Sept. 13, 1966 A. G. SABAT 3,272,188

COMBINATION FAN AND WATER PUMP DRIVE

Filed March 2, 1964 2 Sheets-Sheet 1

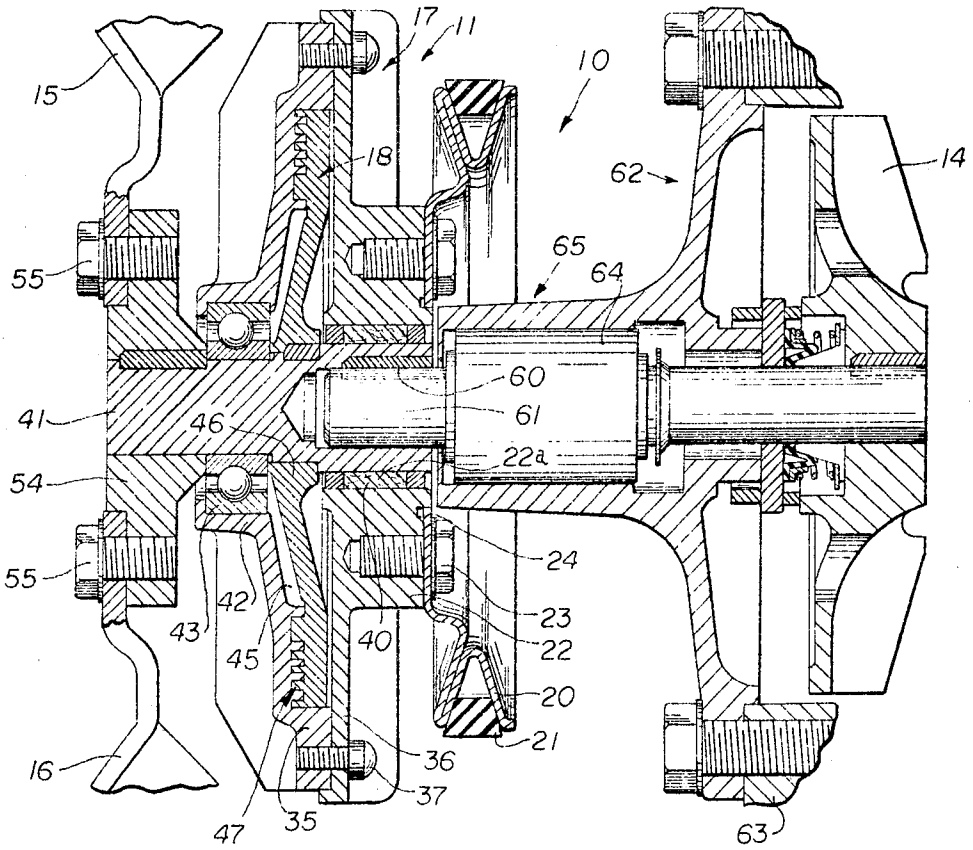


FIG. 1

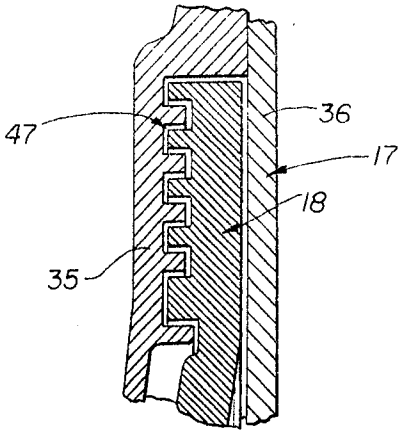


FIG. 2

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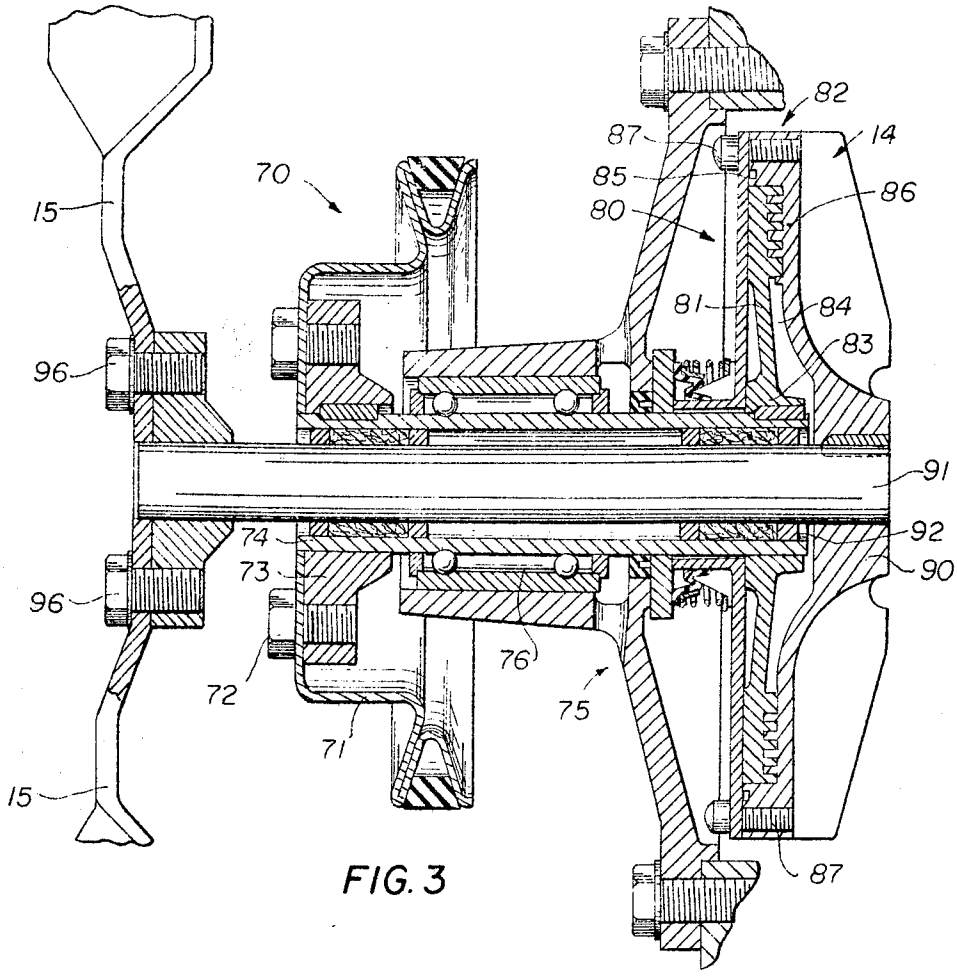


FIG. 3

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COMBINATION FAN AND WATER PUMP DRIVE

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5 Claims. (Cl. 123—41.11)

The present invention relates to a combination drive for automotive accessories, and primarily relates to a common drive for a radiator cooling fan device and a water pump impeller associated with an internal combustion engine.

The internal combustion engine of a vehicle, such as an automobile, has a radiator associated therewith, and a cooling fan device is provided for drawing air through the radiator and blowing the air across the engine. A water pump is also provided to effect the flow of water through the radiator and the air flowing through the radiator cools the water as it flows therethrough. Ideally, the relationship of the fluid flow or water flow through the radiator and the air flow through the radiator should be such as to provide the optimum desired cooling of the water as it flows through the radiator. The air and water flow is dependent upon the speed of operation of the fan device and water pump.

It is common to drive the fan device associated with an internal combustion engine from the engine through a viscous fluid coupling, and the water pump impeller is commonly driven directly from the engine. A viscous fluid coupling is desirable for driving the fan device, as is well known, because its output speed falls off at high input speeds. Since the water pump impeller is driven directly from the engine, at high engine speeds, the speed of the pump impeller is substantially greater than the speed of the fan device.

Accordingly, a principal object of the present invention is the provision of a new and improved combined drive mechanism for a radiator cooling fan device and a water pump impeller associated with an internal combustion engine so that the air flowing through the radiator by the action of the fan device has a constant unvarying relationship with the rate of water flow through the coils of the radiator.

