Sept. 20, 1932. G. O. HODGE 1,878,277

MACHINE FOR WASHING BALL BEARINGS

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Fig. 1

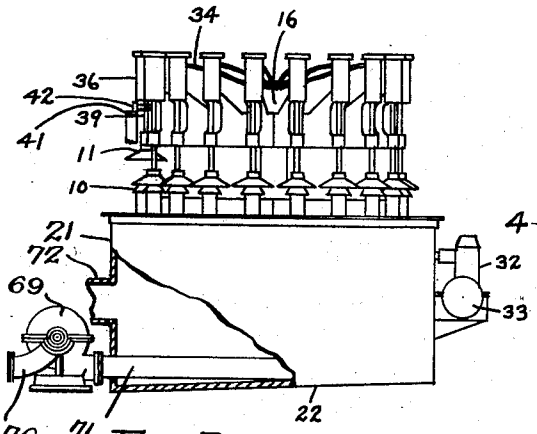


Fig. 2

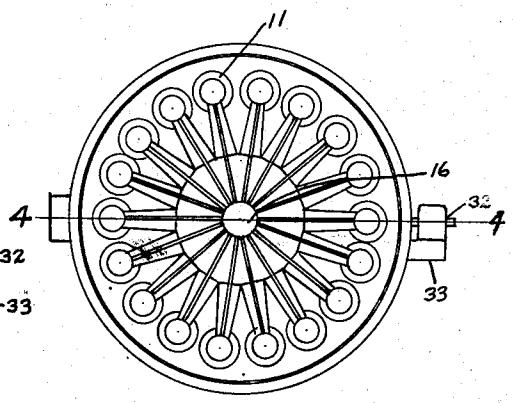


Fig. 5

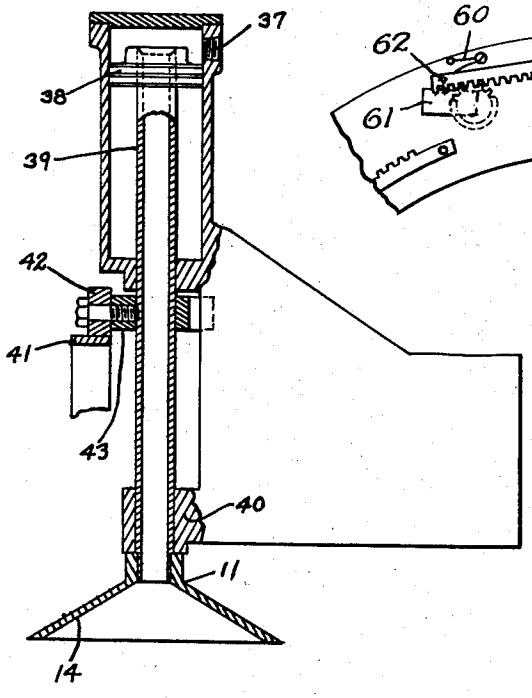


Fig. 8

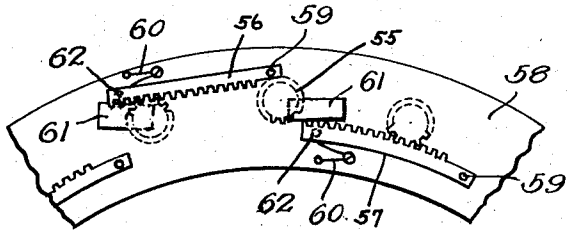
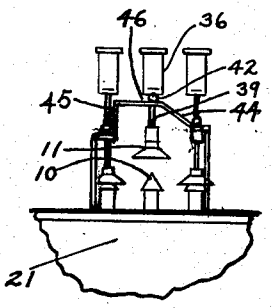


