

April 27, 1926.

1,582,647

K. FREITAG

CIRCULATING PUMP

Filed March 4, 1924

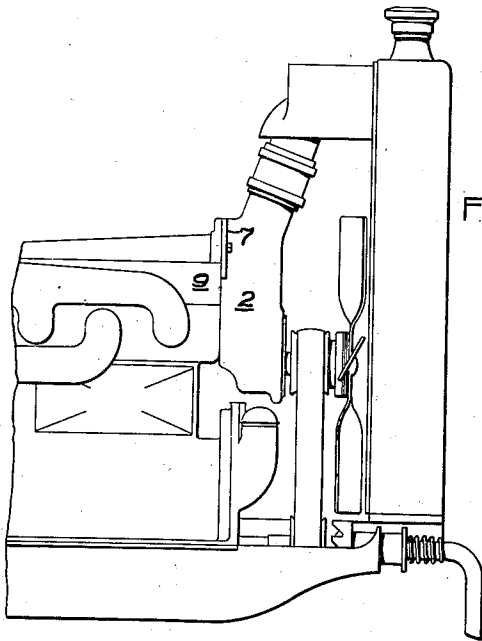


FIG. 1.

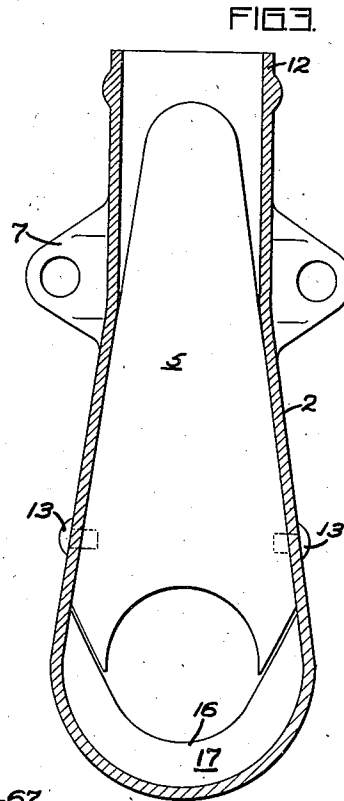


FIG. 3.

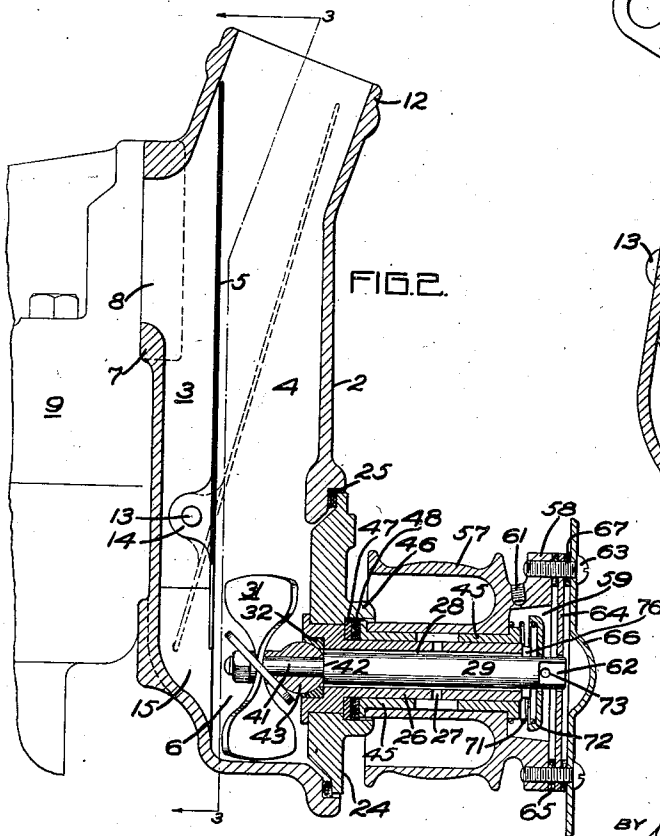


FIG. 2.

