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ENGINE FAN CONTROL

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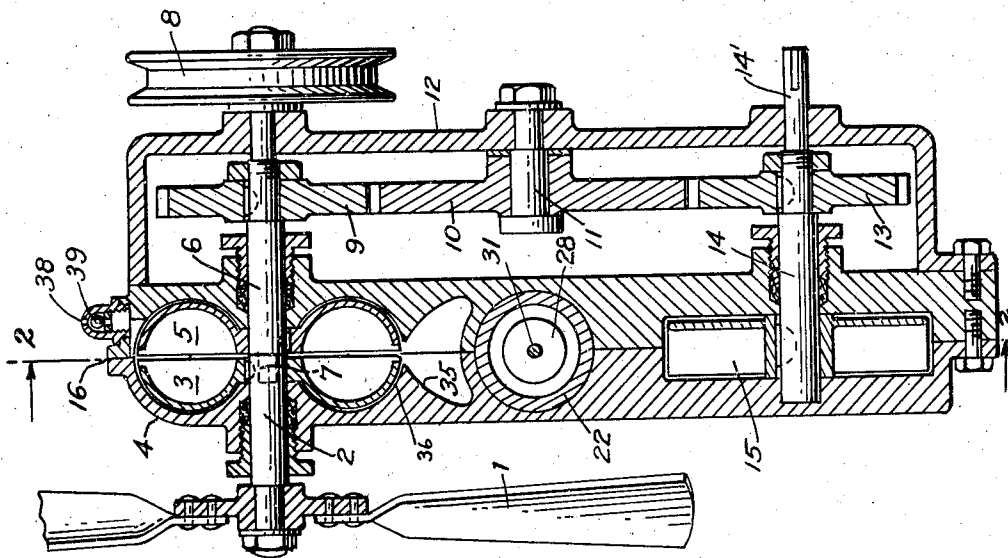


Fig. 1.

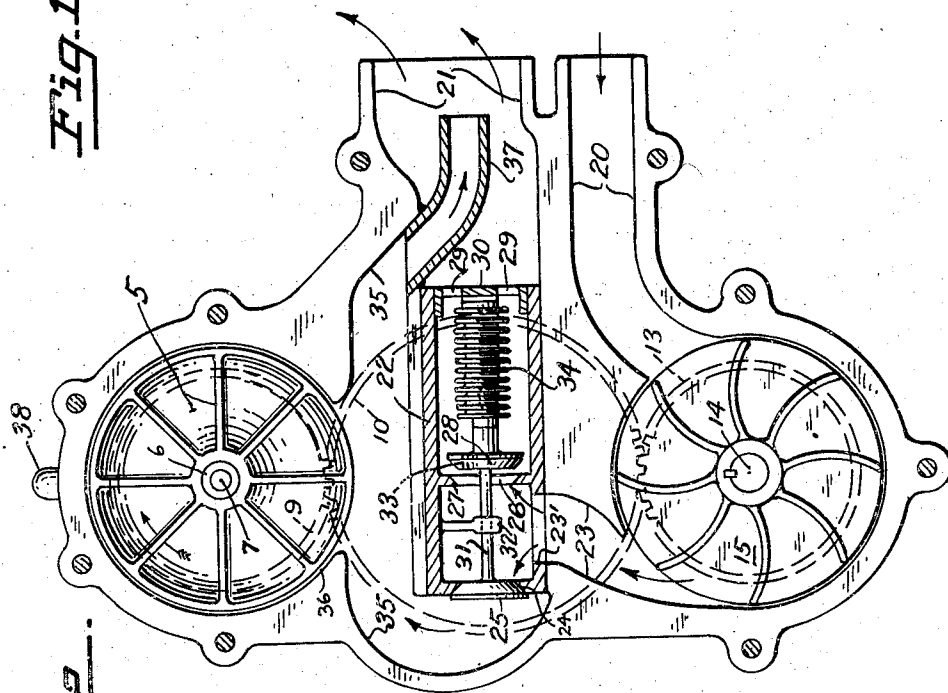


Fig. 2.

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ENGINE FAN CONTROL

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This invention relates to the operation of cooling fans as used for circulating air over an internal combustion engine or through the engine radiator, and the principal object of the invention is to provide improved thermostatic controlled means for confining the operation of the fan to such times only as when it is required—that is—when the water in the engine is getting too hot, and thereby avoid the loss of heat caused by the conventional way of running the fan all the time whether required or not.

Particular features and advantages of my improved construction will appear in the following description and accompanying drawing.

In the drawing:

Fig. 1 is a side view in vertical cross section of my improved engine fan controlled drive.

Fig. 2 is a front elevation taken along the parting line 2—2 of the pump and fluid clutch housing of Fig. 1.

Before describing my improvements, it may be stated that broadly it is old to control the operation of an engine cooling fan by means of a thermostat, but so far such apparatus has not come into general use on motor cars, and it is one of the objects of my improvements to provide a simple reliable arrangement of parts for this purpose and which overcome some of the objections to previously proposed apparatus.