Fig. 3



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Fig. 6

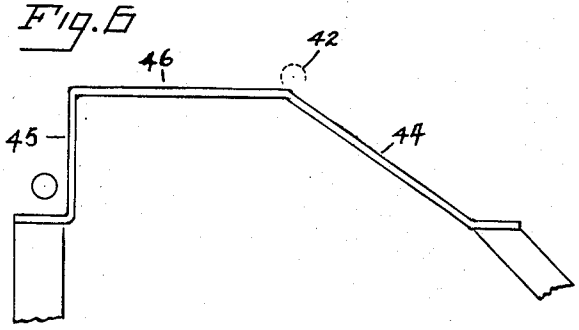
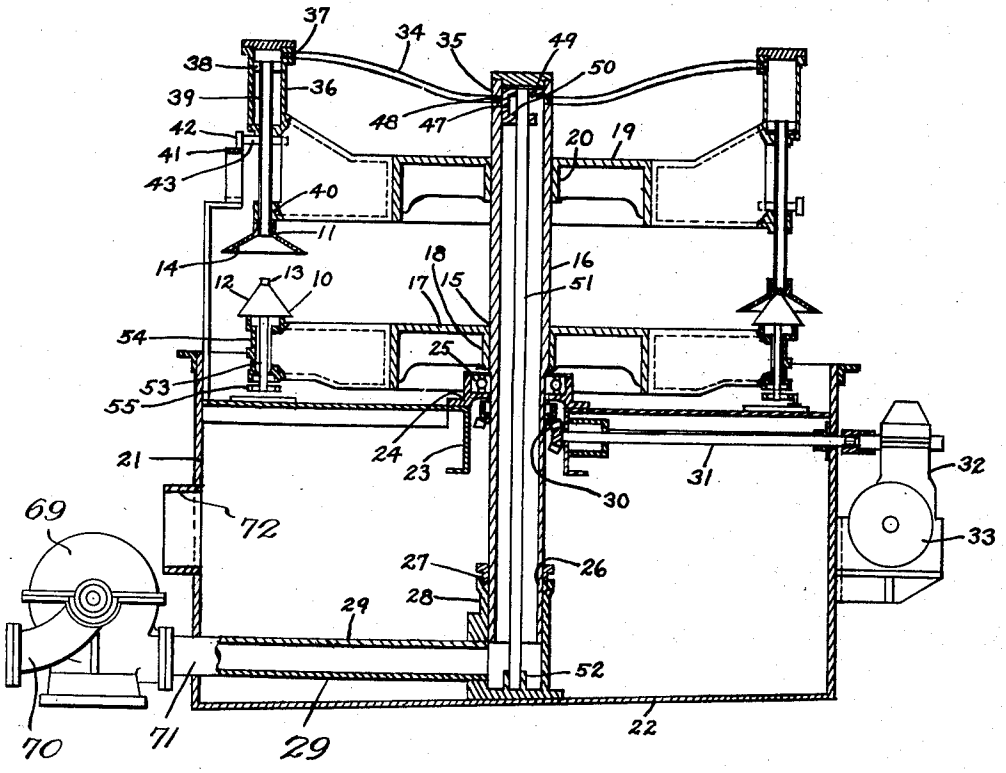


Fig. 4



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Fig. 7

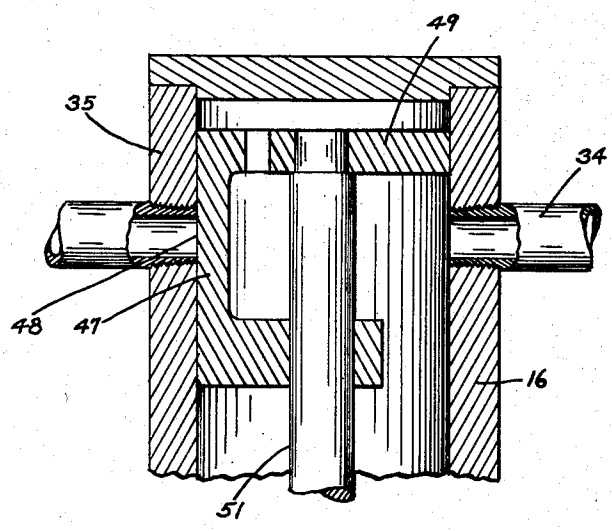
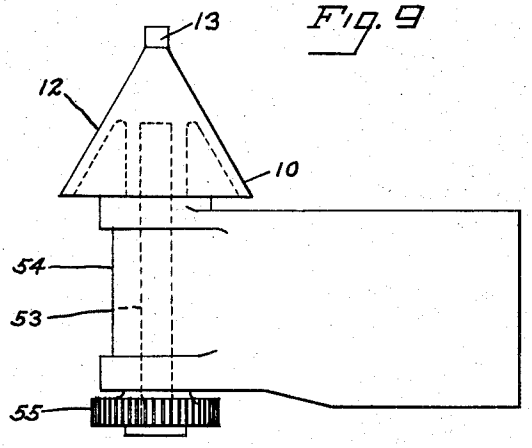


Fig. 9



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UNITED STATES PATENT OFFICE

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MACHINE FOR WASHING BALL BEARINGS

Application filed November 17, 1928. Serial No. 320,164.

