Sept. 4, 1928. 1,682,842

J. H. HAMER

ROTARY PUMP AND THE LIKE

Filed May 27, 1927 2 Sheets-Sheet 1

Fig. 1.

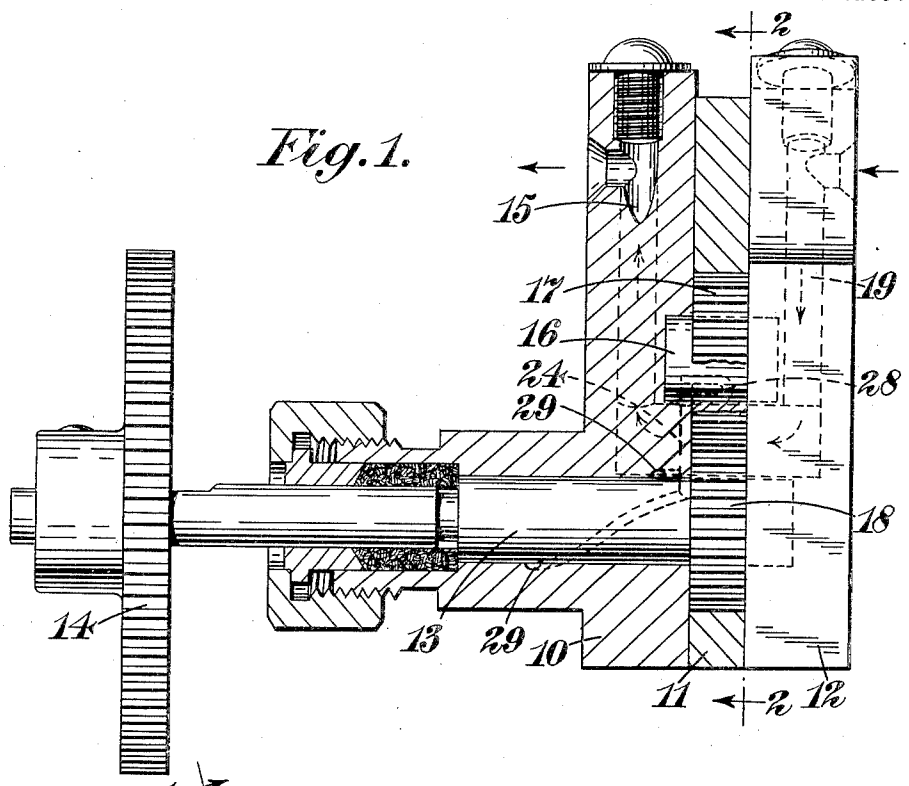


Fig. 2.

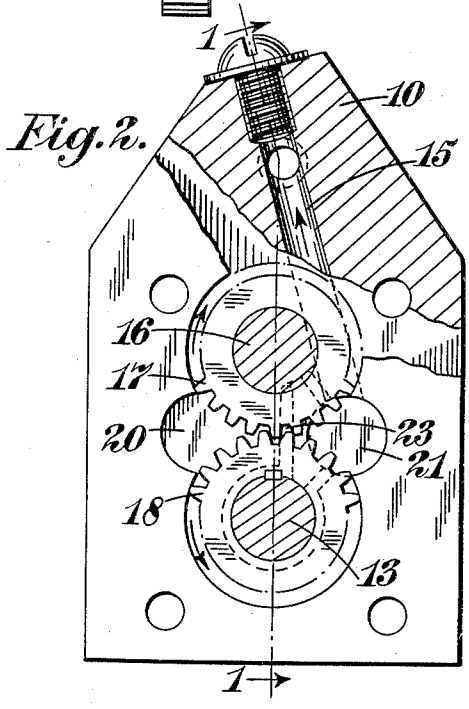
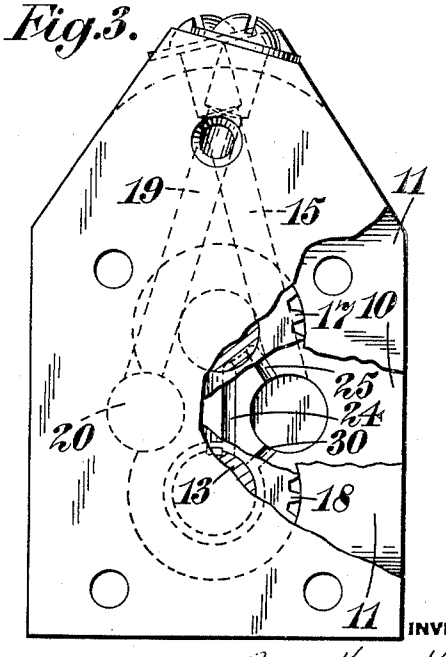


Fig. 3.