Generally described my apparatus comprises a so-called fluid-coupling with one set of blades or cups (the "follower") on the fan shaft and the opposed or "driver" set on an axially aligned pulley or drive shaft, so that the fan is driven through and by the fluid-coupling, providing there is liquid in it. The pulley shaft is driven all the time from the engine by any suitable belt or gear drive as is also the water circulating pump. The water preferably flows from the engine to the pump and from the pump to the radiator for cooling and recirculating through the engine in the well-known way. However, the water in leaving the pump has two paths to the radiator and which paths (passages) are controlled by a thermostat immersed in the water being circulated. One of these paths (A) leads directly to the radiator, while the other path (B) also leads to the radiator but goes by way of the lower part of the fluid coupling casing so as to raise a water level or supply of water in it to thereby cause the ever revolving cups of its driver to act upon this water and start the opposed or follower set of cups in motion and thereby start the fan carried by the shaft of the follower set.

The action of the thermostat is to open passage

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A only when the engine cooling water in which the thermostat is immersed is exceeding the maximum desired temperature and substantially close the passage B, and to close the passage A and open the passage B fully again at such times as the water is too cool for engine efficiency, thereby drawing off the water from the "fluid coupling" and stopping the fan, and so on as the most efficient thermal requirements of the engine may be, and without shock or jar to any moving parts.

In the drawing neither the engine nor its radiator is shown, but only the necessary elements constituting the improvement in the fan control.

In further detail the fan is indicated at 1 mounted on the outer end of a short shaft 2 the inner end of which carries a set of fluid coupling cups or vanes 3 constituting the "follower" of the coupling and running in a circular casing or housing 4, in which the opposed set of cups 5 also operate and are carried on a shaft 6 aligned with shaft 2 and preferably provided with an aligning extension 7 extending into shaft 2, or vice versa.

Shafts 2 and 6 are suitably supported on the housing 4 for rotation, and secured to the outer end of shaft 6 is a belt pulley 8, while within the housing a gear 9 is secured to shaft 6. Gear 9 is in mesh with an idler gear 10 revolvably mounted on a pin 11 secured to a removable cover plate 12 of the housing, and which idler is in mesh with a gear 13 secured to the pump shaft 14 which carries the water circulating pump runner 15. The pump shaft 14 is shown extended as at 14' to indicate that either this shaft, or the pulley 8 may be suitably driven from the engine to drive the coupling and pump in the directions indicated by the arrows on Fig. 2. The housing 4 is preferably parted along the line 16 to facilitate assembling the parts as well understood.

The water passages from the engine (not shown), and to and from the circulating pump and to and from the fluid coupling, are here shown as formed in the housing member 4 and are as follows:

Inlet passage 20 preferably receives the hot water from the engine (not shown), and conveys it to the pump 15 which forces the water through a passage 23 and various valve controlled passages and finally out of outlet passage 21 to the top of the radiator (not shown) for circulation through the radiator for cooling, thence through the engine water jacket and back again to inlet passage 20.

Within passage 21 which is preferably a central bore in the housing 4 is tightly inserted a cylin-

dricul member 22 constituting a valve cage provided with a side opening 23' receiving water from passage 23 from the discharge side of the pump 15, an end opening 24 closable by a valve 25, an opening 26 in an intermediate partition 27 substantially closable by a valve 28, and one or more openings 29 at the opposite or right-hand end of the valve cage formed in an end disk or spider 30.

Within the valve cage 22 is a longitudinally movable valve rod 31 extending through openings 24 and 26 and preferably guided as by a bearing hanger 32 and which rod carried valve 25 and also valve 28 so spaced and arranged that upon sliding of the rod to fully open valve 25, valve 28 is closed, and vice versa, tho a small open passage 33 through valve 28 provides for at least a small flow of water past it at all times.

To actuate the valve rod a linearly expansible thermostat 34, here indicated as an expansive fluid bellows type, is secured at its inner end to and fulcrumed against the spider 30.

Normally, as when starting the engine after becoming cool, thermostat 34 is also cool and contracted to close valve 25 and open valve 28 so that the water from the pump 15 flows from the pump discharge passage 23 through valve port 26, over and around the thermostat and through spider openings 29 and out of outlet 21 to the radiator, when the fan is not then operating.

As the circulating water warms up and reaches the predetermined maximum desired—say about 180° F.—the similar heating of the thermostat expands it and begins to open valve 25 and to close valve 28, these valves being preferably respectively fully opened and closed at about 190° F, and which directs most of the water from the circulating pump 15 (except the small amount passing through hole 33 in valve 28) through passage 35 past the under open edge of the fluid coupling chamber 36 and finally back into outlet 21 by way of a nozzle 37.

As the water pressure from the pump rises in passage 35 it is forced up into the fluid coupling which causes the follower set of cups 3 attached to the fan shaft, to start rotating and put the fan in motion.