My invention relates to improvements in washing ball-bearings, involving the use of a flow of oil under pressure, and the object of my improvement is simplicity and economy in construction and convenience and efficiency in use by the use of a machine having a revolving table structure having a plurality of stations at which the washing is effected and by means that are substantially automatic, whereby the duties of the operator are confined to the removal of the washed bearings and supplying the bearings to be washed.

In the accompanying drawings:—

Figure 1 is a side elevation of a machine for washing ball-bearings embodying my invention.

Figure 2 is a plan view of the same.

Figure 3 is an end elevation of the same from the side of the operator, showing the lifting cam and the adjacent parts.

Figure 4 is a sectional view on an enlarged scale on the line 4—4 of Fig. 2.

Figure 5 is a fragmentary view on a further enlarged scale showing details of one of the cylinders and the upper clamping member.

Figure 6 is a fragmentary view showing the lifting cam.

Figure 7 is a fragmentary sectional view showing the control valve.

Figure 8 is a fragmentary plan view showing the racks for rotating the lower clamping member.

Figure 9 is a side elevation showing one of the lower clamping members.

My improvement in washing ball-bearings involves the use of a machine that is equipped with a plurality of pairs of mating clamping members that hold the bearings by engaging respectively with the inner and the outer rings; that is supplied with a flow of cleansing oil under pressure; that has means for separating said members for permitting of the removal of the washed bearing and the insertion of another bearing that is to be washed; that has automatically operating means for engaging the inserted bearing and for holding the same during the washing operation; such engagement and holding of the bearing involving the utilization of the oil flow and the pressure to which it is subjected during such flow; and in which the clamping members are constructed and arranged for operation upon bearings that vary appreciably in size so that the range thereof will comprise substantially that which will be included in the standard run and out-put as usually found under ordinary conditions of manufacture.

The machine comprises, as shown, eighteen pairs of clamping members, respectively composed of the lower member 10 and the upper member 11. The lower member 10 has a conical face 12 for the major portion of the structure of the clamping portion proper or engaging portion and which is adapted to receive and support the inner ring of the bearing by being entered into the opening therein and which conical face 12 suffices for the greater portion of the product. For particularly diminutive bearings, however, a cylindrical tip 13 is provided at the apex of the conical face 12.

The upper member 11 is generally the counter-part of the lower member 10 as to the clamping portion proper or engaging portion 14, being generally in the form of a hollow cone.

Said upper member operates by engaging with the outer ring and the holding is effected automatically responsive to the pressure of the cleansing oil as it is delivered to and passes through the machine.

The clamping members are incorporated in the structure of turn-table 15, the middle member or shaft 16 of which is in the form of a tube of relatively large size and through which the cleansing oil flows intermediate a pump and said clamping members. A centrifugal pump 69 gives good results. Said pump 69 receives the cleansing oil through a receiving pipe 70 and delivers the same through a pipe 71 to the housing and supporting tank 21, the delivery being located at the lower portion of the tank, adjacent the base 22.

Above the supply pipe 71 the tank 21 is provided with a discharge opening 72 that serves as the outlet for the used oil or other cleansing liquid.

The clamping members are supported from

the tube 16 by a spider construction having arms for the respective clamping members and radiating from a central hub. Thus for the lower members 10 there are arms 17 that connect with the hub 18 and for the upper members 11 there are the arms 19 and the hub 20.

The tank 21 receives the oil from the bearings and is of rigid construction so as to be adapted to operate as a supporting frame, the bottom 22 of said tank serving as the base. On a cross-bar structure 23 at the upper end of the tank 21 is a seat 24 for a ball-bearing 25 that serves as the main bearing for the tube 16 and the turn-table 15.

The lower end portion 26 of the tube 16 is connected by a gland-joint 27 with a fixed sleeve 28 that projects unwardly from the base 22 and which by means of a laterally directed opening is connected with the inner end of the tank-enclosed portion 29 of the pump delivery pipe 71.

Power is applied through the medium of bevel gearing 30 at the inner end of a drive-shaft 31, the outer end portion of which is operatively connected by suitable gearing 32 with the motor 33.

Branch tubes 34 lead from the upper end portion 35 of the main tube 16 to the upper clamping members 11, the actual connection for said branch tubes being with a cylinder that is provided for each of said clamping members. The inlet 37 for each cylinder 36 is above the piston 38 and the said piston is provided with a stem 39 of tubular form that serves both as a mechanical connection with the upper clamping member 11 and also as a delivery tube for delivering the cleansing oil thereto. The stem 39 projects downwardly through a bearing housing 40 and the upper clamping member 11 is mounted at the lower end thereof.