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2 Sheets-Sheet 2

Fig.4.

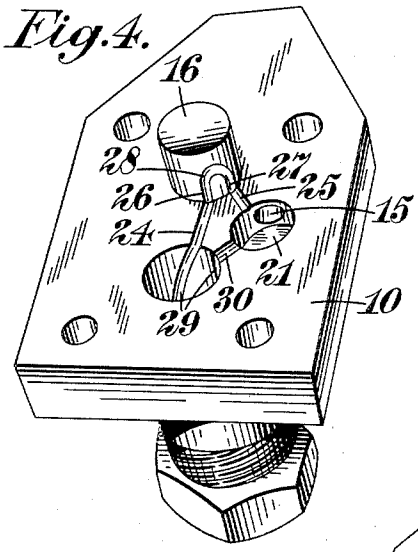


Fig.5.

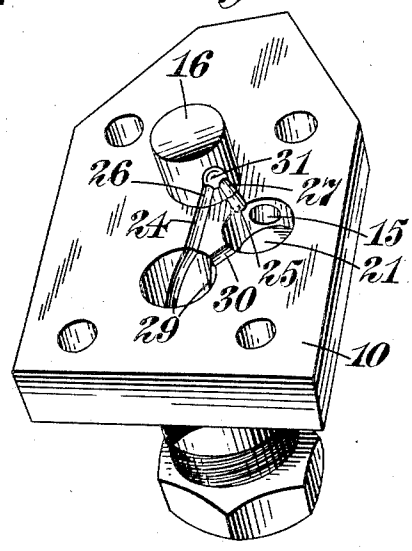
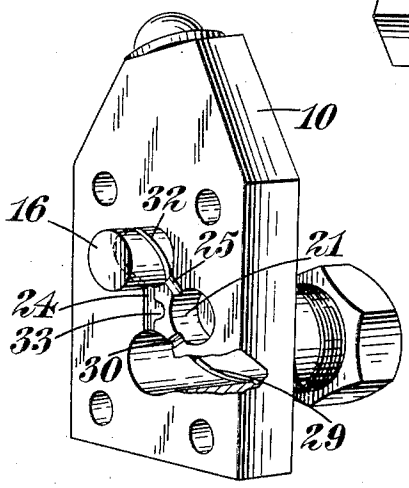


Fig.6.



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UNITED STATES PATENT OFFICE.

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ROTARY PUMP AND THE LIKE.

Application filed May 27, 1927, Serial No. 194,726, and in Great Britain March 29, 1927.

This invention is for improvements in or relating to rotary pumps and the like of the type in which two toothed wheels mesh with each other inside a casing which closely fits the faces, and a portion of the outer periphery, of each wheel but is spaced away at positions immediately adjacent to each side of the meshing position of the wheels to form intake and output chambers, from the former to the latter of which fluid passes by being received in spaces between each two adjacent teeth and the inner periphery of the said casing, and in which a relief passage is provided, located in or passing through the wall of the casing, which passage extends from a position communicating with the clearance space between the crown of each tooth in turn and the base of the space between two teeth of the other wheel in which the fluid is trapped at the meshing point of the wheels during the operation of the pump. Without this relief passage, the pump would be liable to develop excessive wear both on the surfaces of the teeth and on the wheel spindles or their bearings, and the result of this wear would be to reduce very rapidly the efficiency of the pump. The wear is probably due to the thrust upon the working parts caused by the attempt to compress small quantities of fluid by carrying it through the meshing point of the wheels from the output chamber to the intake chamber while trapped in the aforesaid clearance spaces. The relief passage prevents this, because when pressure is exerted upon the trapped fluid during the rotation of the wheels, such fluid will be able to pass through the relief passage and will not cause the aforesaid objectionable thrusts to be exerted on the working parts.

The invention has for one of its objects to provide for the efficient lubrication of the bearings or spindles for the aforesaid wheels.