Any air in the coupling housing escapes by way of a suitable air relief valve opening 38 at the top of the housing and which closes when the water rises sufficiently to float the ball 39.

Upon the water temperature falling too much for efficient operation of the engine, the thermostat contracts, closes valve 25 and fully opens valve 28 so that all of the water again circulates through the valve housing to the discharge end of passage 21, and nozzle 37 being in the form of an injector extending centrally within the out-flowing water in passage 21 will quickly syphon out the water from the fluid coupling chamber to thus stop the fan.

The use of this apparatus not only greatly conserves the engine heat to the point of greatest efficiency, as predetermined by the thermostat setting for the engine in accordance with the engine requirements, but also eliminates the load of the fan from the engine at such times as it is cut out by the thermostat as described.

While I prefer to use a water circulation from the engine directly to the circulating pump and thermostat, and thence to the radiator and back to the engine, as being more correctly responsive to the temperature of the engine, it is of course evident that my apparatus may be installed in any arrangement of circulating water engine cool-

ing systems either before or after the radiator, with proper setting of the valves to operate at the maximum and minimum temperatures of water desired.

While I use the word "water" in the description and claims, it is to be understood that this term is intended to cover the use of any circulation liquid used for cooling the engine and operating the fluid coupling.

Having thus described my improvements in an apparatus of this kind and the manner of its operation, what I claim is:

1. Engine fan control comprising a circulating pump arranged for circulating the cooling water of an engine, means for continuously driving said pump from the engine, a fluid-coupling arranged for driving said fan and with its follower connected to the fan, and its driver connected for continuous driving with said pump, and thermostatic means controlled by the temperature of the circulated water arranged upon predetermined heating to direct some of said water into said fluid-coupling whereby said fan is operated, and upon predetermined cooling of the thermostat to withdraw said water from said fluid-coupling, in repetition as such heating and cooling of the thermostat takes place.

2. Engine fan control comprising a circulating pump arranged for circulating the cooling water of an engine, means for continuously driving said pump from the engine, a fluid-coupling arranged for driving said fan and with its follower connected to the fan, and its driver connected for continuous driving with said pump, and thermostatic means controlled by the temperature of the circulated water arranged upon predetermined heating to direct some of said water into said fluid-coupling whereby said fan is operated, and upon predetermined cooling of the thermostat to withdraw said water from said fluid-coupling, in repetition as such heating and cooling of the thermostat takes place, said thermostat mounted within the flow of said water for direct influence of its temperature.

3. In a structure as set out in claim 2, said fluid-coupling mounted at a point higher than said pump and there being two outlet passages for the water from said pump, one of said passages also opening to the fluid-coupling for delivering and receiving water therefrom, and the second passage by-passing said fluid-coupling, and valve means controlled by said thermostat operating said valve means for delivering and withdrawing water from said fluid-coupling under control of the temperature of said circulating water.

4. In a structure as set out in claim 2, said fluid-coupling mounted at a point higher than said pump and there being two outlet passages for the water from said pump, one of said passages also opening to the fluid-coupling for delivering and receiving water therefrom, and the second passage by-passing said fluid-coupling, and valve means controlled by said thermostat operating said valve means for delivering and withdrawing water from said fluid-coupling under control of the temperature of said circulating water, the water withdrawn from said fluid-coupling being guided to a common discharge circulating passage from the pump through an injector type nozzle to aid in drawing said fluid-coupling.

5. In a structure as set out in claim 2, an automatic air relief valve on said fluid-coupling to facilitate the entry and withdrawal of water therefrom.

6. In an engine fan control, a fluid-coupling

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comprising a driver and a follower each mounted on a separate shaft arranged in alignment, means forming a housing for the coupling members and revolvably supporting the shafts with the follower shaft projecting therefrom, a fan secured to the follower shaft, a shaft driving element secured to the driver shaft, a rotary pump arranged to circulate the water from an engine cooling system, power transmitting means connecting said pump and said driver shaft for simultaneous rotation, water passages arranged for guiding the water to and from said pump for circulating the same, a passage adapted to guide some of the water from said pump into said fluid-coupling for actuating the same, a thermostat exposed to the temperature changes in said water, and valve means operated by said thermostat controlling the flow of water into said fluid-coupling.

7. In an engine fan control, a fluid-coupling comprising a driver and a follower each mounted

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on a separate shaft arranged in alignment, means forming a housing for the coupling members and revolvably supporting the shafts with the follower shaft projecting therefrom, a fan secured to the follower shaft, a shaft driving element secured to the driver shaft, a rotary pump arranged to circulate the water from an engine cooling system, power transmitting means connecting said pump and said driver shaft for simultaneous rotation, water passages arranged for guiding the water to and from said pump for circulating the same, a passage adapted to guide some of the water from said pump into said fluid-coupling for actuating the same, a thermostat exposed to the temperature changes in said water, and valve means operated by said thermostat controlling the flow of water into said fluid-coupling, and means insuring a constant flow of said water over said thermostat.

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