Thus the upper clamping member 11 is supported for vertical to and fro movement toward and away from the clamping position and is adapted to be driven towards such clamping position and to effect a hold on the bearing after gripping the same by the liquid pressure under conditions of oil flow by reason of the excess of area of the piston 38 relatively to the bore of the tubular stem 39.

The lifting of the upper clamping member 11 for releasing the bearing is effected through the medium of a track-cam or riser 41 that, as shown, cooperates with a contacting roller 42 that is operatively supported from the side of the stem 39 through the medium of a bracket 43.

The cam 41 has an inclined portion 44 on the approach side; has an abrupt drop portion 45 on the leaving side; and intermediate said sides has a flat portion 46 on which the roller 42 rides during the period in which the washed bearing is removed and the un-washed bearing is supplied.

In the present structure the flat holding portion 46 corresponds in length to the angle comprised by two adjacent cleansing stations.

During the period that a particular upper clamping member 11 is held out of commission as a clamping device in the manner described the flow of oil to the same is interrupted.

The manner of doing this comprises the use of a valve 47 that covers the corresponding outlet opening 48 at the upper end portion 35 of the main tube 16. The interior of said upper end portion 35 is finished in cylindrical form for serving as a path for face-to-face contact with the valve 47. As the tube structure 16 is rotated the valve 47 is brought successively into registration with the different outlet openings 48, the border walls of which serve as valve seats.

As mentioned, two cleansing stations are shut-off at a time, the valve 47 being of sufficient angular extent to cover two adjacent delivery openings 48 of clamping members 11 above the cam portions 44 and 46.

Incorporated in the structure of the valve 47 is a plug or bridge plate 49 that extends across the top end of the main tube 16, said valve 47 and plate 49 being parts of a single casting 50.

The casting 50 is held in place by means of a rod 51 that extends downwardly therefrom and is axially positioned within the main tube 16. The bottom end of the rod 51 is entered into a boss or socket 52 at the bottom of the fixed sleeve 28.

The lower clamping member 10 is fixed as to elevation and is mounted for rotation, being provided with a stem 53 that projects downwardly through a bearing housing 54. At the lower end of the stem 53 is a spur gear 55 that serves as the means for effecting rotation, by engaging with a cooperating rack structure.

I prefer to have the rotating means constructed and arranged so as to provide alternate rotation in opposite directions. Means for so doing are provided in the present instance by having said rack structure subdivided, comprising parts on opposite sides of the gear 55. As shown, there are twelve diminutive racks, comprising the outside racks 56 that alternate with the inside racks 57.

As the gear 55 leaves the rack 56 on the outer side it immediately makes operative connection with the rack 57 on the inner side and so on alternately.

The twelve racks are composed of two pairs, each pair comprising an outside rack 56 and an inside rack 57, and these are spaced equi-distant one from the next one circumferentially, but they do not fill the circumferential space, in that the racks are omitted from the operator's station.

The racks are supported from a fixed part of the frame, the actual support being an an-

nular plate member 58 that is positioned just below the gears 55 with which they cooperate.

The racks are individually supported by means of a pivot 59 by the leaving end at which the gear 55 breaks the operative connection, and said racks are thus mounted so as to swing back and forth in a horizontal plane.

At the approach end of each rack is a spring 60 that tends to swing the rack towards the operating position and for limiting such movement there is a fixed stop 61 that cooperates with a pin 62 on the rack.

The outside racks 56 are straight and the inside racks 57 are curved as shown.

It will be noted that the structure described permits of the parts being constructed and arranged so that the bearing operated upon is flooded with oil or whatever cleansing liquid may be used and quite thoroughly washed before the bearing rotating devices are brought into operation.

I claim as my invention:—

1. In apparatus for washing ball bearings by means of a flow of cleansing liquid, upper and lower clamping members for engaging respectively the bearing rings, one of said members being supported for rotation, and means in the form of a pinion on said last named member and an interrupted rack structure operating upon said last named member intermittently so as to effect such rotation with intermediate periods of interruption of such rotation.

2. In apparatus for washing ball bearings by means of a flow of cleansing liquid as described in claim 1, a second interrupted rack structure operating substantially like the first mentioned interrupted rack structure and alternating therewith for effecting rotation of said member in the reverse direction.