INVENTOR
 KNUD FREITAS
 BY *White, Frost & Evans*
 his ATTORNEYS.

UNITED STATES PATENT OFFICE.

KNUD FREITAG, OF OAKLAND, CALIFORNIA.

CIRCULATING PUMP.

Application filed March 4, 1924. Serial No. 696,730.

To all whom it may concern:

Be it known that I, KNUD FREITAG, a citizen of the United States, and a resident of Oakland, county of Alameda, and State of California, have invented a certain new and useful Circulating Pump, of which the following is a specification.

The invention relates to a circulating pump for circulating the water in the cooling system of an internal combustion engine.

An object of the invention is to provide a pump for circulating the water in the cooling system of an internal combustion engine which permits free thermo-siphonic circulation of the water when the pump is not in operation.

Another object of the invention is to provide a circulating pump particularly adapted for use on Ford automobiles for positively circulating the water through the cooling system during the time that the engine is in operation.

A further object of the invention is to provide a circulating pump having means for positively separating the inlet from the discharge opening of the pump, during the time that the pump is in operation and for permitting a substantially direct flow of the water from the inlet opening to the discharge opening when the pump is not in operation.

Another object of the invention is to provide a leak-proof construction for the impeller shaft of the pump.

Another object of the invention is to provide a combined pump and fan drive with means for maintaining a tight seal around the impeller shaft of the pump in the event of wear of the fan pulley bearing.

The invention possesses other advantageous features, some of which with the foregoing, will be set forth at length in the following description, where I shall outline in full that form of my invention which I have selected for illustration in the drawings accompanying and forming part of the present specification. In said drawings I have shown one type of circulating pump embodying my invention, but it is to be understood that I do not limit myself to such type, since the invention, as set forth in the claims, may be embodied in a plurality of forms.

Referring to said drawings.

Figure 1 is a side elevation of the front

end of an internal combustion engine showing the pump arranged between the front end of the engine and the radiator.

Figure 2 is a vertical section through the pump.

Figure 3 is a section through the pump casing taken on the line 3—3 Figure 2.

Ford automobiles are not regularly equipped with pumps in the cooling system of the engine and in many instances it is desirable to install pumps in such systems to positively circulate the water through the system. The pump of my invention is adapted to be secured to the front of the engine block to receive water therefrom and deliver it to the radiator. The pump is driven by the fan belt with which the automobile is regularly equipped and the fan is attached to the pump drive so that the fan pulley serves to drive both the pump and the fan. The construction of the pump of my invention is such that many of the parts with which the automobile is regularly equipped may be used in the combined pump and fan drive, so that when the pump is installed, it is not necessary to discard these parts, thereby reducing the cost of equipping an automobile with the pump of my invention.

The pump is connected with the engine so that it operates coincidentally therewith. It has been found advisable to provide a by-pass around the pump so that thermo-siphonic flow of the circulating water may occur when the pump is not in operation. The stoppage of the pump may be caused by the stoppage of the engine or by the breaking of the fan belt or by the stalling of the impeller. Attempts have been made in the past to provide this by-pass for permitting thermo-siphonic flow of the water and these attempts have consisted principally of a permanently open passage connecting the pump inlet with the pump discharge. This arrangement has proven to be disadvantageous, since it provided a short circuit across the inlet and discharge channels in the pump, with the result that a large percentage of the water was merely recirculated through the pump and not circulated through the cooling system. In accordance with my invention, I provide means whereby there is no by-pass around the pump during the time that the pump is in operation, so that all of the water pumped must pass through the circulating system. This means is constructed so that when the pump stops the by-

pass around the pump is opened to permit free thermo-siphonic flow of the water. Therefore, during the time that the pump is in operation, the water is positively driven through the system by the pump and there is no open by-pass around the pump, and when the pump is not in operation, the by-pass around the pump is wide open so that the water may freely flow, due to thermo-siphonic action.

