated by means (not shown) beneath the turntable 11. The table indexing means and the means for rotating the work holders are not new and hence have not been shown in the drawings. These means can take the form of those shown in the Belcourt Patent 2,386,649. Sheet 5, Figure 6 of the Belcourt drawings shows the table indexing means and the work holding rotating means, and page 4, column 2, lines 13 to 28 of the Belcourt specification describes the indexing and rotating means.

Work or polishing heads are shown mounted on the supporting structure table top 12 at G, H, I, and J corresponding to the stations B, C, D, and E on the turntable 11. Each of the work heads is equipped with a polishing wheel which the work head positions in a plane within the internal race to be polished, and thereupon the polishing wheel is moved against the race and both the polishing wheel and the race are rotated, with the result that the races are efficiently polished.

As the turntable 11 is indexed, the race 15 passes beneath and is polished by each of the work heads G, H, I, and J. At the station B the work head G is tilted about the axis 124 on the pin 125 which is affixed in the plate 126 of the work head. The structural member 38 is fixedly attached to the table top 12 and the plate 126 on which the work head elements are attached is swingable about the pin 125. The pin 125 has a threaded stud 127 projecting through a boss 128 on the stationary support 38. A nut 129 is adapted to be drawn up on the threaded stud to hold the plates 126 and 38 together. Cap screws 130 and 131 threadedly engage the tiltable plate 126 and when they are loosened along with the nut 129 the plate 126 may be turned about the pin 125 with the cap screws 130 and 131 moving through enlarged slots 132 and 133 respectively in the stationary support 38. These slots are shown in Figures 4, 5, and 6. A spindle 17 having a polishing wheel 18 at the bottom thereof is carried by the tiltable plate 126. This inclination of the work head and spindle 17 is best shown in Figures 2, 6, 7, and 8. The polishing wheels are basically rubber impregnated with abrasive materials to effect a polishing of the bearing races. When the races are inserted in this polishing machine they have just had the annular bearing surface or race ground therein. The grinding is accomplished by a stone, and upon close examination the race will disclose numerous ridges and valleys which must be removed in order to have the ball bearing function in a proper manner.

The disc-like polishing wheels on the work heads G, H, I, and J have increasingly less amounts of abrasive material impregnated in the wheels in that order. The polishing wheel 18 inclined with respect to a plane through the annular internal race and about the axis 124 is adapted to polish and remove portions of the

grinding ridges in the bearing race. It is important that the polishing wheel be tilted about the axis 124 as that is the center line of the race and tilting on that line insures uniform polishing of the bearing race regardless of the angle of inclination of the polishing wheel. As the race 15 is moved beneath the work head H, it is acted upon by another polishing wheel 19 mounted on a spindle 20 and inclined with the work head in a direction opposite the polishing wheel 18 shown in Figures 7 and 8. As shown in Figures 9 and 10, this polishing wheel 19 substantially cross polishes with respect to the first wheel 18. The bearing race 15 then moves beneath the work head I and is acted upon by a polishing wheel 21 mounted on a spindle 22. As shown in Figures 11 and 12, this polishing wheel 21 is positioned straight or in the same plane as a plane drawn through the internal annular race of the bearing. In other words, this polishing wheel 21 is adapted to polish parallel with the annular race and removes ridges or rough surfaces left by the cross polishings of the wheels 18 and 19. The wheel 21 is initially positioned centrally of the outer bearing race, and for polishing operation it is moved laterally to a position shown by the wheels 18 and 19 in Figures 11 and 12.

The work heads G, H, I, and J are all similar to one another. Another function is to move their respective polishing wheels down to a position within the bearing races and thence laterally to engagement with the annular races. The polishing wheel associated with the work head J has not been shown but it is identical to the parallel positioned polishing wheel 21 of the work head I, the only difference being less abrasive material in the polishing wheel of the work head J. The cross polishing of the first two polishing wheels 18 and 19 and the subsequent polishing by wheels positioned parallel to the races being polished results in a highly polished surface which contributes to long efficient bearing life.

