April 6, 1954 J. BOUVAT-MARTIN 2,674,503

ROTARY PUMP FOR HYDRODYNAMIC LUBRICATION

Filed April 22, 1952

2 Sheets-Sheet 1

Fig.1.

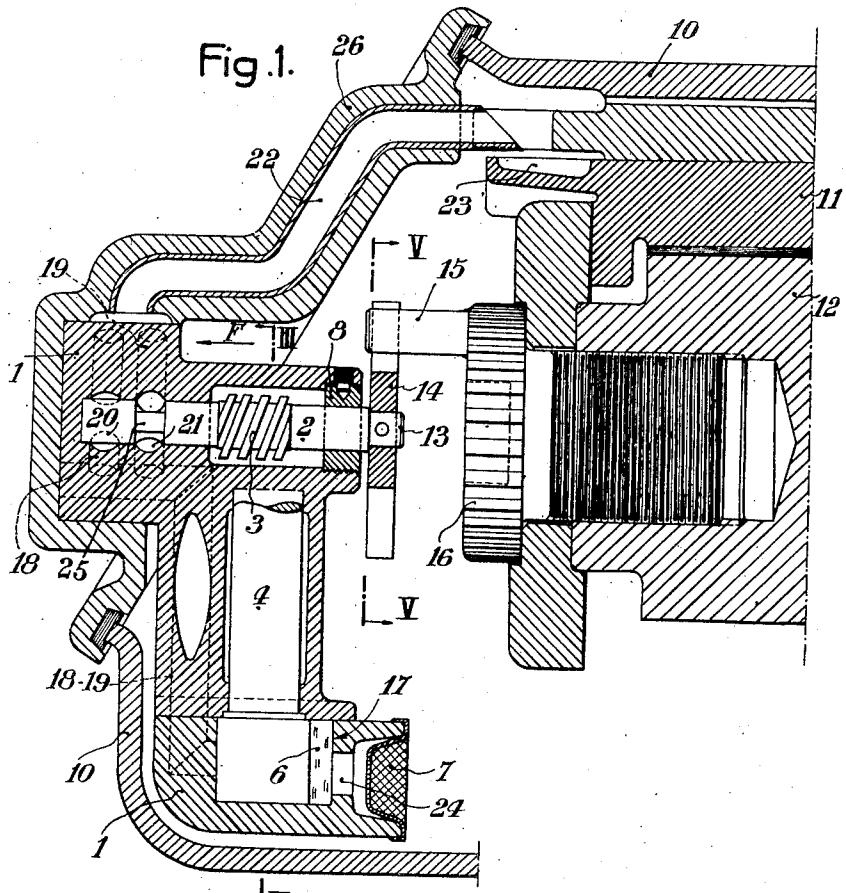


Fig.2.

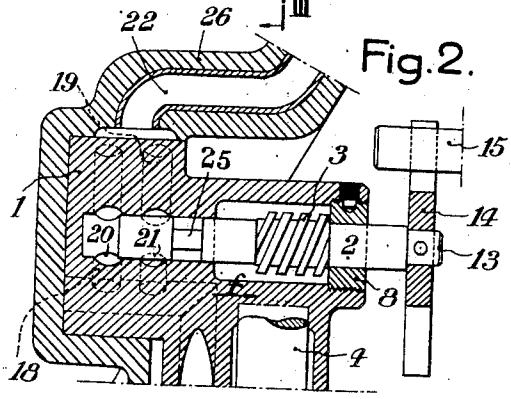
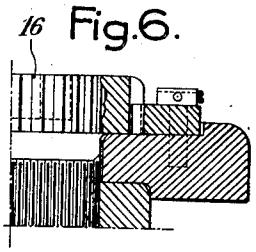


Fig.6.



Inventor
Jean Bouvat-Martin
By Robert E. Burns
Attorney

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2 Sheets-Sheet 2

Fig.3.

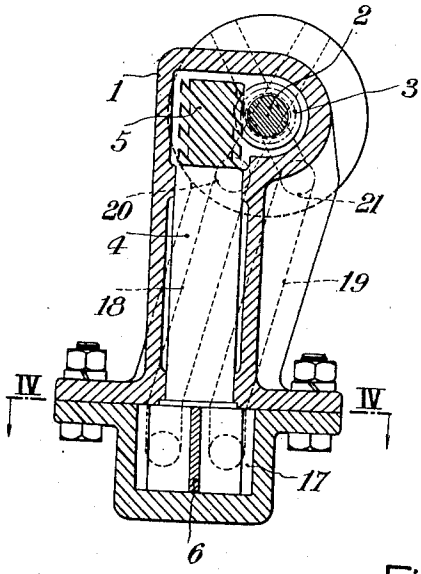


Fig.4.

