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J. R. IOANNILLI

2,308,513

LUBRICATING SYSTEM

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Fig.1.

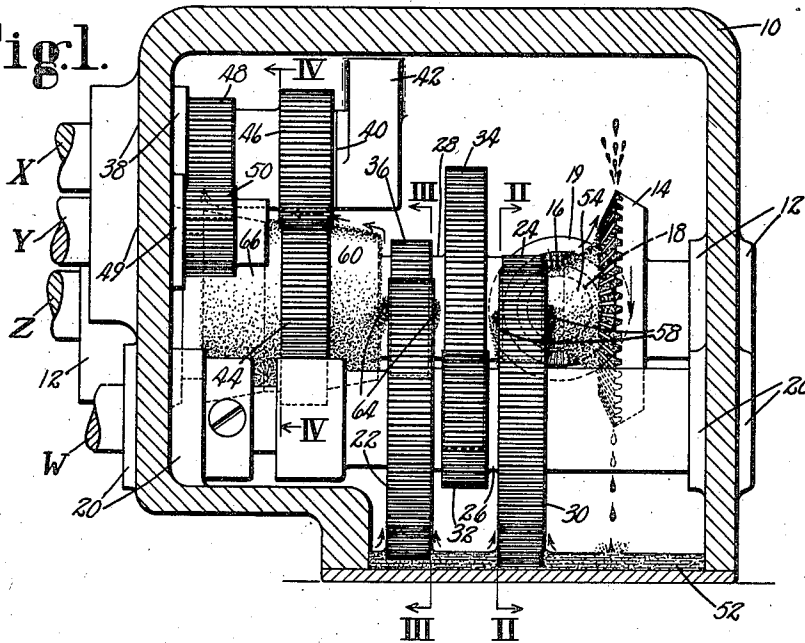


Fig.2.

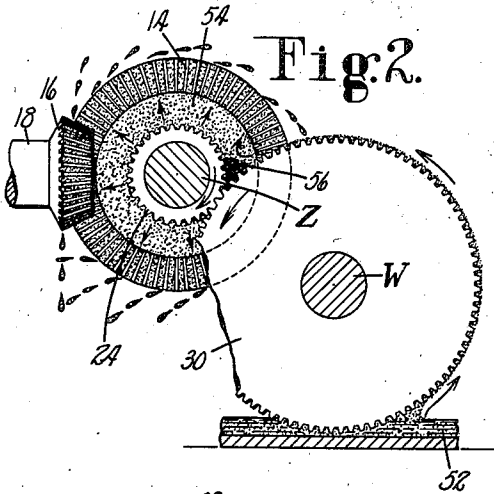


Fig.3.

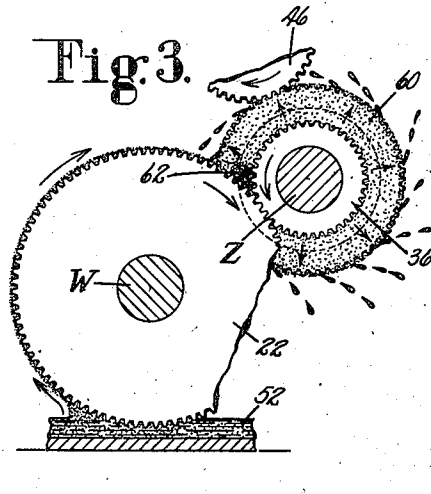
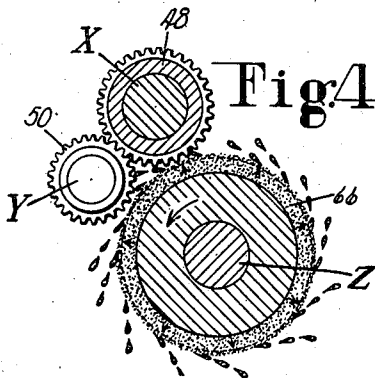


Fig.4.



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UNITED STATES PATENT OFFICE

2,308,513

LUBRICATING SYSTEM

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Application October 22, 1940, Serial No. 362,257

1 Claim. (Cl. 184—11)

The present invention relates to a lubricating system and more particularly to a system for lubricating gears.