As shown in Figure 2, the work head G having the spindle 17 and polishing wheel 18 positioned angularly with respect to the table, is shown in operative position. The bearing race 15 to be polished is held in the clamping holder 13 with the three substantially evenly spaced clamping members 14. The holder 13 is equipped with a downwardly extending shaft 23, which as previously stated passes through the top surface of the turntable 11, and when the holder is at any of the stations B, C, D, or E it is rotated so that the clamped race 15 is also rotated. The polishing wheel and spindle 17 and 18, respectively, are in alignment with the spindle 23 of the work holder 13 so that when the polishing wheel 21 is brought downwardly it does not contact the annular ball bearing race as the diameter of the race is larger than the diameter of the polishing wheel.

The spindle 22 is driven by an electric motor or the like 24 mounted at the rear of the work head. The drive from the motor 24 to the spindle 22 is through the medium of belts 25, as shown in Figure 4, which extend from pulleys 25' on the motor 24 to stepped pulleys 26 on an upward continuation of the spindle 22. A shield 27 covering the belt drive is shown in Figures 1 and 2. For purposes of illustration the shield has been removed from Figures 4 and 5. The work head consists of a base 28 mounted on the table top 12 of the supporting structure 10. The base 28, as

best shown in Figure 5, is equipped with a pair of side guide or track members 29 and 30. These track members 29 and 30 are parallel to each other and are provided on their inner faces with an undercut or offset 31 and 32. The track members 29 and 30 are bolted or otherwise fastened to the base member 28 as shown at 33 and 34. At the outer end of the tracks 29 and 30 and positioned substantially centrally thereof is a bracket 35 shown in Figure 2 which is fixedly attached to the base plate 28. The bracket 35 journally carries a threaded shaft 36 having a hand wheel 37 extending from one side thereof. Rotation of the hand wheel 37 causes rotation of the threaded shaft 36, but the connection between the shaft and the bracket 35 is such that no longitudinal movement of the shaft may occur. An upwardly extending structural member 38 has a base plate 39 shown in Figure 5 with outwardly extending flanges 40 and 41 at each side thereof which cooperatively engage the track members 29 and 30 with the flanges extending into the undercut or offset as shown at 31 and 32. The base plate 28 with its parallel tracks 29 and 30 mounted on the surface thereof is positioned radially with respect to the center of the turntable 11 so that movement of the structural member 38 along and within the radially extending tracks 29 and 30 will position the work head toward or away from the center of the turntable 11. A sleeve-like member 42, shown in Figure 2, is associated with the structural member 38 and is positioned in alignment with the threaded shaft 36. The sleeve member 42 is internally threaded for the reception of the shaft 36. Upon rotation of the hand wheel 37 the threaded shaft 36 enters or is withdrawn from the sleeve 42. Inasmuch as the shaft 36 cannot move longitudinally the sleeve 42 and the structural member 38 are drawn toward or away from the stationary bracket 35. Movement, of course, takes place within the track members 29 and 30. The work head may thus be accurately positioned to operate at any point in a radial line drawn from the center of the turntable.

Spaced side plates or transverse housing members 43 move vertically on tilting plate 126. Each of the side plates 43 is equipped with a rearwardly extending lug at its lower end having apertures in alignment with each other. A hinge pin or rod 45 is positioned through the aligned apertures in the lugs 44. A motor-carrying bracket 46 is hingedly attached to the pin 45, and thus the motor 24 and its supporting bracket 46 may rotatably move about the shaft 45 as an axis. The motor is limited in its rotational movement by a bolt 47 which extends through an aperture in the upper portion of the motor support 46 and into a back plate 136. A spring 48 surrounds the shank of the bolt 47 between the motor supporting structure 46 and the side plates 43. Thus as the device is viewed in Figure 2, the head of the bolt 47 will prevent further counter-clockwise movement of the motor 24 about its axis of rotation 45, but the motor 24 may move in a clockwise direction against the action of the spring 48 until such time as the spring 48 is fully compressed.

