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F. T. IRGEN

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ENGINE LUBRICATION

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FIG. 1.

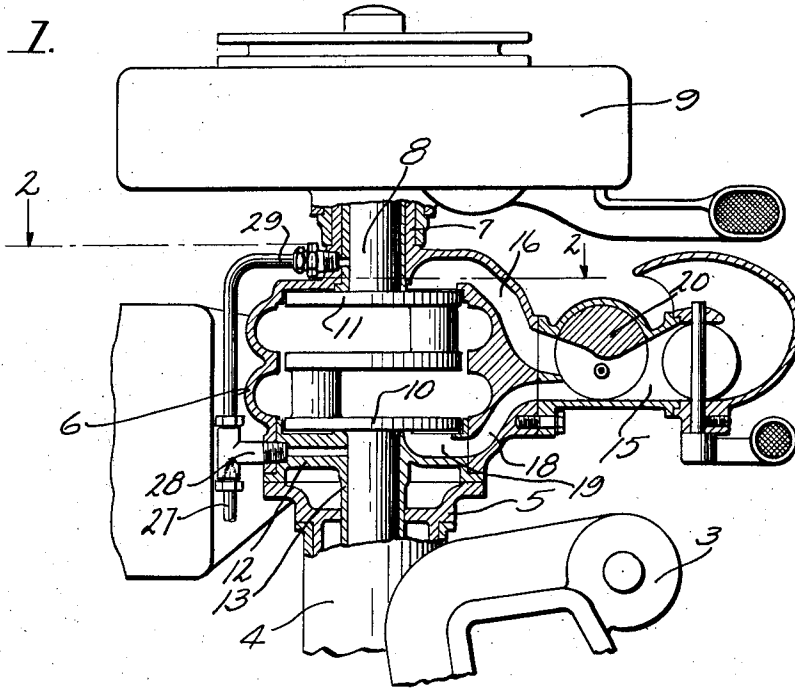
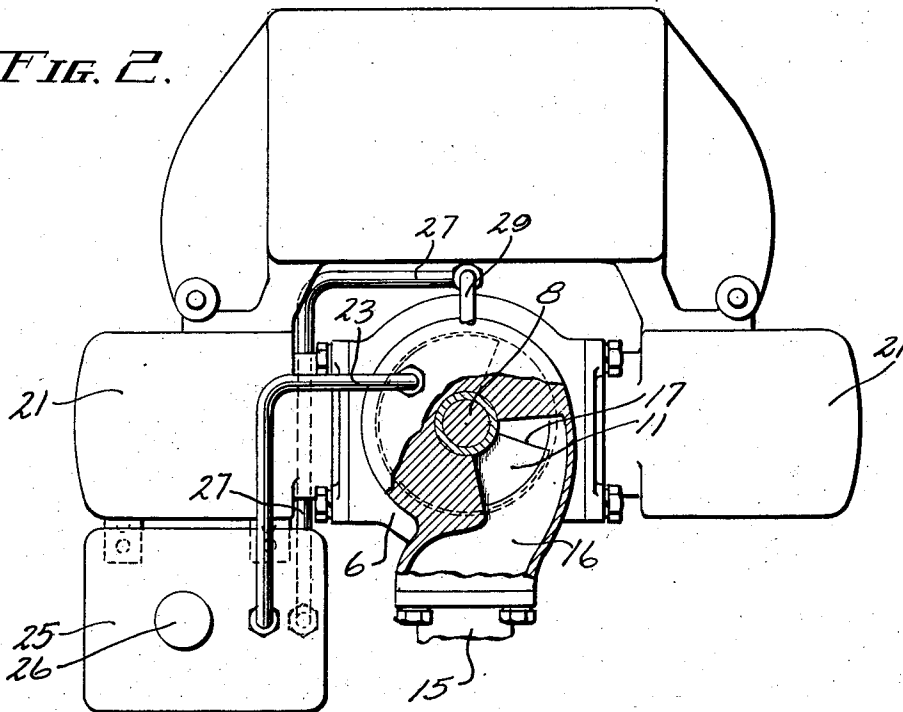


FIG. 2.