According to the primary feature of the present invention there is provided a rotary pump or the like of the type above described, and also having automatic lubrication of the bearing or spindle for one or both of the said wheels, which pump or the like is characterized in that to effect the said automatic lubrication a conduit is provided whereby fluid is led from the aforesaid relief passage to the said bearing or spindle to serve as the lubricant therefor. The pressure which forces the fluid into the relief passage is relied upon to feed that fluid to the bearing or spindle so that the operation is entirely automatic.

The invention is capable of being used in connection with various fluids, but it is particularly applicable to the pumping of the viscous solution used in the manufacture of artificial silk. In such pumps it is not feasible to employ ordinary lubricant because of the effect it would have upon the solution, but the solution itself will serve quite well to keep the bearings lubricated.

Preferably, in addition to the aforesaid conduit leading fluid from the relief passage to the bearing or spindle, there is also provided a discharge conduit through which the said lubricant can pass from the bearing or spindle to the output chamber of the pump. In this way a continual supply of lubricant would be fed through the bearings and thence to the main stream from the pump.

The actual formation of the said lubricating conduits will vary according to circumstances and certain alternative forms will be hereafter described.

For a more complete understanding of the invention there will now be described, by way of example only and with reference to the accompanying drawings, certain constructional forms of rotary pump embodying the present invention. It is to be understood, however, that the invention is not restricted to the precise constructional details set forth.

In these drawings:—

Figure 1 is a side elevation of one construction of pump, partly in section on the line 1—1 of Figure 2.

Figure 2 is a sectional elevation on the line 2—2 of Figure 1, additional parts being broken away.

Figure 3 is an end elevation of certain of the parts shown in Figure 1, parts also being broken away to show the internal construction.

Figure 4 is a perspective view of certain details of the pump.

Figure 5 is a perspective view corresponding to Figure 4, but showing a modified construction, and

Figure 6 is another perspective view showing still a further modification.

Like reference numerals indicate like parts throughout the drawings.

Referring firstly to the construction shown in Figures 1–4, the pump comprises a three-part casing whereof the parts are marked 10, 11 and 12 respectively in the drawings. The part 10 constitutes the main bearing for the driving shaft 13 of the pump, the end of the hearing being packed by a gland. The shaft 13 carries a gear wheel 14 whereby it is driven. There is also formed in the casing part 10 an output conduit 15 and a recess to constitute a housing for the spindle 16 of a gear wheel 17 which meshes with a wheel 18 keyed to the shaft 13. The spindle 16 is stationary in its housing and the wheel 17 rotates freely upon it. The part 11 of the casing abuts closely against the flat face of the part 10 and abutting against the part 11 is the third part 12 of the casing. The thickness of the part 11 is slightly greater than that of the toothed wheels 17 and 18 so as to allow the latter just sufficient clearence for a working fit. The part 12 of the casing is formed with recesses to constitute a bearing for the end of the shaft 13 and a housing for the end of the spindle 16, and it is also formed with an intake conduit 19.

The part 11 of the casing is shaped to surround the major portion of the periphery of each of the wheels 17 and 18 and to make a working fit therewith, but it is spaced away from the peripheries of these wheels at situations adjacent to each side of the meshing position of the wheels. In this way intake and output chambers 20 and 21 respectively are constituted. The intake chamber 20 lies opposite to the mouth of the intake conduit 19 in the part 12 of the casing, and the output chamber 21 lies opposite to the mouth of the output conduit 15 in the part 10 of the casing. The current of the pumped liquid passes from the intake chamber 20 around the peripheries of the two wheels 17 and 18 to the output chamber 21.

A relief passage 24 is formed in that face of the part 10 of the casing which abuts against the part 11. This relief passage leads downwardly and upwardly to the surfaces of the shaft 13 and spindle 16, one side of the relief passage lying nearly in the plane containing the axes of this shaft and spindle and the other side of the passage lying nearer to the output chamber 21, but not communicating therewith directly. This plane defines the position at and near which the fluid is trapped in the clearance space between the crown of a tooth on one wheel and the space between two teeth on the other wheel. For instance, in Figure 2 fluid may be assumed to be trapped in the space marked 23. The relief passage 24 will, therefore, permit the discharge of any of the fluid which, if it had remained in the aforesaid clearance space would have caused the above mentioned objectionable thrusts to be set up. The relief passage, as illustrated, is so located as not to constitute a complete by-pass past the meshing point of the wheels 17 and 18.