As shown in Figure 4, a fluid cylinder 49 is attached by means of bolts 134 to the tilting plate 126. A source of fluid under pressure (not shown) is supplied to a conduit 50 which carries the fluid to an inlet 51 of the cylinder 49. An outlet 52 is provided at the top of the cylinder 49 and likewise has a conduit 53 which exhausts the fluid

under pressure. A piston 54 is adapted for vertical reciprocation in the cylinder 49. When fluid under pressure is supplied to the inlet 51, the piston 54 is raised in the cylinder. The piston 54 is equipped with a piston rod 55 extending upwardly through the top of the cylinder 49 and having an extension 56 which extends upwardly through the work head to a position over the top of the side plates 43. A cam 57 is fastened to the upper extension 56 of the piston rod 55 and is provided with an inclined surface 58 for engaging a roller 59 mounted on a shaft or pin 60 and extending between a member 61. As the piston 54 is moved upwardly the inclined surface 58 of the cam 57 moves upwardly and causes the roller 59 to move to the right, as viewed in Figure 4. The roller 59 thus in turn causes the member 61 to similarly move to the right. A shaft 62 is fastened to the member 61 and carries a flexible cup member 63 having a washer 64 on the outside and a washer 65 on the inside. A nut 66 threadedly engages the shaft 62 and holds the washers and flexible cup together as a unit. A bolt 67 is adapted to fasten a front plate member 68 to the shaft 62. It will thus be evident that as the piston 54 moves upwardly in the cylinder 49, the structure consisting of the roller 59, the rectangularly shaped member 61, the washer and flexible cup assembly 63, 64, and 65, the shaft 62, and the outer front plate 68 all move as a unit with respect to the stationary side plates 43. A plug member 69 is adapted to cover the chamber opening to the right of the flexible cup 63. This plug member has an annular flange 70 fastened by means of bolts 71 to a block member 72 which is fastened and carried with the side plates 43. The block 72 includes a vertical hole 73 to permit passage of the upper extension 56 of the piston rod 55. Bushing members 74 and 75 are provided within the block 72 to afford guidance for the rod 56.

Member 61 extends around the rod 56 and its associated cam 57. As shown in Figure 4, the rectangular member 61 has a first end portion 76 which is fastened to the shaft 62 and the opposite end 77 on the rear side of the rod 56 which carries a pin 78. The pin 78 is adapted to extend into a socket 79 in an insert member 80 placed in the upwardly extending tilting plate 126. The pin 78 engages the socket 79 and prevents an upward movement of the entire work head when the piston rod 55 is moved upwardly until such time as the pin is withdrawn from the socket 79. As the piston 54 moves upwardly, certain of the elements move to the right as previously described. Included in this movement is the rectangularly shaped member 61. The cam surface 58 is sufficiently deep to cause the pin 78 to be withdrawn completely from the socket 79. It will thus be evident that the work head may not be moved upwardly while the pin 78 remains in its socket 79. Hence as the piston 54 moves upwardly, the cam surface 58 causes the polishing wheel spindle 22 to move with the roller 59 and associated structure. The spindle 22 is mounted in a journal bracket 81 which is fastened to the end plate 68 and thus moves with the end plate. The polishing wheel 21 would be positioned within the ball bearing race and against the annular bearing surface in the position of the device as indicated by the work head in Figure 4. In order for the bearing race carrying members 13 to be moved from one station to the next, the polishing wheel must be removed from the concave bearing surface prior

to lifting of the wheel from its position within the confines of the annular bearing race. It should be understood therefore that initial movement of the piston 54 causes the polishing wheel to move to a position centrally of the race being polished. This is accomplished, of course, by the cam surface 58 riding against the roller 59. The pin 78 within the socket 79 prevents upward movement of the polishing wheel until such time as the polishing wheel is in a position centrally of the annular race.