INVENTOR
John T. Jorgens
 BY *Wheeler, Wheeler & Wheeler*
 ATTORNEYS

UNITED STATES PATENT OFFICE

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ENGINE LUBRICATION

Finn T. Irgens, Wauwatosa, Wis., assignor to
Outboard Motors Corporation, Milwaukee, Wis.,
a corporation of Michigan

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15 Claims. (Cl. 123—196)

This invention relates to improvements in engine lubrication.

It is the object of the invention to provide a means and method for causing a flow of lubricant under pressure to any desired bearings in or associated with an internal combustion engine through the use of pressure intermittently generated by the engine itself in the normal performance of its functions, and transmitted to a suitable pressure chamber through connections which are so controlled by an engine valve as to be open only during the intermittent periods in the engine cycle when the pressure is available.

While the invention has particular utility in such two cycle engines as are employed in outboard motor practice, it is by no means limited to this field. In a two cycle engine a convenient source of pressure is available by a connection to the crank case, but in other engines the principles herein disclosed may be applied to the derivation of pressure from the engine cylinders under the proper control of a valve to open and close communication with the source of pressure at properly timed intervals.

It is a further object of the invention to provide a construction wherein the application of pressure to the surface of the lubricant may be controlled by the same valve which controls mixture admission to the engine. In this connection also, the invention has particularly advantageous application in two cycle rotary valve engines such as are used in certain outboard motors.

In the drawing:

Figure 1 is a vertical axial section through a two cycle two cylinder opposed rotary valve internal combustion engine embodying this invention.

Figure 2 is a view taken generally in the plane indicated at 2—2 in Fig. 1, with fragments of the manifold wall broken away to expose the manifold and valve.

Like parts are identified by the same reference characters throughout the several views.

Since the invention has particular utility in the outboard motor field, I have chosen by way of illustration, an outboard motor structure to exemplify the invention. The bracket 3 carries a sleeve 4 in which the shaft housing bearing member 5 is rotatably mounted for the support of the engine crank case 6. The crank case is provided at its upper end with an integral bearing sleeve 7 for the crank shaft 8 upon which magneto fly wheel 9 is mounted. At its lower end the crank case 6 has an opening sufficiently large to receive the crank disks 10 and 11 of crank shaft 8, this

opening being normally sealed by a closure 12 which provides a lower bearing 13 for the crank shaft.

In accordance with the disclosure of co-pending application Serial No. 489,793 filed October 20, 1930, patented October 20, 1931, Patent No. 1,827,818, I provide a dual manifold from the carburetor 15 to the crank case. The manifold passage 16 leads through an integral portion of the crank case to a position immediately above crank disk 11 which has a sector-shaped notch at 17 adapted to function as a valve to control the admission of mixture from passage 16 to the crank case. Manifold passage 18 is extended through the closure member 12 at 19 to a position immediately beneath crank disk 10 which is similarly formed in accordance with the disclosure of the above identified application, to control communication between manifold passage 18—19 and the crank case. The throttle valve 20 successively cuts off mixture flow from the carburetor to the several manifold passages.

It will be understood by those skilled in the art that in accordance with the usual two cycle engine practice the mixture is compressed in the crank case before being transferred to the cylinders 21 for combustion. In accordance with piston movement controlled by crank shaft 8, each cycle of engine operation includes a period of crank case depression during which mixture is drawn through manifolds 16 and 18, and a period of crank case compression preliminary to the delivery of the charge to the cylinders. The sector-shaped valve opening 17 in the crank disks registers with the manifold passages at the time of depression, and closes the manifold passages when the crank case is under pressure.

In accordance with this invention I provide a pipe 23 which leads from the crank case at a point with which the valve sector 17 will register when the crank case is under compression. It will be noted from Fig. 2 that pipe 23 enters the crank case at a point diametrically opposite the center of the manifold port. Hence, the solid portions of disk 11 will cover the opening of pipe 23 when the crank case is under depression and will expose the end of pipe 23 when the mixture in the crank case is under high pressure.