3. In apparatus for washing ball bearings, a turntable mounted for rotation provided with a spider-arm that carries a bearing, a clamping member having a shaft that is housed for rotation in said bearing, a contact face structure for engaging with a bearing-ring and a spur gear on said shaft, a movably mounted rack element on one side of the path of said spur gear during part only of the rotative movement of the turn-table for cooperating therewith for effecting rotation of said shaft and the contact face structure supported thereby, and spring means in back of said rack element whereby said element is adapted to yield during the operative making of engagement of said spur gear with said rack.

4. In apparatus for washing ball bearings as described in claim 3 a second rack element spaced from said first mentioned element and operative likewise and in substantially a similar manner to effect such rotation of the shaft and contact face structure.

5. In apparatus for washing ball bearings as described in claim 3 a second rack element spaced from said first mentioned element and positioned on the opposite side of said path operative to effect rotation of said shaft and contact face structure in the opposite direction.

6. In apparatus for washing ball bearings by means of a flow of cleansing liquid, lower and upper clamping members for engaging respectively with the rings of a bearing, means for delivering liquid to a bearing held between said members, and said upper member comprising a hollow cone that projects generally downwardly and outwardly from a central support to a sufficient extent so as to overhang the opposed lower clamping member and a ball bearing mounted thereon under operating conditions and thus positively operate to shed all splashed liquid flow generally downward and away from the upper side of said upper clamping member.

7. In apparatus for washing ball bearings by means of a flow of cleansing liquid, a turntable comprising a vertically elongated tubular structure that is supported for rotation, spider-arms radiating from said structure, and bearing clamping members supported from said arms, ducts radiating from the upper end portion of said tubular structure for delivering liquid from the interior of said tubular structure to said members, said ducts connecting by their inner ends with apertures in the side wall of the tubular structure, a stationary rod positioned axially along the interior of said tubular structure, and a valve projecting radially from said rod for periodically covering said apertures during rotation of said turn-table.

8. In apparatus for washing ball bearings, a bearing clamping member, a cylinder connected to a source of cleansing liquid and a piston therein, said clamping member having a contact face structure for engaging with a bearing part, and a stem of tubular form serving to mechanically connect said piston and member and opening by its ends respectively at the intake side of the piston and at said contact face structure whereby with such cleansing liquid delivered to said cylinder under pressure simultaneously the cleansing liquid pressure operates to drive said piston and cleansing liquid is delivered to said member.

9. In apparatus for washing ball bearings, a turn-table structure comprising a set of radial arms that support bearing clamping devices arranged in pairs as lower and upper members, an axially positioned member supported for rotation serving as the mechanical support for said arms, and said axially positioned member being in the form of a tubular structure extending substantially throughout the height of said turntable; and provided at the lower end with an inlet for the liquid; and also provided with

means for the distribution of liquid to said members at the upper end and valve means at said upper end for periodically checking such distribution.

10. In apparatus for washing ball bearings, a lower clamping member of generally conical form for receiving the inner ring of a bearing, an upper clamping member for engaging with the outer ring of said bearing, said upper member being of inverted hollow conical form, and provided with means for supplying cleansing liquid, said upper member being relatively large for engaging with varied sizes of bearings and also for serving as a liquid shed for deflecting the liquid downwardly, and the said lower clamping member only being provided with means for being rotated under conditions of use.

11. In apparatus for washing ball bearings as described in claim 10 the apex portion of said lower clamping member being in the form of a cylindrical tip for supporting small sizes of bearings for washing.

12. An apparatus for washing ball bearings, comprising bearing supporting devices comprising a lower member for engaging with one of the rings of the bearing and an upper member for engaging with the other ring thereof, a cylinder positioned above said upper member, a piston in said cylinder and having a tubular stem opening into the cylinder thereabove, said stem being connected to said upper member, and means for supplying cleansing liquid under pressure to said cylinder above said piston, whereby simultaneously the cleansing liquid pressure operates to drive said piston and cleansing liquid is delivered to said upper member.

13. In apparatus for washing ball bearings, a turn-table that comprises a vertically elongated axially located tubular structure that serves as the mechanical axle of the turn-table structure and also as the delivery means for liquid cleansing solution, a non-rotary rod rigidly supported along the axis of said axle, the wall of said tubular structure being provided with perforations for effecting distribution of such liquid, a valve supported by said rod for periodically covering such perforations, a bridge structure above said valve and supported by said rod extending across the interior of said tubular structure and a supply inlet for said tubular structure located below said valve.

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