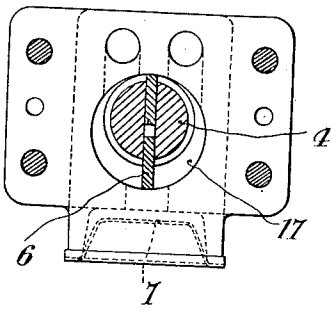
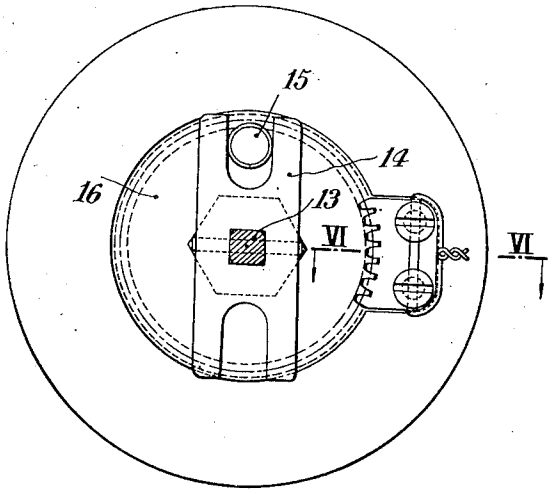


Fig.5.



Inventor
Jean Bouvat-Martin
By Robert E. Burns
Attorney

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2,674,503

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2,674,503

ROTARY PUMP FOR HYDRODYNAMIC LUBRICATION

Jean Bouvat-Martin, Paris, France, assignor to Societe Anonyme dite: Societe General Isothermos, Paris, France

Application April 22, 1952, Serial No. 283,662

Claims priority, application France April 24, 1951

1 Claim. (Cl. 308—84)

1

It is known that the lubrication of plain bearings cannot be effected under proper and satisfactory conditions if a continuous oil film is not formed and maintained between journal and bearing, according to the thearetical requirements of hydrodynamic lubrication.

A particular problem arises in connection with the lubrication of railway-stock axle-boxes; it is not possible to submerge the axle spindle in an oil bath because the desired complete oil-tightness and long useful life of an oil-bath axle-box are hardly obtainable in railway engineering. Consequently, it must be admitted that in the axle-box the oil level should be kept below the spindle and that a mechanical means has to be utilized for feeding oil to the spindle.

The fact that this lubricating oil must pass through a strainer so that only clean oil will be supplied to the spindle involves the use of a pump enclosed in the axle-box itself, mechanically driven by the axle and adapted to operate at least under a low pressure.

The demand for a pump designed to operate in both directions of rotation had set the hitherto wide-spread trend of piston-pumps, but anybody conversant with the art has to admit that they lack sturdiness and are ill-suited for heavy-duty conditions as commonly encountered in railway operation.

Now, it is the object of this invention to provide a rotary pump adapted to meet the above-listed requirements, the two-way operation of the pump according to this invention being obtained by means of a distributor combined with the pump-driving shaft.

The pump-driving shaft is actuated by a member rotatably rigid with the spindle and carrying a helical pinion in meshing engagement with a vertical or oblique shaft fixed with the oil-pumping vane.

This driving shaft may slide axially in its casing formed in the pump body between two extreme positions wherein the oil-intake duct of the bearing is in fluid connection with either of two oil-delivery ducts that lead from the chamber of the rotary pump vane.

According to the direction of rotation of the spindle, this shaft will first move axially toward either of the aforesaid two outermost positions, thereby connecting automatically the appropriate oil-delivery duct with the pumping circuit.

This arrangement is extremely simple, safe and economical; it makes it possible to use a rotary pump in an axle-box irrespective of the direction of movement of the vehicle and without any undue complications.

2

The accompanying drawings forming part of this specification illustrate diagramatically by way of exampe a few embodiments of the invention. In the drawings:

Figure 1 is a longitudinal section of the front portion of an axle-box;

Figure 2 is a similar vertical view showing the device in another operative position;

Figure 3 is a cross-sectional view taken across the line III—III of Fig. 1;

Figure 4 is a sectional view taken along the line IV—IV of Fig. 3;

Figure 5 is another sectional view according to the line V—V of Fig. 1, and

Figure 6 is a sectional detail view according to the line VI—VI of Fig. 5.