Generally, it is not difficult to lubricate a train of gears where the individual gears mesh with each other because, if oil can be supplied to one of the gears, it is carried by contact from one to the other throughout the entire series of gears in the train. If there is a break in the train, however, there is no way for the oil to bridge the gap from one part of the train to the other and, consequently, there is no assurance that all of the gears will be properly lubricated. To provide separate oil sumps, oil cups or oil pressure systems for each part of the train may, in some instances, be impossible, and in others, impracticable and expensive.

It is an object of the present invention, therefore, to provide an improved adequate and inexpensive lubricating system applicable to any system of gearing irrespective of whether or not all the gears of the train are connected.

Accordingly, the invention resides in oil transferring means disposed between the lateral faces of a plurality of adjacent nonmeshing gears which form elements of separate gear trains and means for supplying one of the gears with oil, the oil transferring means being rotated and having a surface of revolution of progressively increasing diameter from end to end, the small end being of substantially the same diameter as the gear supplied with oil and terminating close to the lateral face thereof whereby oil runs onto said small end and is moved by centrifugal force to the large end, and the large end being of substantially the same diameter as the other gear and terminating close to the lateral face thereof whereby oil on the large end runs onto the gear.

The invention will now be described with reference to the drawing, in which

Fig. 1 is a section through the gear casing showing the gearing in side elevation;

Fig. 2 is a section taken on the line II—II of Fig. 1;

Fig. 3 is a section taken on the line III—III of Fig. 1; and

Fig. 4 is a section taken on the line IV—IV of Fig. 1.

The invention is shown applied to the gearing employed for driving the cement applying rolls and the feed rolls of the cement applying machine shown and described in a pending application Serial No. 294,248, filed September 11, 1939, in the name of Paul H. Dixon. It is to be understood, however, that this is by way of illustration

only, since the invention may be used in any system of gearing.

The gear box 10 of the aforesaid machine is shown in Fig. 1 with four shafts, *x*, *y*, *z* and *w*, projecting from one end wall thereof. These shafts serve to drive the various rolls employed in that machine, which are not shown herein since they are not part of the present invention. The shaft *z* is journaled in bearings 12, 12 formed in the end walls of the gear box. The shaft *z* is driven by way of a bevel gear 14 fixed thereto, the latter meshing with a bevel gear 16 fixed to the end of a shaft 18 which enters the side of the gear box through a bearing 19. The shaft 18 is driven by a motor, or by pulley and belt (not shown), whereby the gear 16 turns the gear 14, and consequently the shaft *z*, in the direction indicated by the arrow (Fig. 1). Thus, the shaft *z* constitutes the main drive shaft in the gear box from which the remaining shafts are driven. For reasons which appear in the application referred to, it is desirable to turn the shaft *w* in the opposite direction to that of the shaft *z* and at a slower speed. To this end, the shaft *w* which is journaled in bearings 20, 20 formed in the ends of the gear box has fixed thereto a gear 22 adapted to be driven by a gear 24 fixed to the shaft *z* through a series of intermediate gears. The intermediate gears comprise two sets of double idler gears 26 and 28 mounted on the shafts *w* and *z*, respectively. The idler 26 consists of two gears 30 and 32 and the idler 28 consists of two gears 34 and 36. The gears 30 and 36 mesh with the gears 24 and 22, respectively, and the gears 32 and 34 mesh with each other. The shaft *x* is journaled in a bearing 38 formed in an end wall of the gear box and a bearing 40 formed in a bracket 42 projecting inwardly from one of the side walls of the gear box. A gear 46 is fixed to the shaft *x* and is driven from the shaft *z* by a gear 44 fixed thereto. The shaft *y* which is journaled in a bearing 49 at the end of the gear box has fixed thereto a gear 50 which meshes with and is driven by a gear 48 which is formed integral with the gear 46 and rotates therewith.

