

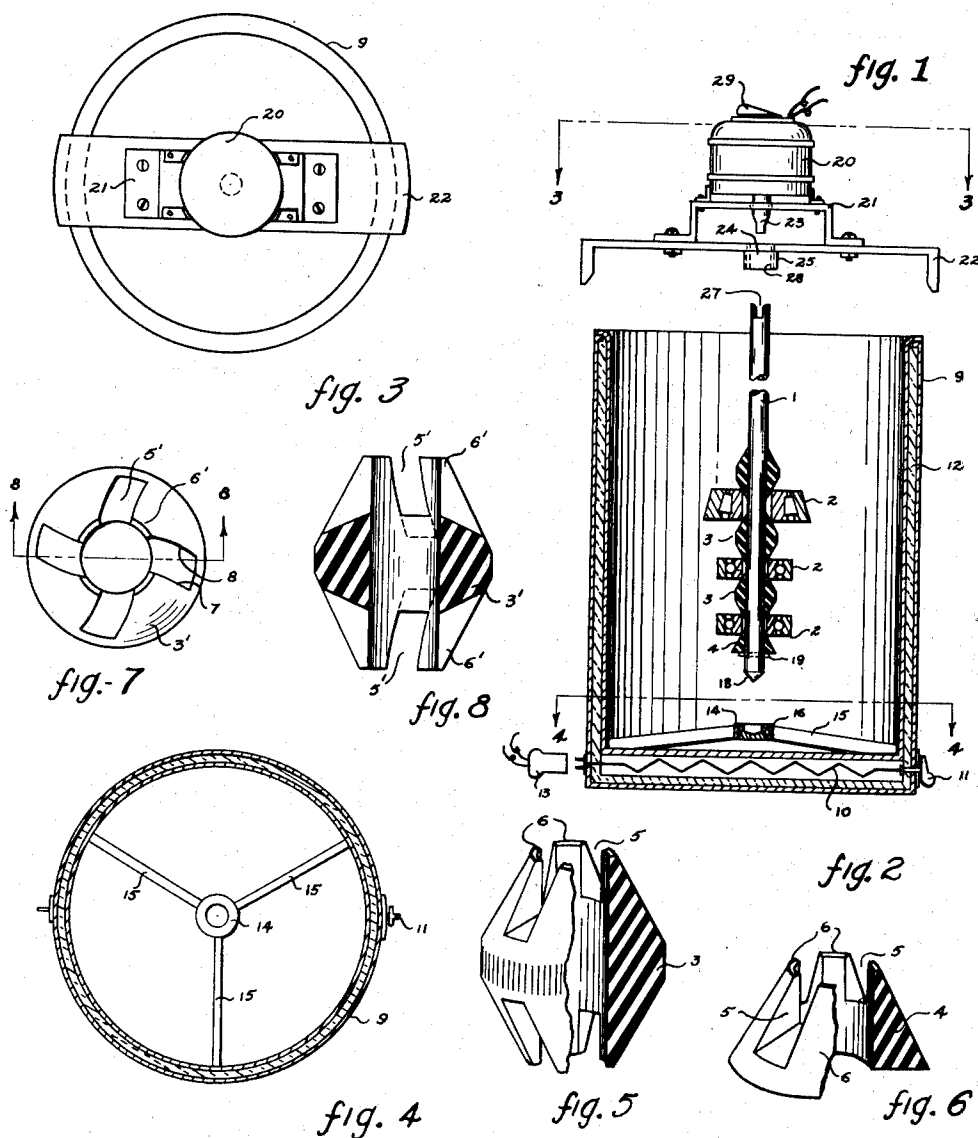
Sept. 15, 1953

P. T. DAILEY

2,652,350

BEARING-CLEANING DEVICE AND METHOD

Filed Nov. 16, 1948



INVENTOR.

PHILIP T. DAILEY

BY

John C. Mack, attorney

UNITED STATES PATENT OFFICE

2,652,350

BEARING-CLEANING DEVICE AND METHOD

Philip T. Dailey, Akron, Ohio

Application November 16, 1948, Serial No. 60,289

7 Claims. (Cl. 134-23)

1

This invention relates to an apparatus and method for cleaning anti-friction bearings of the ball or roller type. It may be used in cleaning new bearings and used bearings which have been lubricated with oil or grease. It will be described more particularly as applied to the cleaning of bearings in which a grease lubricant has been used.