A further object of the present invention is the provision of a new and improved combination drive for a radiator cooling fan device and the impeller element of a water pump for an internal combustion engine including a viscous shear-type fluid coupling for driving the fan device and impeller at all times at substantially the same speeds.

A still further object of the present invention is the provision of a new and improved combination drive for a water pump impeller and fan blades wherein the impeller and fan blades are mounted on a common shaft means driven by a viscous coupling means having an output coupling member secured to the shaft means and rotatable in a fluid reservoir chamber defined by the input coupling member.

Another object of the present invention is the provision of a new and improved combined drive for a water pump impeller and fan blades of a cooling fan device associated with an internal combustion engine wherein the impeller and fan blades are mounted on a common shaft means driven by a viscous fluid coupling having its output member connected to the impeller and defining a fluid reservoir chamber in which the input coupling member rotates.

A further object of the present invention is the provision of a new and improved drive for a water pump impeller member including a viscous fluid coupling wherein the input member of the fluid coupling which drives the impeller rotates in a viscous fluid chamber defined by a housing member, or output coupling member carrying the water pump impeller blades and forming the impeller member.

Further objects and advantages of the present invention will be apparent to those skilled in the art to which it relates from the following detailed description thereof made with reference to the accompanying drawings forming a part of this specification and wherein:

FIG. 1 is an axial sectional view of a drive mechanism embodying the present invention;

FIG. 2 is an enlarged fragmentary sectional view of a portion of the drive illustrated in FIG. 1; and

FIG. 3 is a transverse axial sectional view of a modified drive mechanism embodying the present invention.

The present invention is embodied in a combination drive for accessory devices of an internal combustion engine wherein the accessory devices are driven at all times in a constant timed relation so that an increase in the speed of one device causes at least a proportional increase in the speed of the other device. A drive embodying the present invention is particularly adaptable to drive an impeller of a water pump and the fan blades of a radiator cooling fan device of the internal combustion engine so that the rate of flow of water through the radiator is at all times directly related to the rate of flow of air through the radiator.

Referring now to FIG. 1, a preferred embodiment of the present invention is illustrated as comprising a drive **10** for a water pump impeller **14** and fan blades **15, 16** of a radiator cooling fan device associated with an internal combustion engine, such as in an automobile. The drive **10** includes a fluid drive coupling **11** which drives the water pump impeller **14** and fan blades **15, 16** in a constant timed relationship from the engine. The fluid coupling **11** includes an input coupling member **17** and an output coupling member **18**. The output coupling member **18** in the preferred embodiment drives the fan blades **15, 16** and impeller **14** at all times at the same speed.

The input coupling member **17** of the fluid coupling **11** is driven from the engine by a pulley member **20** and a suitable belt **21** which is trained over the pulley member **20** and is driven from the engine. The pulley member **20** is secured to a hub portion **22** of the input coupling member **17** by means of a plurality of screws **23** which extend through a radially extending portion **24** of the pulley member **20** and into suitable tapped holes in the hub portion **22** for receiving the screws **23**.

The input coupling member **17** of the fluid coupling **11** is rotatably supported by a shaft member **41**. The coupling member **17** comprises a pair of coupling members **35, 36** which are secured together at their outer peripheries by a plurality of screws **37**. The coupling member **36** includes the hub portion **22** which has an opening **22***a* therethrough and is supported for rotation relative to the shaft member **41** by suitable bearings **40** positioned in the opening **22***a* in the hub **22** and encircling the shaft member **41**. Suitable seals are associated with the bearing **40** and encircle the shaft member **41** and prevent fluid leakage therealong, as will be apparent from the description hereinbelow. The coupling member **35** also includes a hub portion **42** and is supported by a suitable bearing means **43** for rotation about the shaft member **41**. The bearing means **43** is positioned in an opening in the hub **42** and encircles the shaft member **41**.

The coupling members **35** and **36** define therebetween a fluid chamber **45** in which the output coupling member **18** rotates. The output coupling member **18** comprises a disk-like member having a hub portion **46** keyed for rotation with the shaft member **41** and positioned between the bearing means **40** and **43**. The coupling mem-

ber 35 and the output coupling member 18 having facing surfaces which include a plurality of cooperating annular lands and grooves, generally designated 47, which provide opposed, spaced parallel surfaces defining a fluid shear space therebetween. A fluid shear medium, such as silicone fluid, in the fluid chamber 45 and specifically in the fluid shear space effects the transmission of torque between the input and output coupling members, as will be described hereinbelow.