The pump comprises a casing 2 which is divided into an inlet channel 3 and an outlet channel 4 by the vertically disposed wall or partition 5, which terminates above the lower end of the casing, thus providing a pump chamber 6 at the lower end of the casing. The casing is provided on its inlet side with a flange 7 which is bolted to the front of the engine block with the inlet opening 8 of the pump in registry with the outlet opening of the circulating system in the engine block 9. At its upper end the casing is provided with a neck 12 which is connected to the upper part of the radiator by a hose. The wall or partition 5 which divides the casing into two channels is movably mounted within the casing so that it may move to open or close direct communication between the inlet opening 8 and the discharge opening 12 of the pump. The wall 5 thus acts as a valve to determine the direction of the flow of water from the inlet opening to the outlet opening. The valve is preferably pivoted on rivets 13 set into the casing, the valve being provided with ears 14 through which the rivets extend. The valve is so shaped, that in one position it makes a substantially tight contact with the walls of the casing, thereby separating the inlet channel 3 from the discharge channel 4. When the pump is in operation, the pressure produced by the impeller causes the valve 5 to be positioned as shown in Figure 2, with the edges of the valve in contact with the walls of the casing, thus dividing the casing into inlet and outlet channels, which are not in communication with each other, except through the pump chamber. All water, therefore, entering the inlet opening 8 is forced, by the impeller, through the discharge opening 12. When the valve 5 is in this position, it stands substantially vertical, so that very little if any, effort is required to move the valve to the open position shown in the dotted lines in Figure 2. When the impeller stops, the pressure of the water flowing into the inlet opening 8 causes the valve to fall over to the position indicated by the dotted lines in Figure 2, thereby establishing direct communication between the inlet opening 8 and the discharge opening 12, whereby free thermo-siphonic circulation of the water may occur. The casing 2 is provided at its lower portion with a shoulder 15 which underlies the

inlet channel 3 and which has a curved bottom wall 16, which is substantially concentric with the axis of the impeller. The front wall 17 of the shoulder lies in substantially the same plane as the partition wall 5, when the wall is in the position that it assumes during the time that the pump is in operation. The lower edge of the wall 5 is also preferably curved concentrically with the axis of the impeller so that a circular inlet opening to the impeller chamber is provided, the opening being preferably substantially concentric with the axis of the impeller. This causes a very efficient feed of the water to the impeller and increases the efficiency of the pump.

The casing is provided in its front wall, adjacent the lower end thereof, with a circular opening which is closed by a circular cover-plate 24, any suitable means being employed for holding this plate in tight engagement with the casing. A gasket 25 interposed between the plate and the casing prevents the leakage of water at this point. Mounted eccentrically in the cover-plate 24 is stud bearing 26 which extends forwardly from the casing. The stud bearing is tightly fixed to the cover-plate 24 so that no leakage occurs at the joint. The stud bearing is provided with holes 27 through which lubricating oil may freely pass. Disposed within the hollow stud bearing is a shaft 29 to the inner end of which the impeller 31 is secured. The impeller is disposed in the pump chamber 6 and rotation of the impeller causes a discharge of water through the outlet channel 4. At its inner end the stud bearing 26 is provided with an enlarged bore and arranged in this bore is a ring or cup 32, preferably formed of fiber and having a hemispherical seat therein through which the driving shaft 29 extends. The driving shaft 29 is of lesser diameter than the interior of the stud bearing 26, forming an annular oil passage 28 surrounding the shaft. The shaft is provided adjacent its inner end with a turned down portion 41, which forms with the remainder of the shaft, a shoulder 42. Interposed between the shoulder 42 and the impeller 31 is a spacing member 43 which is spherical in shape and which seats in the cup 32, forming a tight leak-proof joint therewith. After extended use of the pump, the axis of the shaft 29 may move, due to wear of the bearings and, by forming the joint between the shaft and the stud bearing of a spherical member and a spherical seat, movement of the shaft away from its axis, will not open the joint between these two members and permit leakage of water into the stud bearing.