The diametrically opposite position of the manifold port and the end of pipe 23 gives to pipe 23 all the advantage in timing which the manifold port possesses. Ordinarily, the opening and closing of the inlet valve is not centered with reference to the point of minimum pressure, but

is somewhat advanced. The position of the valve sector 17 will consequently be advanced to a corresponding degree with reference to the end of pipe 23 so that the valve 11 will close the end of pipe 23 either at the point of maximum compression or immediately thereafter.

Pipe 23 leads to a pressure chamber 25 at the front of the motor in which oil or other lubricant may be introduced beneath filler cap 26 to receive pressure transmitted through pipe 23 from the crank case. From the pressure storage chamber 25 the oil may be led to any desired parts requiring lubrication.

I have shown a discharge pipe 27 having branches 28 and 29 leading from the lubricant chamber 25 (Fig. 2) to the crank shaft bearings 13 and 7 respectively. These bearings are typical of bearings which are difficult to lubricate in a motor of this type because they also are subject to intermittent pressure. The arrangement disclosed is such that the storage chamber 25, through its intermittent communication with the crank case at cyclic periods of maximum compression, is always under the greatest pressure which the crank case ever reaches. Hence, during the remaining portion of the time, there is a very substantial pressure differential between the chamber 25 and the crank shaft bearings which ensures the positive lubrication of the bearings.

Other bearings involving less difficult lubrication problems are handled with even greater facility by the mechanism herein disclosed. It will be obvious that any desired lubrication controls of the many types well known in the art may be employed to regulate the flow of lubricant to any particular bearing or bearings. The fit of the parts is such that no regulation is necessary in the particular structure disclosed.

I claim:

1. The combination with an engine having a cylinder, piston, crank shaft and crank case, and a charge delivering means including a crank case, whereby said crank case is subject to cyclic variation in pressure, a bearing requiring lubrication, a lubricating chamber, and means for subjecting the lubricant in said chamber to predetermined pressure including a valve controlled passage from said crank case to said chamber, and a valve operated from said crank shaft and timed to close at a point of maximum pressure in said chamber together with means for delivering lubricant from said chamber to said bearing.

2. The combination with a two cycle engine having a charge receiving crank case subject to crank case compression, and a bearing requiring lubrication, of a lubricant chamber provided with an open delivery line to said bearing, and means for subjecting said chamber to crank case pressure including a valve normally closed and actuated by said crank shaft to open only at high crank case pressures.

3. The combination with an engine having a crankshaft, and a chamber and bearing subject to cyclic variation in pressure, of a lubricating chamber provided with a permanently open lubricant delivery line to said bearing, means for affording communication between said chambers, and a valve actuated by said crank shaft and controlling such communication in accordance with the cyclic variation in pressure in said first mentioned chamber, said valve being timed to open and close during a period when the pressure in said chamber is substantially in excess of the average pressure to which said bearing is subject,

4. In an engine, the combination with a crank shaft, of a bearing for said shaft and a chamber, both being subject to cyclic variation in pressure in accordance with the predetermined cycle of the crank shaft rotation, a lubricating chamber provided with means affording communication with the first chamber, and connected to supply lubricant to said bearing and a valve controlled by the rotation of said crank shaft for regulating the periods of communication between said chambers in each cycle in accordance with periods of high compression in said first mentioned chamber, said valve being timed to open and close during a period of pressure in said chamber in excess of the average pressure to which said bearing is subject.

5. The combination with an engine having a bearing, a crank shaft and a chamber subject to variation in pressure in accordance with the cycle of crank shaft rotation, of a pressure lubricator comprising a tank having a permanently open lubrication line to said bearing, means affording communication between said tank and chamber, and a valve provided with operating means positively synchronized with crank shaft rotation and controlling communication between the engine chamber and tank, the synchronization of said valve being such as to afford communication between the chamber and tank solely at times when the pressure of said chamber is relatively high.