From the above description, it should be readily apparent that upon rotation of the pulley member 20, the input coupling member 17 rotates relative to the shaft member 41 and the fluid shear medium in the fluid chamber 45 and, specifically in the shear space defined by the lands and grooves above described, transmits torque from the input coupling member 17 to the output coupling member 18 in a manner well known to those skilled in the fluid coupling art. Rotation of the output coupling member 18 effects rotation of the shaft member 41 to which the output coupling member 18 is keyed.

The shaft member 41 which is rotated by the viscous fluid coupling 11 is connected to the fan blades so as to drive the fan blades upon rotation thereof. The left end of the shaft member 41 is keyed to and supports an annular plate member 54 which is supported on the shaft member 41 and abuts the inner race of the ball bearing assembly 43. The plate member 54 supports the fan blades 15 and 16 which are secured to the plate member 54 by suitable screw members 55.

The right end portion of the shaft member 41 is provided with a passageway or socket 60 which receives and supports the end portion of a shaft member 61. The shaft member 61 is keyed to the shaft member 41 so that the shaft member 61 will rotate upon rotation of the shaft member 41. The shaft member 61 is supported by a housing 62 which is suitably secured to adjacent support structure 63. The shaft 61 rotates relative to the housing 62 and is supported for rotation relative thereto by bearing means 64 which is positioned in an opening in a hub portion 65 of the housing 62. The extreme right end of the shaft member 61, as viewed in FIG. 1, is keyed to the impeller 14 of the water pump associated with the internal combustion engine.

From the above description, the operation of the drive mechanism 10 should be readily apparent. Upon rotation of the pulley member 20, the input coupling member 17 of the fluid coupling 11 is rotated and torque is transmitted to the output coupling member 18 by the shear action of the shear fluid medium in the fluid chamber 45. Rotation of the output coupling member 18 effects rotation of a shaft means which includes the shaft members 41 and 61, thereby causing rotation of the fan blades 15, 16 and the water pump impeller 14 at substantially the same speed. Thus, if at high engine speeds, the output speed of the coupling 11 falls off, the speed of both the fan blades and the water pump impeller falls off.

The modified construction of a drive embodying the present invention, shown in FIG. 3, is similar in function to that shown in FIG. 1 and is designated generally 70. The fluid drive shown in FIG. 3 is effective to drive fan blades 15 and 16 and a water pump impeller 14 from the engine at substantially the same speed. The drive means 70 includes a pulley member 71 driven from the engine by a suitable belt and which is secured by suitable screw members 72 to an annular plate member 73. The annular plate member 73 has a circular opening therethrough through which a hollow shaft member 74 extends and the shaft member 74 is keyed to the plate member 73 for rotation therewith. The shaft member 74 is supported by a housing means 75 which has an opening therethrough through which the shaft member 74 extends, and is supported for rotation relative to the housing means 75 by suitable bearings 76 which are positioned in the opening in the housing means 75.

The drive 70 includes a viscous shear-type fluid coupling 80 including an input coupling member 81 and an output coupling member 82. The input coupling member 81 comprises a disk-like member having a hub portion 83 which is keyed for rotation with the shaft member 74 and which rotates in a fluid operating chamber 84 defined by the output coupling member 82. The output coupling member 82 includes a pair of members, designated 85 and 86 and secured together by suitable screws 87 in the outer periphery thereof. The coupling members 85 and 86 define the fluid chamber 84. The coupling member 86 and the input coupling member 81 are provided with facing surfaces having cooperating lands and grooves which provide opposed, spaced parallel surfaces defining a fluid shear space therebetween. A fluid shear medium located in the fluid shear space is effective to transmit torque from the input coupling member 81 to the output coupling member 82. Thus, upon rotation of the input coupling member torque is transmitted to the output coupling member 82 in a manner well known to those skilled in the art relating to fluid couplings.