A lubricating groove is formed in the outside of the spindle 16, underlying the wheel 17, and this groove extends along a substantial portion of the length of the bearing part of the spindle 16 and terminates at one end at the relief passage 24 and at the other end at a conduit 25 leading to the output chamber 21. This lubricating groove extends, from the passage 24, along the spindle 16 more or less parallel to the axis thereof and doubles back to terminate at the conduit 25. The two legs 26 and 27 of the groove (see particularly Figure 4) are joined at their ends remote from the conduits 24 and 25 by a semi-circularly or similarly curved groove 28. Thus, lubricant will be forced into the relief passage 24 when trapped in the clearance spaces between the teeth of the wheels, and will be forced through the relief passage into the groove 26, 27, 28 in the spindle 16 and therefrom will pass through the conduit 25 to the output chamber 21, the whole operation being automatic and ensuring proper lubrication of the bearing surface of the wheel 17 on the spindle 16.

In the bearing for the shaft 13, there is formed a lubricating groove 29 which extends along a substantial portion of the length of the bearing and almost completely encircles the shaft but terminates at one end at the relief passage 24 and at the other end at a conduit 30 leading to the output chamber 21. Thus fluid will be automatically circulated from the relief passage through the bearing for the shaft 13 and passed on to the output chamber.

In the modified construction shown in Figure 5, the two legs 26 and 27 of the groove in the spindle 16 are joined at their ends remote from the relief passage 24 and the conduit 25 by a circular recess 31 drilled in the spindle 16. The circulation of the fluid in this construction will be similar to that described in connection with Figures 1–4.

In the construction shown in Figure 6 the spindle 16 is formed with a lubricating groove 32 which almost completely encircles the spindle and lies along a substantial portion of the length of the bearing part of the spindle. One end of the groove 32 terminates at the relief passage 24 and the other end terminates at the conduit 25 leading to the output chamber 21. In this construction the relief passage 24 is shown as being enlarged at 33 in the direction towards the output chamber 21 in order to accommodate a larger amount of fluid. The circulation of the fluid through the groove 32 will be similar to the circulation through the grooves in the spindle 16 described in connection with the preceding figures of the drawings.

It is to be understood that the invention is not restricted to the precise constructional details set forth.

I claim:—

1. A rotary pump or the like comprising two toothed pumping wheels meshing with each other, a casing in which the said wheels are mounted which closely fits the faces, and a portion of the outer periphery, of each wheel and has a relief passage extending from a position communicating with the clearance space between the crown of each tooth in turn and the base of the space between two teeth of the other wheel in which the fluid is trapped at the meshing point of the wheels during operation of the pump, and means whereby fluid is led from the aforesaid relief passage to the mounting for one of the said toothed wheels to serve as the lubricant therefor.

2. A rotary pump or the like comprising two toothed pumping wheels meshing with each other, a casing in which the said wheels are mounted which closely fits the faces, and a portion of the outer periphery, of each wheel and has a relief passage extending from a position communicating with the clearance space between the crown of each tooth in turn and the base of the space between two teeth of the other wheel in which the fluid is trapped at the meshing point of the wheels during operation of the pump, and means whereby fluid is automatically led from the aforesaid relief passage to the mountings for the said toothed wheels to serve as the lubricant therefor.

3. A rotary pump or the like comprising two toothed pumping wheels meshing with each other, a casing in which the said wheels are mounted which closely fits the faces, and a portion of the outer periphery, of each wheel and has a relief passage extending from a position communicating with the clearance space between the crown of each tooth in turn and the base of the space between two teeth of the other wheel in which the fluid is trapped at the meshing point of the wheels during operation of the pump, means whereby fluid is automatically led from the aforesaid relief passage to the mounting for one of the said toothed wheels to serve as the lubricant therefor, and means whereby the said lubricant is discharged from the mounting and led to the output chamber of the pump.

4. A rotary pump or the like comprising two toothed pumping wheels meshing with each other, a casing in which the said wheels are mounted which closely fits the faces, and a portion of the outer periphery, of each wheel and has a relief passage extending from a position communicating with the clearance space between the crown of each tooth in turn and the base of the space between two teeth of the other wheel in which the fluid is trapped at the meshing point of the wheels during operation of the pump, a shaft on which one of the said toothed wheels is fixedly secured to rotate therewith and a bearing in the said casing for the shaft, which bearing is formed with a lubricating groove extending along the substantial portion of the length of the bearing and almost completely encircling the shaft but terminating at one end at the said relief passage and leading at the other end to the output chamber of the pump.

