May 2, 1950 H. J. FINDLEY 2,506,547

ENGINE COOLING PUMP AND FAN ASSEMBLY

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FIG. 1

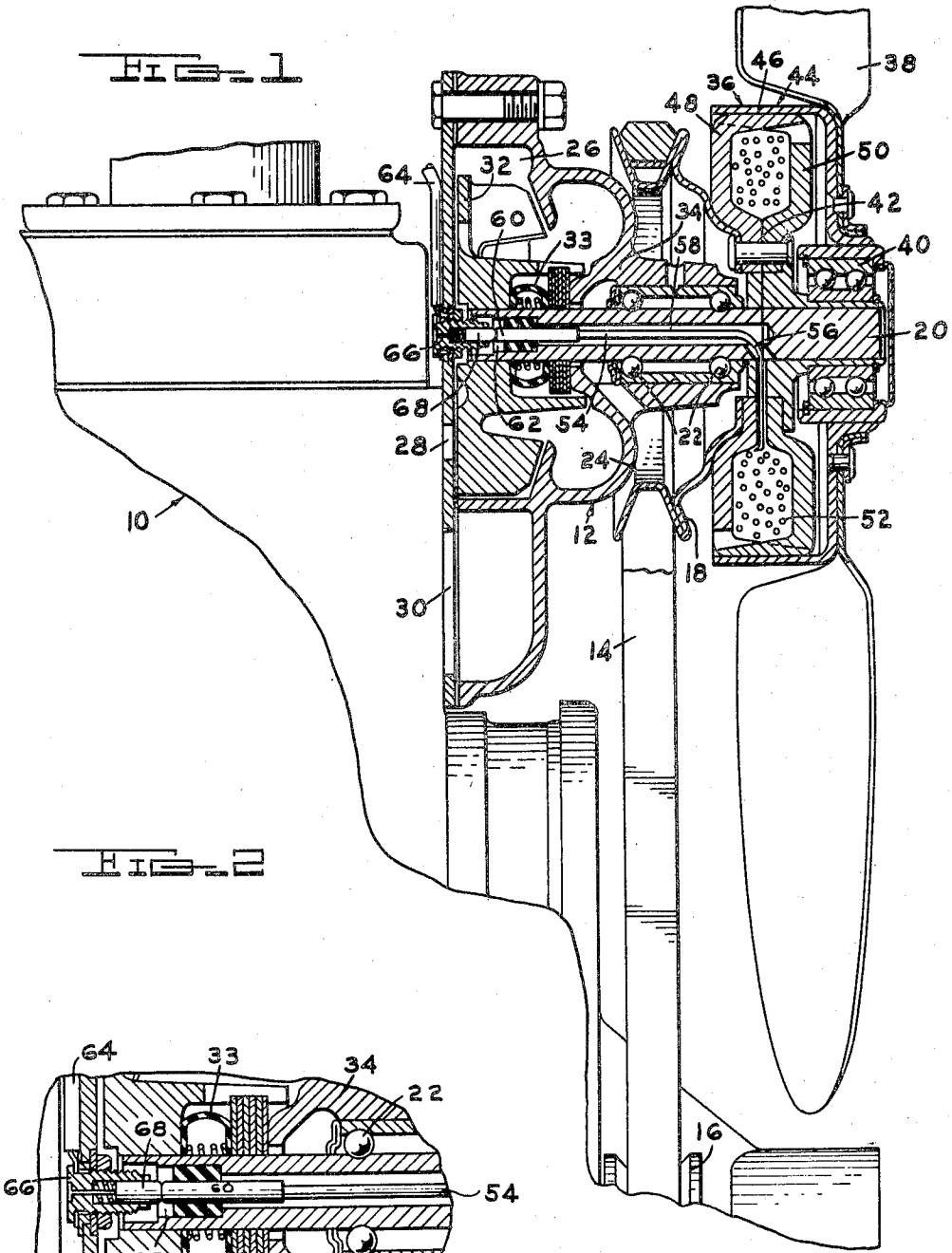


FIG. 2

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ENGINE COOLING PUMP AND FAN ASSEMBLY

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8 Claims. (Cl. 123—175)

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This invention relates to eddy current electromagnetic drives or engine cooling pump and fan assembly and more particularly to structural features thereof as applied to the driving of engine cooling fans or the like.

Broadly the invention comprehends the provision of an eddy current electromagnetic drive for controlling the speed of operation of an air circulating fan for a liquid cooled internal combustion engine wherein the fan is associated with the liquid circulating means of the engine and the liquid circulating means and electromagnetic drive have a common driving source of power. The liquid circulating means, electromagnetic drive and a circulating fan are so structurally incorporated relative to one another in a compact, efficient arrangement with the current carrying brush for the drive arranged in the liquid circulating system of the engine.

An object of the invention is the provision of an incorporated engine air circulating fan and liquid circulating pump structure wherein the fan is speed controlled driven by an eddy current electromagnetic drive which has its current supplied axially of the pump in the liquid circulating system of the engine.