After bearings have been subjected to prolonged periods of service the lubricant becomes caked in the bearing races and separators. Cheaper soap greases usually contain large proportions of solid matter and fillers which have no lubricating value. Many of these greases separate or deteriorate in use and the oil content escapes, leaving the solid matter to clog the bearing. This solid material may, in some instances, become so tightly packed in a bearing separator that the races will be frozen. Other greases have a tendency to oxidize. These oxides form hard deposits on the races and on the load-carrying members.

Whatever the deposit left by the old lubricant, it is very important that a bearing be thoroughly cleaned and freed of such deposit before it is repacked. If the deposit is not thoroughly removed it acts as an abrasive in the races. If the fresh lubricant is of a different composition from the old, the interaction of the ingredients in the two may cause the fresh lubricant to deteriorate quickly. Under these conditions wear is excessive. It is useless effort to repack unclean bearings and frequent replacement of them is expensive.

The cleaning device of this invention provides a simple, yet very effective means of cleaning clogged bearings. It generally consists of a power-driven shaft or rotor upon which the bearings are held and which is positioned vertically in a container. The container holds any suitable cleaning solution. A preferred cleaning composition is a water solution of sodium tetraborate to which caustic soda and acetic acid have been added. Such a solution must be used hot. Bearings mounted on the rotor are rotated at high speeds in the hot cleaning solution. When removed the hot solution quickly evaporates. No drying is required. The cleaning operation may be accomplished in several minutes. The time required may be reduced by driving the rotor intermittently, or rotating it first in one direction and then in the other.

The invention will be further described with reference to the accompanying drawing in which—

Fig. 1 is a side elevation of the power unit and its mounting means;

2

Fig. 2 is a cross section of the container with bearings mounted thereon;

Fig. 3 is a view of the power unit and means of mounting taken on the line 3—3 of Fig. 1;

Fig. 4 is a view of the bottom of the container showing a socket to receive the rotor taken on the line 4—4 of Fig. 2;

Figs. 5 and 6 are perspective views, partly broken away, of rubber sleeves which are the preferred means of securing bearings to the rotor;

Fig. 7 is a plan view of modified sleeve with helical slotting; and

Fig. 8 is a view taken on the line 8—8 of Fig. 7.

The bearing-cleaning device of this invention is formed of a vertically mounted rotor 1 which is preferably tubular and which is of smaller diameter than the bore of the bearings 2 which are to be cleaned. The bearings 2 are secured to the rotor 1 by sleeves 3 and 4 which are preferably of rubber. An oil-resistant rubber which resists attack by a heated alkaline cleaning solution is generally preferred. The sleeve 3 is in the shape of a double cone frustum. The sleeve 4 is the shape of a single cone frustum and is preferred as the retaining means at the lower and upper ends of rotor 1, but the sleeves 3 and 4 may be used interchangeably anywhere on rotor 1.

Slots 5 are molded through the tapered walls of sleeves 3 and 4 and they are equally spaced around a sleeve. These slots 5 divide the sleeves into sections 6, each of which may be flexed inwardly. The sections 6 of each sleeve fit under the edge of an inner bearing race when the sleeves are in operating position on the rotor 1. The tapered surfaces of the sections 6 center the bearing and hold it concentrically about the rotor. When the sections 6 are engaged with an inner race they are pressed tightly against the rotor 1 and grip it securely. This grip is released when the bearing is removed and the sleeves are then free to slide on the rotor.

Sleeve 3' as shown in Figs. 7 and 8 contain slots 5' which are similar in purpose to slots 5 of sleeves 3 and 4 but they are molded in a helical shape. The helices are generated in a direction opposite to the direction in which the rotor 1 will be turned. Slots formed in this manner will cause the sleeves to act similarly to a screw when they are rotated in a cleaning solution. Slots 5' will scoop up the solution as the sleeves are rotated and they will direct the flow of the solution into the bearing races. The leading edges 7 of slots 5' are preferably round and the opposite edges 8 are sharp.