The lubrication of the gearing described above is effected as follows: An oil sump 52 is provided at the bottom of the gear box 10 into which the lower portion of the gears 22 and 30 dip. The gears 22 and 30 act as pumps to lift small quantities of oil in their teeth up to the gears 36 and 24, respectively. Ordinarily, this would be the limit of lubrication, for there is no way for the oil so lifted to get to the other gears of the system and the excess oil carried up by the gears 22

and 30 would merely run back into the sump. In the present system, however, a hub 54 is formed on the gear 24 (Fig. 1), the hub extending laterally therefrom to a point substantially in engagement with the opposite lateral face of the bevel gear 14. The hub is frusto-conical in shape, increasing in diameter from the gear 24 toward the bevel gear 14. The opposite ends of the frusto-conical hub are of substantially the same diameter as the root circles of the gears at its ends. The oil picked up by the teeth of the gear 30 accumulates at the meshing points of the gears 30 and 24, as shown at 56 in Fig. 2, and is squeezed out laterally from both sides of the gear, forming beads 58, as shown in Fig. 1. The bead of oil 58 on the side of the gear next to the frusto-conical hub 54 runs onto the surface of the frusto-conical hub and, due to the centrifugal force caused by rotation of the hub, the oil creeps up the frusto-conical surface thereof, as shown by arrows in Fig. 2, to the bevel gear 14 where it flows over the teeth of this gear. The oil supplied to the gear 14 lubricates the gear 16 with which it meshes (Fig. 2), and the excess oil drains back into the sump.

The gears 32 and 34 are close enough to the gears 22, 24, 30 and 36 so that the oil lifted up by the teeth of the gears 22 and 30 and squeezed laterally in beads 58 and 64 spreads to the surfaces of the gears 32 and 34, thereby providing adequate lubrication for these gears.

The gears 44, 46, 48 and 50, however, require a more positive lubrication and so hubs similar to that described in connection with the gear 24 are employed for that purpose. As illustrated in Fig. 1, a hub 60 is formed on one face of the gear 44, the hub being frusto-conical in shape, the small end of the hub being of substantially the same diameter as the root circle of the gear 36 and substantially in contact with the lateral face thereof. Oil collects at the meshing point of the gears 22 and 36, as shown at 62 (Fig. 3), in the same manner as previously described in connection with the gears 24 and 30, and beads of oil 64 are formed at opposite sides of the gears (Fig. 1). The end of the frusto-conical hub 60 is close enough to the faces of the gears 22 and 36 so that it contacts the bead of oil 64. The centrifugal force produced by the rotating hub 60 draws the oil up the surface of the hub (see the arrows in Figs. 1 and 3) to the teeth of the gear 44. A part of this oil lubricates the gear 46 by direct contact with the gear 44 and a part is squeezed laterally from the meshing point of the gears 44 and 46 onto a second frusto-conical hub 66 formed on the opposite face of the gear 46. The small end of this frusto-conical hub 66

is of substantially the same diameter as the root circle of the gear 44 and increases in diameter toward the gear 50, the large end of the hub terminating close to the peripheries of the gears 48 and 50. The oil carried up by the frusto-conical hub 66 is thrown by centrifugal force onto the gears 48 and 50, as indicated in Fig. 4.

From the description, it is evident that when the machine is running and there is oil in the sump 52, all the gears will be thoroughly lubricated. As shown, the oil is carried up from the sump 52 by the gear 30 and supplied to the gears 14 and 16 by way of a hub 54. Similarly, oil is carried up by the gear 22 and distributed to the gears 44 and 50 by the hubs 60 and 66. It is to be understood, however, that this particular arrangement of the gearing and the frusto-conical hubs is not a limitation of the present invention, but is merely illustrative, since the invention is equally applicable to any system of gears.

Having described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

In a lubricating system for supplying oil to a plurality of independent pairs of gears from a single source, an oil sump for supplying oil to one of the gears of one of said pairs in such quantity that oil is carried by the teeth of that gear into contact with the teeth of the other gear of said pair and is also displaced laterally by said teeth at their point of mesh, a pair of meshing gears remote from the oil sump and from said first pair of gears, one of the gears of said remote pair of gears being larger in diameter than the second-named gear, means for receiving the laterally displaced oil from said first pair of gears at said point of mesh and conducting it directly to the teeth of the larger one of said remote pair of gears whereby said remote pair of gears are lubricated, said means comprising a frusto-conical hub having its small end of substantially the same diameter as the root diameter of said second-named gear and formed integral with its lateral face, said hub extending from the lateral face of said second-named gear to a point closely adjacent to the lateral face of the larger one of said remote pair of gears, the larger end of said frusto-conical hub being of substantially the same root diameter as the larger one of said remote pair of gears, said hub being rotatable with said second-named gear to cause the oil delivered thereto by the first pair of gears to be fed longitudinally along said hub by centrifugal force to the teeth of the larger one of said remote pair of gears.

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