Another object of the invention is the provision of an eddy current electromagnetic power transmitting device for an engine fan for controlling the speed of operation thereof having the current supply brush thereof arranged axially of the drive immersed in the liquid of the liquid cooling system of the engine.

Another object of the invention is the provision of an eddy current electromagnetic power transmitting mechanism wherein the current transmitting means associated therewith is immersed in water or the like.

A yet further object of the invention is the provision of an efficient, compact structural arrangement of engine air circulating fan and liquid circulating pump driven from an output shaft of the engine and wherein the operation of the engine fan is controlled by an eddy current electromagnetic power transmitting mechanism interposed between the output shaft and fan.

A still further object of the invention is the provision of an eddy current electromagnetic power transmitting mechanism comprising a member receiving driving relation from a power output member and a driven member cooperable therewith, one of said cooperating members having an electromagnetic coil associated therewith and electrical supply current transmitting means therefor which is immersed in liquid.

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Other objects and advantages of the invention will appear from the following description taken in connection with the drawings, forming a part of the specification, and in which:

Fig. 1 is a fragmentary partially cross-sectionalized view of a novel form of engine circulating fan and liquid circulating pump structure in association with an internal combustion engine; and

Fig. 2 is an enlarged view of the current transmitting arrangement shown by Fig. 1.

It has become necessary in view of the adaptation of eddy current electromagnetic power transmitting mechanisms to internal combustion engines for controlling the speed of operation of air circulating fans therefor to effectively incorporate the mechanisms with the power input means of the fan. The structural relation of the electromagnetic mechanism to the fan becomes further significant when the liquid circulating pump for he engine forms a part of the general fan assembly thereby necessitating a compact and efficient structure to replace the conventional associated pump and fan assembly.

The present combined pump-fan assembly compares with conventional pump-fan assemblies in that the fan and pump derive their driving source from an output shaft of their associated engine by way of a belt drive connected to a drive shaft for the pump and fan. The electromagnetic power transmitting mechanism of the presently devised pump-fan assembly is of the general type disclosed by my co-pending U. S. App. S. N. 693,061, filed August 26, 1946, now Patent #2,497,402, February 14, 1950, interposed between the pump drive shaft and fan assembly for controlling the operational speed of the fan in accordance with engine cooling requirements. As a means of carrying out the compact arrangement of structural relation between the pump, fan and power transmitting mechanism it was found most practical, for the purpose of supplying electrical current to the electromagnetic coil of the power transmitting mechanism, to arrange the current carrying brush along the axis of the pump-fan drive shaft in current contacting relative rotative relation within the liquid jacket of the pump completely surrounded by the liquid of the engine liquid circulating system. In the case of conventional automotive engines of the passenger vehicle class, because of the limited required operation of the engine fan and the size of the electromagnetic drive required to transmit power to the fan for the maximum rated operation thereof, a small amount of current is transmitted

by the current carrying brush to supply the electromagnetic coil for short periods of time with the result that the electrolytic action taking place upon the brush contacts is finite.

Referring to the drawings for more specific details of the invention wherein like numerals refer to like parts and more particularly to Fig. 1, 10 represents generally an internal combustion engine having incorporated therein a combination pump-fan structure 12 which is driven from the crankshaft of the vehicle, not shown, by way of a belt drive 14 arranged between a pulley 16 mounted on the crankshaft and a pulley 18 incorporated in the pump-fan structure.

The pump-fan structure 12 comprises a central shaft 20 journalled on bearings 22 which in turn are mounted upon a housing member 24. The housing member 24 is suitably secured upon the engine 10 on the forward end thereof and provides therein a liquid pump chamber 26 having suitable inlet and discharge parts 28 and 30 respectively associated therewith and adapted to also be in communication with the liquid passages in the engine cooling system, not shown.

A pump 32 suitably affixed on the shaft 20 for rotation therewith is arranged in the pumping chamber and has suitable liquid sealing means 33 arranged on one end thereof in association with a hub portion 34 of the housing to inhibit leakage of liquid from the chamber along the shaft.

An eddy current electromagnetic power transmitting mechanism 36 of the type more fully disclosed by my co-pending U. S. App. S. N. 693,061, filed August 26, 1946, is arranged intermediate the driven pulley 18 and an air circulating fan 38 suitably journalled on bearing 40 which is mounted on shaft 20 as an effective speed control means for transmitting power from the crankshaft to the fan. The mechanism 36 comprises a rotor 42 fixedly secured to shaft 20 forward axially disposed from the pump 32 having the pulley 18 suitably secured to the hub thereof and extending outward radially axially in overhanging relation to the hub of housing 24 and a drum member 44 which is fixedly secured to the hub of fan 38 and is arranged with its axially extended portion 46 in radially spaced relation to the rotor 42.