The pump mounted in the front portion of the axle-box 10 endwise of the bearing 11 in view of lubricating from above the spindle 12 consists essentially of a pump body 1 receiving on the one hand a horizontal driving shaft 2 carrying a helical pinion 3 rigid therewith and on the other hand a vertical shaft 4 also formed with or carrying a helical pinion 5 meshing with the aforesaid pinion 3 as shown, the bottom end of shaft 4 supporting a vane 6 rotating in a chamber 17 in fluid connection through a duct 24 and a strainer of filter 7 with the bottom or sump-forming portion of the axle-box; the inner end 13 of the driving shaft 2 has fixed thereon a strap like member 14 rotatably driven by a crank-pin 15 fixed eccentrically to the outer end or head 16 of a screw or other cap member fixed endwise of the spindle 12; the axial displacement of the horizontal driving shaft 2 is restricted in one direction by an abutment nut 8 acting also as a bearing member and in the other direction by a shoulder formed in the bottom of the chamber in which the helical pinion 3 rotates; 18 and 19 designate a pair of oil-delivery ducts connecting the pump chamber 17 to a pair of ports 20, 21. According to the axial position of shaft 2, the fluid connection is established between chamber 17 and a delivery duct 22 through either of these ports 20 and 21, the delivery duct 22 being adapted in turn to deliver oil to a pool 23 formed in the upper portion of the bearing 11.

The above-described device operates as follows:

(a) *Clockwise rotation (as seen in Fig. 3)*

The horizontal driving shaft 2 is shifted from right to left (see arrow F, Fig. 1) and abuts the left-hand shoulder or wall of its chamber in the pump body 1. It therefore closes the delivery port 20 and uncovers the other delivery port 21, thereby connecting the oil-delivery duct 19 with

the delivery duct 22 through a reduction 25 in the diameter of shaft 2.

The vertical shaft 4 is then driven by pinion 5 and rotates clockwise. The pump vane 6 forces oil from the strainer 7 and intake 24 through both ducts 19, 22 the latter being formed in the front cover of the axle-box.

(b) *Anti-clockwise rotation (as seen in Fig. 3)*

The horizontal driving shaft 2 is shifted from left to right (see arrow *f*, Fig. 2) and abuts against the right hand guide nut 8, thereby obturating the delivery duct 19 and opening the delivery duct 18.

Then, the vertical shaft 4 is rotatably driven by pinion 5 and rotates in the opposite direction; the pump vane 6 draws in oil through the strainer 7 and intake duct 24 and delivers same across both ducts 18 and 22, thereby supplying clean oil to the pool 23 of bearing 11.

It will be seen that irrespective of the direction of movement of the vehicle and therefore of rotation of the spindle 12, the shaft 2 of the device according to the invention, which is constantly driven by the crank pin 15 slidably engaged in the notch formed in the member 14 rigid with this shaft, will first move axially in the direction of either of arrows F or *f*, thereby connecting either of the oil-delivery ducts 18 or 19 with the duct 22 through which oil from the bottom of the axle-box is supplied to the pool 23 of bearing 11.

What I claim is:

A pump mounted in an axle-box of railway vehicle for feeding the lubricating pool of the bearing mounted on the spindle with oil from the bottom of said axle box, said pump comprising a pump body formed with a cavity, a shaft mounted for rotation about a horizontal axis in said cavity and adapted to slide longitudinally between two end positions, means for drivingly connecting said shaft from said spindle for rotation therewith, a helical pinion fast on said shaft in said cavity, another shaft mounted for rotation about a vertical axis in said body, another helical pinion fast on said other shaft and meshing with said first helical pinion, a vane extending radially from and rigid with said other shaft in the vicinity of said bottom of said axle box, the pump body being crossed by two inner channels, each of said channels having a cross passage through the cavity, a lower aperture positioned in the bottom of the axle box and an upper aperture, and leading to the upper aperture the oil driven by the vane in the lower aperture when the spindle and both shafts rotate in one direction, the first shaft being then moved by the reaction of the other pinion against the first pinion to one of its end positions and the first shaft occluding, in said end position, the cross passage of the other channel in the cavity, and a duct leading to the lubricating pool the oil issuing from anyone of both channels.

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