The sleeves 3 and 4 are conical or pyramidal or other shape tapering outwardly to the edge of the sleeve so that any particular set of sleeves

may hold bearings of many different sizes. For example, the preferred rotor 1 is of uniform, circular cross-section about $\frac{3}{8}$ " in diameter. Sleeves to fit this size rotor could have their exterior tapered from $\frac{3}{4}$ " diameter at their smallest section to about 4" at their largest section. Sleeves formed to these dimensions would be capable of holding any bearing whose bore size lay within that range. This taper may be made to any degree depending on the service required of the device.

The preferred container 9 is double walled and open at the top. A heating coil 10 is located between the double bottoms. Thermostat control switch 11 may be used for maintaining the solution at substantially constant temperature. Suitable insulation 12 is provided to fill the space between the double wall to retain the heat in the cleaning solution while the device is in operation. The heating coil is connected with a source of electric power through plug 13.

A socket 14 is held above the bottom of the container by several equally spaced and radially extending arms 15 whose outer ends rest on the inner bottom of the vessel in contact with its inside wall. A suitable thrust bearing 16 is mounted in socket 14 to receive the tapered end 18 of rotor 1 and permit the rotor 1 to rotate freely in the socket 14. This unit, including arms 15, is removable from container 9 and this feature facilitates cleaning of the device. A pin 19 passes radially through rotor 1 just above the tapered end 18 to support the bottom of sleeve 4. This may be necessary if a heavy bearing is to be cleaned and the sleeves fit rotor 1 loosely.

The driving means 20 is preferably a high speed, fractional-horsepower (about $\frac{1}{25}$ H. P. is sufficient) electric motor designed for intermittent operation. Other driving means may be used such as an air motor or the like. The motor 20 is mounted on a bracket 21 which in turn is mounted on a cover plate 22, which fits over the top of container 9. Coupling 23, preferably, of rubber, is secured to the driving shaft of the motor 20. A hole 24 passes through cover plate 22 and sleeve 25 is fixed to the lower side of cover plate 22 in register with hole 24.

The upper end of rotor 1 contains a notch 27. This end of the rotor 1 passes through sleeve 25 and hole 24 in the cover plate 22 when the rotor 1 and cover plate 22 are in operating position. The notch 27 receives the rubber coupling 23 on the motor shaft thus forming a readily detachable and shock-proof engaging means between motor 20 and rotor 1. A suitable bushing 28 is inserted in sleeve 25 to journal the rotor 1.

An intermittent switch 29 is provided in the circuit supplying power to motor 20 and may be mounted conveniently on the motor or cover plate to permit the operator to start and stop the motor at will.

To operate the device with an aqueous cleaning solution which is most effective at about its boiling point, the solution is poured into the container 9 where it is heated by coil 10. The switch 11 is adjusted to maintain the preferred solution at about 200° F. during the cleaning operation. The bearings 2 to be cleaned are held in place on rotor 1 by sleeves 3 and 4 which fit onto the rotor 1. The tapered end 18 of rotor 1 is inserted in the socket 14 to rotate on the bearing 16 therein. The cover plate 22 is fitted over the rotor 1 and placed on the top of container 9 and when in position the coupling 23 engages the notch 27.

The motor 20 turns rotor 1 containing the bearings 2 which are immersed in the cleaning solution. The rotor 1 is spun at preferably about 1200 revolutions per minute. The motor 20 may be operated intermittently by the switch 29 if foreign matter has clogged the bearing to the extent that the races are frozen. This intermittent operation will free the frozen parts and also allow the races to be rotated at different speeds relative to each other.

The inner races of the bearings, being secured to the rotor 1, turn at the speed of the rotor 1. The drag of the cleaning solution, however, causes a much slower rotation of the outer races and as a result the hot cleaning fluid penetrates the inner recesses of the separators and the races and dissolves the oxides and hardened matter which may be formed therein. It would be possible to provide sleeves having paddles extending from the edges which would fit over the outer races and further retard their rotation but this is not necessary in the usual installation.

Rotating bearings 2 in this manner usually requires one or two minutes for a thorough and effective cleaning. After sufficient rotation the plate 22 is removed and the rotor 1 is removed from the cleaning solution. The hot solution quickly evaporates and no drying is necessary. The bearings may then be removed from the rotor 1 and repacked with clean grease. Bearings so cleaned may be safely returned to service and will give dependable performance.