5. A rotary pump or the like comprising two toothed pumping wheels meshing with each other, a casing in which the said wheels are mounted which closely fits the faces, and a portion of the outer periphery, of each wheel and has a relief passage extending from a position communicating with the clearance space between the crown of each tooth in turn and the base of the space between two teeth of the other wheel in which the fluid is trapped at the meshing point of the wheels during operation of the pump, a stationary spindle on which one of the said toothed wheels is mounted to rotate, and a housing for said spindle in the casing, which spindle is itself formed with a lubricating groove which extends along a substantial portion of the length of the bearing part of the spindle and terminates at one end at the said relief passage and leads at the other end to the output chamber of the pump.

6. A rotary pump or the like comprising two toothed pumping wheels meshing with each other, a casing in which the said wheels are mounted which closely fits the faces, and a portion of the outer periphery, of each wheel and has a relief passage extending from a position communicating with the clearance space between the crown of each tooth in turn and the base of the space between two teeth of the other wheel in which the fluid is trapped at the meshing point of the wheels during operation of the pump, a stationary spindle on which one of the said toothed wheels is mounted to rotate, and a housing for said spindle in the casing, which spindle is itself formed with a lubricating groove which almost completely encircles the stationary spindle and extends along a substantial portion of the length of the bearing part of the spindle and terminates at one end at the said relief passage and at the other end at a conduit leading to the output chamber of the pump.

7. A rotary pump or the like comprising two toothed pumping wheels meshing with each other, a casing in which the said wheels are mounted which closely fits the faces, and a portion of the outer periphery, of each wheel and has a relief passage extending from a position communicating with the clearance space between the crown of each tooth in turn and the base of the space between two teeth of the other wheel in which

the fluid is trapped at the meshing point of the wheels during operation of the pump, a stationary spindle on which one of the said toothed wheels is mounted to rotate, and a housing for said spindle in the casing, which spindle is itself formed with a lubricating groove which extends, from the said relief passage, along a substantial portion of the length of the bearing part of the spindle in a direction more or less parallel to the axis thereof and doubles back to lead to the output chamber of the pump.

8. A rotary pump or the like comprising two toothed pumping wheels meshing with each other, a casing in which the said wheels are mounted which closely fits the faces, and a portion of the outer periphery, of each wheel and has a relief passage extending from a position communicating with the clearance space between the crown of each tooth in turn and the base of the space between two teeth of the other wheel in which the fluid is trapped at the meshing point of the wheels during operation of the pump, a stationary spindle on which one of the said toothed wheels is mounted to rotate, and a housing for said spindle in the casing, which spindle is itself formed with a lubricating groove which extends from the said relief passage, along a substantial portion of the length of the bearing part of the spindle in a direction more or less parallel to the axis thereof and doubles back to lead to the output chamber of the pump, the two legs of the lubricating groove in the spindle being joined at their ends remote from the relief passage and output chamber by a semi-circularly or similarly curved groove.

9. A rotary pump or the like comprising two toothed pumping wheels meshing with each other, a casing in which the said wheels are mounted which closely fits the faces, and a portion of the outer periphery, of each wheel and has a relief passage extending from a position communicating with the clearance space between the crown of each tooth in turn and the base of the space between two teeth of the other wheel in which the fluid is trapped at the meshing point of the wheels during operation of the pump, a stationary spindle on which one of the said toothed wheels is mounted to rotate, and a housing for said spindle in the casing, which spindle is itself formed with a lubricating groove which extends, from the said relief passage, along a substantial portion of the length of the bearing part of the spindle and leads to the output chamber of the pump.

10. A rotary pump or the like comprising two toothed pumping wheels meshing with each other, a casing in which the said wheels are mounted which closely fits the faces, and a portion of the outer periphery, of each wheel and has a relief passage extending from a position communicating with the clearance space between the crown of each tooth in turn and the base of the space between two teeth of the other wheel in which the fluid is trapped at the meshing point of the wheels during operation of the pump, said relief passage having an enlargement intermediate of its ends, a stationary spindle on which one of the said toothed wheels is mounted to rotate, and a housing for said spindle in the casing, which spindle is itself formed with a lubricating groove which extends along a substantial portion of the length of the bearing part of the spindle and terminates at one end at the said relief passage and at the other end at a conduit leading to the output chamber of the pump.

In testimony whereof I affix my signature.

JAMES HENRY HAMER