A lug 82 is fastened to the piston rod 55 and moves with the rod. When the lug 82 contacts the under surface of the bushing 74, the polishing wheel has moved out from polishing contact and is ready to be raised from within the annular race. Continued movement, therefore, of the piston 54 will cause upward movement of the heretofore stationary block member 72 with respect to the tilting plate 126. The tilting plate 126 is equipped with recessed side portions 83 and 84 near the top thereof, thus leaving a central forwardly projecting portion 85. A plate 86 of greater width than the forwardly projecting portion 85 is attached thereto by bolts 87 in such a manner that the side recess portions 83 and 84 are now enclosed grooves. The block member 72 has attached thereto a pair of inwardly projecting strip members 88 which engage the vertical slots or grooves 83 and 84, thus forming a tongue and groove within which the work head may be raised and lowered and properly guided therein. A guide plate 135 is fastened to the plate 86 and projects forwardly forming a vertical guide to prevent lateral displacement of the block 72. The plate 135 is preferably hardened to form a good bearing surface.

In order to facilitate and eliminate friction on the initial movement of the work head to the right, it moves on a plurality of balls 89 which are confined and carried by bottom and top plates 90 and 91, respectively. Each of these plates has a V-shaped track on its ball engaging surface. The members 90 and 91 are fastened to the front plate 68 by means of bolts 92 and 93. The V-shaped ball tracks 137 and 138 shown in Figure 5 keep the balls 89 confined within the work head. Springs 94 are adapted to be positioned within wells 95 formed in the block member 72. The wells 95 are opened at their right ends, thus permitting insertion of the springs. Adjustable stop members 96 have threaded stud portions 97 which engage threaded apertures in the front plate 68. The springs 94 may thus be precompressed to any desired extent. When the cam surface 58 acts against the roller 59, the springs 94 will both aid in pushing the front plate 68 and thus the spindle-carrying bracket 81 forwardly or to the right as viewed in Figure 4. The spindle-carrying bracket 81 is best shown in Figure 3. The spindle 22 is journaled within a bearing member 98 which is clamped by a split circular ring 99 forming the front or right side of the member 81. A bolt 100 is adapted to draw the split clamp 99 together and to hold the bearing 98 in fixed position. The rear or left portion of the member 81 is provided with outwardly and rearwardly tapered walls 101. These tapered walls 101 are adapted to be clamped within oppositely tapered strip members 102 which are fixedly attached to the front plate 68 of the work head. Set screws 103 threadedly engaging the strips 102 extend through the strips and contact the spindle-holding member 81 to hold it in any vertical position desired.

It has been shown that the work head is capable of moving the polishing wheel, from a position engaging the annular concave race, laterally and then upwardly to permit rotation of the turntable 11 so that the ball bearing race being polished may be successively treated by each of the work heads G, H, I, and J. After the polishing wheel 18 of the first work head G has completed its polishing, the "grain" of the polishing is inclined as shown at 104 in Figures 7 and 8. The fluid cylinder 49 is then actuated as described above, causing the polishing wheel 18 to initially move to a position centrally of the bearing race 15 and then upwardly so that the polishing wheel is clear of the race. The turntable then rotates so that the race 15 is positioned beneath the work head H, and in order to effect downward and lateral movement of the polishing wheel 19 into a position engaging the race to be polished, the fluid in the cylinder 49 is then exhausted through the inlet 51 permitting the piston 54 to drop. It may be desirable to make this downward movement positive by applying fluid under pressure to the previously designated outlet 52 at the top of the cylinder, thus forcing the piston 54 downwardly. The work head moves downwardly, and by reason of the inclined cam surface 58 the roller 59 is permitted rearward movement or movement to the left as viewed in Figure 4. The springs 94, however, act to maintain the spindle and its associated polishing wheel in their foremost position, and hence another means must necessarily overcome the action of the springs to cause the spindle to move inwardly into engagement with the race to be polished by the polishing wheel.