Various means for holding the bearings on the rotor may be employed. For instance, if the rotor is helically grooved and loose-fitting sleeves are used, means can be provided on the inner surface of each to cause the sleeves to turn with the groove as they slide down the rotor. By rotating the rotor in the direction which causes the sleeves to tend to slide down it the helical groove will cause the sleeves to hold the bearings tightly between them even though the sleeves fit loosely over the rotor.

The device illustrated could be modified to include a plurality of rotors mounted in a large tank, each being rotated on its own axis by suitable gearing connected to a single driving means. This modification of the device could be made if it is desired to clean a great number of bearings on a production basis, as in a bearing manufacturing plant.

It is apparent that the apparatus and method herein described could be used to clean clutch plates or other machine parts which the receptacle could accommodate.

What I claim is:

1. A device for cleaning an anti-friction bearing comprising a container for holding a cleaning solution, a rotor in the container adapted to receive the bore of an anti-friction bearing with the portion receiving the bearing adapted to be immersed in the cleaning solution, two sleeves of yieldable composition removable from the rotor and longitudinally slidable thereon and adapted to hold a bearing between them concentric with the rotor, those ends of the respective sleeves which are adapted to contact the bearing tapering whereby the sleeves are longer at the bore, means for rotating the rotor, and means for removably mounting the rotor in the container in operative connection with the driving means.

2. A device for cleaning anti-friction bearings comprising a container for holding cleaning solution, a rotor in the container adapted to receive the bores of a plurality of bearings, a plurality

5

of sleeves of yieldable composition longitudinally slidable on the rotor and removable therefrom, any two of the sleeves being adapted to hold the inner race of a bearing between them, those ends of the respective sleeves which are adapted to contact a bearing tapering whereby the sleeves are longer at the bore, driving means for rotating the rotor and means for removably mounting the rotor in the container in operative connection with the driving means.

3. In a device for cleaning an anti-friction bearing comprising a container for holding cleaning solution and a rotor in the container adapted to receive the bore of an anti-friction bearing, sleeves of yieldable composition slidably mounted about the rotor, each sleeve tapering at one end whereby it is longer at the bore, the tapered portions of adjacent sleeves extending toward one another to cooperate to hold a bearing between them concentrically about the rotor, and means for rotating the rotor.

4. In a device for cleaning an anti-friction bearing comprising a container for holding cleaning solution and a rotor in the container adapted to receive the bore of an anti-friction bearing, sleeves of yieldable composition each having a bore of regular cross section and mounted on the rotor and longitudinally slidable thereon, each sleeve being slotted at at least one end, the inner surfaces of each of the portions between the slots being in contact with the rotor and their ends tapering whereby each sleeve is longer at its bore, and means for rotating the rotor.

5. The method of cleaning an anti-friction bearing which comprises rotating the races of the bearing in a cleaning solution at different speeds by driving only one of the races and retarding the speed of rotation of the other race by the resistance of the cleaning solution.

6

6. The method of cleaning an anti-friction bearing which comprises rotating the races of the bearing while immersed in a cleaning solution at different speeds by intermittently driving only one of the races and retarding the speed of rotation of the other race by the resistance of the cleaning solution.

7. The method of cleaning an anti-friction bearing which comprises rotating the bearings while immersed in a cleaning solution at different speeds by positively driving the inner race and retarding the speed of rotation of the outer race by the resistance of the cleaning solution.

PHILIP T. DAILEY.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,120,882	Anderson	Dec. 15, 1914
1,366,496	Roop	Jan. 25, 1921
1,547,971	Solomon	July 28, 1926
1,548,655	Braunschweig	Aug. 4, 1925
1,712,751	Cunningham	May 14, 1929
1,766,208	Anstiss	June 24, 1930
1,767,370	Kehn	June 24, 1930
1,814,592	Geiger	July 14, 1931
2,062,100	McCornack	Nov. 24, 1936
2,068,408	Greulach	Jan. 19, 1937
2,156,594	Lester	May 2, 1939
2,160,214	Jackson	May 30, 1939
2,171,877	Johnson	Sept. 5, 1939
2,178,701	Petre	Nov. 7, 1939
2,210,478	Berg	Aug. 6, 1940
2,369,498	Streuber	Feb. 13, 1945
2,493,291	Hirsch	Jan. 3, 1950
2,536,129	Heaney	Jan. 2, 1951
2,544,491	Engel	Feb. 20, 1951