Mounted on the stud bearing 26 are flanged bushings 45 which form a part of the regular equipment of the automobile.

The cover-plate 24 is provided on its outer surface with a ring 46 concentric with the axis of the stud bearing and the end of the bushing extends into the annular chamber formed between the ring 46 and the stud bearing. Leakage of oil between the stud bearing and bushing is minimized by a fiber washer 47 surrounding the stud bearing and a felt washer 48 interposed between the end of the bushing and the fiber washer 47. The bushings serve to bush the pulley 57, which is the regular fan pulley with which the automobile is equipped and which is removed from its regular assembly and included in the present pump assembly. This regular Ford fan pulley 57 is provided on its outer end with an axially extending flange 58 which forms a lubricant chamber 59 surrounding the shaft 29. The pulley is provided with an aperture normally closed by the screw plug 61 whereby lubricants may be introduced into this chamber. The shaft 29 is formed on its outer end with a non-circular end, preferably rectangular, and the shaft is driven by means engaging this non-circular end 62. Secured to the pulley 57 by screws 63 which form part of the regular Ford equipment, is the drive plate 64 which is provided at its center with a non-circular aperture into which the end 62 of the shaft extends. The shaft 29 is thus supported and centered at one end by the cup 32 and at the other end by the plate 64, so that it practically floats in the stud bearing. A gasket 65 is interposed between the end of the pulley and the plate 64 to prevent the leakage of oil at that point. The standard Ford fan is provided with an imperforate center portion and this fan 66 is also secured to the pulley by the screws 63. A gasket 67 is interposed between the fan and the driving plate 64, thereby preventing leakage of lubricants at that point. The pulley and the shaft 29 are held in their relative proper positions by means of a coiled spring 71, interposed between the outer face of the pulley in the lubricant chamber and the spring retainer 72, which is held in position on the shaft 19 by the cotter-pin extending through the hole 73. This spring exerts an outward pressure on the shaft and an inward pressure on the pulley and holds the spherical member to its seat in the cup and holds the pulley in position.

The bushings, the pulley and the fan are standard Ford equipment and when it is desired to install the pump of this invention, these parts are removed from the Ford and assembled with the other parts of the pump. The pump is of such structure that the axis of the pulley lies in the same position with respect to the fan belt driving pulley as it does in the regular Ford equipment. The axis of the stud bearing is disposed

eccentrically with relation to the axis of figure of the cover-plate 24, so that rotary movement of the cover-plate to variable adjusted positions, varies the position of the axis of the fan pulley and thereby loosens or tightens the fan driving belt.

When assembling the pump the shaft 29 has a tendency to slip out of its seat, before the spring 71, the spring retainer 72, and the cotter-pin 73 are inserted, and to prevent this a flexible rawhide pin 76 is inserted in a hole drilled thru the shaft 29 adjacent the outer end of the stud bearing 26.

Subject matter shown and described and not claimed herein is claimed in my co-pending application Serial No. 673,268, filed November 7, 1923.

I claim:

1. In a water cooling system for internal combustion engines consisting of a water jacket, a radiator and connections between the water jacket and radiator at the top and bottom to permit thermo-siphonic circulation, means operating coincidentally with the engine for forcing water through said system, and a valve in the system arranged to open in the direction of the thermo-siphonic flow, the pressure produced by the operation of the water forcing means serving to close said valve.

2. In a water cooling system for internal combustion engines consisting of a water jacket, a radiator and connections between the water jacket and radiator at the top and bottom to permit thermo-siphonic circulation, a pump operating coincidentally with the engine for forcing water through said system and means moved by the water passing through the pump for interrupting the thermo-siphonic flow.

3. In a water cooling system for internal combustion engines consisting of a water jacket, a radiator and connections between the water jacket and radiator at the top and bottom to permit thermo-siphonic circulation, a pump operating coincidentally with the engine for forcing water through the system and a valve, closed while the pump is in operation by the water discharged from the pump, and arranged to open when the pump stops to permit thermo-siphonic circulation.