As best shown in Figure 5, a conduit 105 is supplied with a source of fluid under pressure (not shown) and delivers this fluid to a valve 106 which is used to regulate the amount of fluid passage by a hand wheel 107. The fluid under pressure then passes upwardly through a continuing conduit 108 and feeds the fluid to a control valve 109. The control valve 109 includes a sliding stem 110 having a tapered flange disc valve at its lower end as shown at 11. A spring 112 is adapted to normally move the valve disc 111 upwardly into engagement with a seat 113 formed in the housing of the control valve. When the valve disc 11 is in a seating position with respect to the seat 113, the fluid in the conduit 108 is barred from passing to the outlet 114 of the control valve 109. This condition prevails when the work head is in an up and non-operating position. The stem 110 has a nut 115 adjustably engaging the upper end thereof. This upward extension of the stem 110 projects out of the housing of the control valve 109, and upon applying a downward pressure on the nut 115 sufficiently strong to overcome the action of the spring 112, the valve disk 111 may be moved away from the seat 113, thus permitting fluid under pressure to pass from the inlet 116 of the valve 109 to the outlet 114. Suitable packing 117 is provided around the upper extension of the valve member 110, and a bushing 118 is adapted to hold this packing in position. As the work head moves downwardly, the bottom plate 90 is arranged to strike the nut 115 and open the control valve 109 so that fluid under pressure is permitted to pass through the valve and to a conduit 119. The position of the spindle and polishing wheel is similar to that shown in Figure 6 in which the polishing wheel is positioned centrally of the bearing race to be polished and has not

yet contacted the bearing surface. The conduit 119 passes upwardly and terminates at a discharge opening 120 within a chamber 121 formed between the flexible cup 63 and the plug member 69. It will be recalled that the plug member 69 is stationary in so far as lateral movement is concerned, and thus the fluid under pressure as it enters the chamber 121 will act against the flexible cup 63, forcing the flanges of the cup outwardly against the block member 72 and moving the cup and its associated assemblies laterally so that the roller 59 moves over against the upper extension 56 of the piston rod 55. Simultaneously, of course, the polishing wheel and its associated spindle move laterally into work-engaging position. The chamber 121 is sealed against fluid pressures by a packing 122 surrounding the shaft 62 and a bushing 123 threadedly engaging the plug 69 firmly holding the packing in position. The shaft 62 can thus have lateral movement with fluid pressure being confined within the chamber 121. As the fluid pressure moves the member 61 laterally, the pin 78 reengages its socket 79 and thus the work head may not move vertically without first moving laterally.

The engagement of the polishing wheel with the race to be polished is thus directly controlled by the fluid pressure coming from the conduit 119, as shown in Figures 3 and 5, to the chamber 121. The regulating valve 106 may be adjusted so that the polishing wheel will contact the surface to be polished with any amount of pressure desired. As shown in Figures 9 and 10, after the race 15 has been polished with the wheels 18 and 19, the polishing grain is composed of the inclined polishing marks 104 from the wheel 18 and also includes cross-inclined polishing marks 124′ from the polishing wheel 19. Indexing of the table another time so that the polishing wheel 21 engages the race 15 as shown in Figures 11 and 12 causes a third "grain" 125′ to be recorded on the race. As stated above this third grain is parallel with the surfaces of the bearing race. The multiple positions at which the polishing wheels contact the race 15 reduce the possibility of grinding ridges being left in the race and unpolished. The fourth polishing wheel on the J work head is not shown, but is identical in shape and position to the polishing wheel 21. The abrasive qualities of this last wheel, however, are less than the abrasive qualities of the wheel 21 and thus impart a final fine surface to the crossed and parallel polishing grain made by the polishing wheels 18, 19, 20, and 21.

Numerous details of construction may be varied throughout a wide range without departing from the principles disclosed herein, and I therefore do not propose limiting the patent granted hereon otherwise than as necessitated by the appended claims.

What is claimed is:

1. A machine for polishing internal annular bearing races comprising a support, a vertically slidable member carried on said support, a rotatable spindle, a spindle journalling member slidable laterally in said vertically slidable member, a polishing wheel attached to said spindle, means positioning a rotatable bearing race adjacent said support, and means for moving said vertically slidable member so the accompanying polishing wheel is positioned centrally of the bearing race, and means for subsequently laterally moving said spindle journalling member so the polishing wheel engages the race to be polished, said means for moving the vertically slidable member including a fluid cylinder carried on the support and a piston for said fluid cylinder connected to said vertically slidable member for movement with said vertically slidable member, said means for subsequently laterally moving said spindle journalling member in one direction including a fluid under pressure and cam means on said piston for said fluid cylinder adapted to move said spindle journalling member laterally in a direction opposite to the direction of movement by the fluid under pressure and a lug member on said piston for said fluid cylinder adapted to engage said vertically slidable member to effect return movement thereof, whereby the polishing wheel is positioned out of the plane of the bearing race.