The rotor 42 includes a pair of members 48 and 50 forming the field body of the power transmitting mechanism and have arranged annularly therebetween an electromagnetic coil 52. The coil 52 is grounded at one end to the members 48 and 50 and has its other end supplied with live current by way of lead line 54 extending radially through the hub of the rotor and axially through passages 56 and 58 provided in shaft 20 in insulated relation thereto terminating in a contacting member 60 secured upon an insulated sleeve fitted in a bore 62 of the shaft 20.

A source of electrical current is supplied to contact member 60 for transmission to coil 52 by a current supply line 64, from a source not shown, through a terminal member 66 secured on the housing 24 and extending into the liquid chamber 26 and through terminal member 66 in the shaft 20 supporting for movement centrally therein a contacting button 68 arranged in juxtaposed position to contact member 60 within bore 62 in shaft 20.

Through the arrangement of the current supply contacting, relatively rotating means centrally of the shaft a more compact pump-fan structure employing a separate speed control means for the fan in the form of an eddy current drive is possible. Furthermore because of the normal limited required operation of the fan and small quantity of current supplied to the coil for the effective transmission of power for operation of the fan for normal passenger automotive vehicle and the like operation no appreciable electrolytic action takes place and the contacting members do not have to be sealed from the cooling system in the pump chamber.

Although the invention has been described in connection with specific embodiments of structure relative to combination pump-fan assemblies for internal combustion engines it is adaptable to any eddy current electromagnetic power transmitting mechanism wherein the current for the electromagnetic coil thereof is required to be passed through a liquid chamber and the mechanism transmits power from a power source to a device or apparatus to be propelled thereby, the invention is to be limited only as indicated by the scope of the appended claims.

What I claim is:

1. An engine cooling apparatus comprising a liquid pump, a fan, a single power source for the pump and fan, an eddy current electromagnetic power transmitting mechanism for coupling the fan to the driving source, a source of electrical current for the mechanism, and current transmitting means for the mechanism arranged in the pumping chamber of the pump.

2. In an internal combustion engine, a power output means from the engine, a shaft driven from the power output means, a liquid circulating pump for the engine secured to the shaft for rotation therewith, an eddy current electromagnetic power transmitting mechanism comprising a driving part secured to the shaft and a driven part, an air circulating fan secured to the driven part of the mechanism, an electrical source of power for the mechanism, and relatively rotatable current transmitting means for the mechanism arranged centrally of the shaft in the liquid chamber of the pump.

3. In combination with an internal combustion engine a cooling system comprising a pump for circulating liquid through the engine, a fan for circulating air, a single drive source for the pump and fan, a pulley driven from the driving source, a shaft connecting the pulley to the pump, an eddy current electromagnetic power transmitting mechanism interposed between the fan and pulley having driving and driven members connected respectively with the pulley and fan, an electric circuit for energizing the mechanism, a pump housing enclosing the pump, and current transmitting means in the electric circuit for the mechanism arranged centrally of the shaft in the pumping chamber within the pump housing.

4. An engine cooling apparatus comprising a liquid pump, means for driving the pump, an eddy current electromagnetic power transmitting mechanism comprising a member connected to and driven by the driving means, a member electromagnetically driven from the first member, and an electromagnetic coil carried by the first member, an air circulating fan connected to the second member of the mechanism for rotation therewith, a source of electrical current for the coil, a liquid housing for the pump, and relatively rotatable current transmitting means in the pump housing for the delivery of current to the coil.

5. An engine cooling apparatus comprising a

liquid circulating pump, an air circulating fan, a power driven shaft for the pump, an electromagnetic power transmitting mechanism interposed between the shaft and fan comprising a member driven from the shaft, an associated member connected to the fan for rotation therewith, and an electromagnetic coil carried by one of the members, a stationary housing for the pump, and an electrical supply circuit for the coil comprising a lead from the supply, a lead from the coil and current transmitting means between the leads arranged centrally of the shaft in the pump chamber.

6. An engine cooling apparatus comprising a liquid circulating pump, an air circulating fan, a power driven shaft for the pump, a housing enclosing the pump and a portion of the shaft, an electromagnetic drive interposed between the shaft and pump comprising an input member driven by the shaft, an output member coupled to the fan, and an electromagnetic coil carried by the input member, and an electrical supply circuit for the coil comprising a lead extending from the coil centrally through the shaft terminating in a contact button exposed to the liquid in the pump housing, and a lead extending from the electrical supply through the pump housing terminating in a current contacting member axially juxtaposed the contact button.

7. An eddy current electromagnetic power transmitting mechanism comprising an input member, an output member associated with the input member, an electromagnetic coil carried by one of the members, a source of electrical current for the coil, a liquid chamber associated with one of the members, and current transmitting means for the coil arranged in the chamber.

8. An electromagnetic power transmitting mechanism comprising a power supplied input member, an associated driven output member, an electromagnetic coil arranged on one of the members, a liquid carrying housing associated with one of the members, and an electrical supply circuit for the coil having relatively rotatable current transmitting means arranged in liquid immersed relation in the housing.

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