6. The combination with an engine having a crank shaft and a crank case subject to cyclic variation in compression in accordance with the rotation of said shaft, of an oil chamber and a mechanically operated valve controlling communication between said crank case and oil chamber in predetermined synchronism with the crank shaft cycle.

7. The combination with an engine having a crank shaft and a crank case subject to cyclic variation in pressure, of a tank in potential communication with the crank case and means for establishing a substantially constant pressure in said tank, said means comprising a valve controlling communication between said crank case and tank, and means for mechanically actuating said valve directly from said crank shaft in synchronism with the rotation thereof for the opening and closing of said valve at predetermined points in the cycle of crank shaft rotation and crank case pressures.

8. The combination with an internal combustion engine having a crank case, a crank shaft, a passage leading to said crank case, a rotary valve connected with said crank shaft and controlling said passage, a tank, and a pipe controlled by said valve for periodically affording communication between said crank case and tank whereby to maintain pressures in said tank corresponding to crank case pressures at a predetermined point in each cycle.

9. The combination with an internal combustion engine having an associated bearing, a crank shaft and a crank case subject to cyclic variation in pressure in accordance with the rotation of said shaft, of a passage leading to said crank case, a rotary valve mounted on the crank shaft and controlling communication between said passage and crank case, a storage chamber and a pipe affording potential communication between said storage chamber and crank case and opening to such crank case at a point subject to the control of said rotary valve, said stor-

age chamber being operatively connected with said bearing.

10. The combination with an internal combustion engine, crank shaft and crank case, of a storage chamber, an air intake passage, means affording communication between said crank case, said storage chamber and said passage respectively, and valve means controlling such communication and connected with the crank shaft to receive motion therefrom, said valve means being arranged to connect said crank case alternately with said passage and chamber.

11. The combination with an internal combustion engine having a crank case subject to cyclic variation in pressure, and ports opening into opposite sides of the crank case, of a rotary valve operating in said case for the alternate opening and closing of the respective ports, and a storage chamber with which one of said ports communicates, the other port comprising an air admission port.

12. In a device of the character described, the combination with an internal combustion engine having a crank case subject to cyclic pressure variation, a crank shaft rotatable in said crank case, and a valve disk having an open sector mounted on said crank shaft and positioned adjacent a wall of said crank case, said wall having ports on opposite sides of the crank shaft subject to the control of said valve, the valve being arranged to open one of said ports at a period of crank case depression and to open the other at a period of crank case pressure, a charge forming device connected with the former port, and a pressure chamber connected with the latter port.

13. In a device of the character described, the combination with an internal combustion engine having a crank case subject to cyclic pressure variation, a crank shaft rotatable in said crank

case, and a valve disk having an open sector mounted on said crank shaft and positioned adjacent a wall of said crank case, said wall having ports on opposite sides of the crank shaft subject to the control of said valve, the valve being arranged to open one of said ports at a period of crank case depression and to open the other at a period of crank case pressure, together with a lubricant storage chamber with which said last mentioned port is in communication and which is provided with a delivery pipe for lubricant under pressure communicated to said chamber from said crank case.

14. In a two cycle engine, the combination with a crank case subject to cyclic variation in pressure and provided with a crank shaft bearing, of a crank shaft rotatable in said bearing, a lubricant storage chamber having a pipe leading to said bearing, and means affording potential communication between said chamber and crank case, and a valve operable positively in accordance with the rotation of said shaft controlling communication between said crank case and chamber and arranged to open and close during a period in said pressure cycle wherein the pressure in said crank case is substantially in excess of the average crank case pressure to which said bearing is subject.

15. In a device of the character described, the combination with a crank case having an admission port and an opposite communication port, a crank shaft rotatable in said case and provided with a rotary disk valve controlling said ports for alternate opening and closing, a crank shaft bearing adjacent said valve, and a lubrication storage chamber having a pipe leading from said communication port and a pipe leading to said bearing.

FINN T. IRGENS.