2. A polishing device including a stationary member, a fluid operated cylinder fixed in a vertical position to said stationary member, a piston adapted to be moved by fluid pressure vertically within said cylinder, a piston rod connected to said piston and movable therewith, a head member constructed and arranged to slide vertically with respect to said stationary member, said piston rod journalled for slidable movement through said head member, a spindle, a spindle carrying member arranged and constructed to slide laterally within said head member, a polishing wheel on said spindle, means on said piston rod for shifting said spindle carrying member laterally in one direction, and further means fixed to said piston rod for moving said head member vertically.

3. A polishing device including a stationary member, a fluid operated cylinder fixed in a vertical position to said stationary member, a piston adapted to be moved by fluid pressure vertically within said cylinder, a piston rod connected to said piston and movable therewith, a head member constructed and arranged to slide vertically with respect to said stationary member, said piston rod journalled for slidable movement through said head member, a spindle, a spindle carrying member arranged and constructed to slide laterally within said head member, a polishing wheel on said spindle, means for shifting said spindle carrying member laterally in one direction, and further means fixed to said piston rod for shifting said head member vertically, said means for shifting said spindle carrying member laterally in one direction comprising a cam on said piston rod.

4. A polishing device including a stationary member, a fluid operated cylinder fixed in a vertical position to said stationary member, a piston adapted to be moved by fluid pressure vertically within said cylinder, a piston rod connected to said piston and movable therewith, a head member constructed and arranged to slide vertically with respect to said stationary member, said piston rod journalled for slidable movement through said head member, a spindle, a spindle carrying member telescoping said head member and arranged and constructed to slide laterally with respect to said head member, a polishing wheel on said spindle, means shifting said spindle carrying member laterally, and further means fixed to said piston rod for shifting said head member vertically comprising a stop member fastened to said piston rod for engaging the underside of said head member.

5. A polishing device including a stationary member, a fluid operated cylinder fixed in a vertical position to said stationary member, a piston adapted to be moved by fluid pressure vertically

within said cylinder, a piston rod connected to said piston and movable therewith, a head member constructed and arranged to slide vertically with respect to said stationary member, said piston rod journalled for slidable movement through said head member, a spindle, a spindle carrying member telescoping said head member and arranged and constructed to slide laterally with respect to said head member, a polishing wheel on said spindle, means shifting said spindle carrying member laterally in one direction, and further means fixed to said piston rod for shifting said head member vertically, said means for shifting said spindle carrying member laterally in one direction including said head member having a horizontally disposed cylinder therein, a piston connected to said spindle carrying member and adapted to slide in said horizontally disposed cylinder, a fluid under pressure, and regulating means for admitting the fluid under pressure to said horizontally disposed cylinder to move the piston and its connected spindle carrying member laterally in the one direction.

6. A polishing device including a stationary member, a fluid operated cylinder fixed in a vertical position to said stationary member, a piston adapted to be moved by fluid pressure vertically within said cylinder, a piston rod connected to said piston and movable therewith, a head member constructed and arranged to slide vertically with respect to said stationary member, said piston rod journalled for slidable movement through said head member, a spindle, a spindle carrying member telescoping said head member and arranged and constructed to slide laterally with respect to said head member, a polishing wheel on said spindle, means for shifting said spindle carrying member laterally, and further means associated with said piston rod

for shifting said head member vertically, said means for shifting said spindle carrying member laterally including said head member having a horizontally disposed cylinder therein, a piston connected to said spindle carrying member and adapted to slide in said horizontally disposed cylinder, a fluid under pressure, and regulating means for admitting the fluid under pressure to said horizontally disposed cylinder to move the piston and its connected spindle carrying member laterally in one direction and said means for shifting said spindle carrying member laterally further including a cam on said piston rod for moving said spindle carrying member in an opposite direction.

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