4. In a water cooling system for internal combustion engines consisting of a water jacket, a radiator and connections between the water jacket and radiator at the top and bottom to permit thermo-siphonic circulation, a pump operating coincidentally with the engine for forcing water through the system, a by-pass around the pump, and a valve in said by-pass arranged to move to open position when forcible movement of water through the system is halted by stopping of the pump.

5. In a water cooling system for internal combustion engines consisting of a water jacket, a radiator and connections between the water jacket and radiator at the top and bottom to permit thermo-siphonic circulation, a pump operating coincidentally with the engine for forcing water through the system, a by-pass around the pump and a valve adapted to be moved by water pressure to close the by-pass when the pump is operating and to open the by-pass when the pump stops.
6. In a water cooling system for internal combustion engines consisting of a water jacket, a radiator and connections between the water jacket and radiator at the top and bottom to permit thermo-siphonic circulation, a pump operating coincidentally with the engine for forcing water through the system, a by-pass around the pump and a valve closing said by-pass when the pump is in operation and arranged to be opened by the thermo-siphonic current when the pump stops.
7. In a water cooling system for internal combustion engines consisting of a water jacket, a radiator and connections between the water jacket and radiator at the top and bottom to permit thermo-siphonic circulation, a pump casing in one of the connections, said casing having inlet and discharge openings adjacent its upper end, a pump impeller arranged adjacent the lower part of the casing and a wall, movable by fluid impact, mounted in the casing and dividing the casing into two channels communicating with the impeller, said wall serving in one position to prevent the direct flow of water from the inlet to the discharge opening and in the other position to permit such direct flow.
8. A pump for the cooling system of an automobile engine adapted to be inserted between the water jacket of the engine and the radiator comprising a casing having inlet and discharge openings, an impeller and a wall movable by fluid impact dividing the casing into two channels communicating with the impeller and with the inlet and discharge openings respectively, said wall in one position serving to prevent direct flow to water from the inlet to the discharge opening.
9. A pump comprising a casing having water inlet and discharge openings adjacent the upper end thereof and a movable partition wall in said casing extending downward and terminating above the bottom of the casing and an impeller in the lower part of the casing adapted to draw water from the channel on one side of the wall and discharge it into the channel on the other side of the wall, said wall being movable by fluid impact to make and break direct connection between the inlet and discharge openings.
10. A pump comprising a casing having an inlet and a discharge opening substantially opposite the inlet opening and a wall separating the inlet from the discharge, said wall being movable by fluid impact to establish substantially direct communication between the inlet and discharge openings.
11. A pump comprising a casing, a wall dividing the casing into two vertical channels, inlet and discharge openings at the upper ends of said channels, and an impeller arranged to move water through said channels, said wall being movable by fluid impact to permit water to flow from the inlet to the discharge without passing through said channels.
12. A pump comprising a casing having inlet and discharge openings adjacent the upper end thereof, an impeller arranged at the lower part of the casing and adapted to circulate water thru said pump, and a wall pivoted in said casing and adapted to be moved by impact of said water, said wall dividing the casing into two channels extending upward from the impeller to the inlet and discharge openings respectively.
13. A pump comprising a casing having inlet and discharge openings adjacent the upper end thereof, an impeller arranged at the lower part of the casing, a movable wall in said casing dividing the casing into inlet and discharge channels and pivots on which said wall is mounted, said wall having a curved lower edge substantially concentric with the axis of the impeller.
14. A pump comprising a casing having inlet and discharge openings adjacent the upper end thereof, an impeller arranged at the lower part of the casing, a movable wall in said casing dividing the casing into inlet and discharge channels and a shoulder in the bottom of the casing having its front face lying substantially in the plane of the wall, the upper face of the shoulder and the lower edge of the wall being curved and being disposed substantially concentric with the axis of the impeller.
- In testimony whereof, I have hereunto set my hand.
- KNUD FREITAG.