The output coupling member 82 comprises the water pump impeller 14 and carries the impeller blades. The impeller 14, and specifically the coupling member 86 thereof, includes a hub portion 90 which is secured to the right end portion of a shaft member 91, as viewed in FIG. 3. The shaft member 91 extends through the hollow shaft member 74 and is supported for rotation relative thereto by axially spaced bearings 92 and 93 which encircle the shaft 91 and engage the inner surface of the hollow shaft member 74. The left end of the shaft member 91, as viewed in FIG. 3, is keyed to an annular support plate 95 which, in turn, carries the fan blades 15 and 16. The fan blades 15 and 16 are secured to the support plate 95 by suitable screw members 96.

From the above description, it should be readily apparent that the drive 70 functions in much the same manner as the drive 10 to effect rotation of the water pump impeller 14 and fan blades 15 and 16 at substantially the same speed. This provides for an improved operation of the cooling system in a vehicle utilizing the drive arrangements and is particularly effective to maintain a controlled rate of water flow through the radiator in proportion to air flow through the radiator at high engine speeds. As the engine speed increases, the fluid couplings 11 and 80 inherently function to drive the fan blades and water pump impeller at greater speeds. However, at extremely high engine speeds, the output speed of the fluid couplings does not increase proportionately and the output speed commonly is said to taper off or fall off so that proportionately the fan blades and water pump impeller are driven at a lower speed ratio at high engine speeds. This is particularly advantageous in that at high engine speeds, it is not necessary to drive the fan or water pump impeller at a speed directly dependent on engine speed and, in most cases, substantial horsepower is lost and a large amount of noise is created by driving the fan and water pump impeller at a speed higher than which is necessary.

While the preferred embodiment of the present invention has been described hereinabove in considerable detail, it is to be understood that certain modifications, changes, and adaptations may be made therein by those skilled in the art and it is hereby intended to cover all such modifications, changes, and adaptations which fall within the scope of the appended claims.

Having described my invention, I claim:

1. A drive for fan blades and a water pump impeller comprising a shaft means carrying said fan blades and water pump impeller, a viscous fluid coupling means operatively connected with said shaft means for driving said shaft means, said coupling means comprising an input coupling member and an output coupling member, said output coupling member defining a fluid chamber and drivingly connected with said shaft means, said input coupling member being rotatable in said chamber and

being drivingly connected with a hollow shaft which encircles and extends co-extensively with said shaft, and means for rotating said hollow shaft means thereby effecting rotation of said input coupling member and in turn rotation of said fan blades and water pump impeller.

2. A drive for fan blades and a water pump impeller as defined in claim 1 wherein said water pump impeller includes a plurality of impeller blades carried by said output coupling member.

3. A drive for an internal combustion engine radiator cooling fan device having fan blades for effecting air flow through the radiator and a pump having an impeller for effecting fluid flow through the radiator comprising fluid coupling means having an input coupling member to be driven from the engine and an output coupling member, said input and output coupling members having opposed spaced surfaces defining a fluid shear space therebetween cooperable with a fluid shear medium for transmitting torque therebetween to continuously effect driving of the output coupling member upon rotation of the input coupling member with the speed of rotation of said output coupling member increasing at a given rate as engine speed increases through a low speed range and at a lesser rate as engine speed increases above the low speed range, means for driving said fan blades and pump impeller from said output coupling member including shaft means fixedly connected to said output coupling member for rotation therewith, said shaft means fixedly supporting the fan blades and the pump impeller and driving the pump impeller and fan blades upon rotation of said output coupling member at an angular speed corresponding to the angular speed of said output coupling member so that the fan blades and pump impeller are increased in speed at a given rate through a low engine speed range and at a lesser rate as engine speed increases above the low speed range.

4. The drive as defined in claim 3 wherein said shaft means includes first and second shaft members and means rigidly connecting said shaft members and holding said shaft members against relative rotation, said fan blades carried by one of said shaft members and said pump impeller carried by the other of said shaft members.

5. A drive as defined in claim 3 wherein said output coupling member carries said impeller and has impeller blades connected thereto.

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