June 18, 1935. A. B. MODINE 2,005,468

ENGINE COOLING DEVICE

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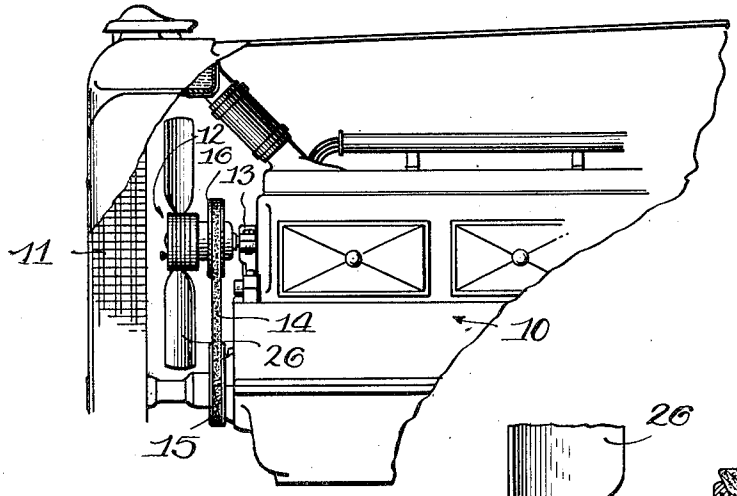


Fig. 1

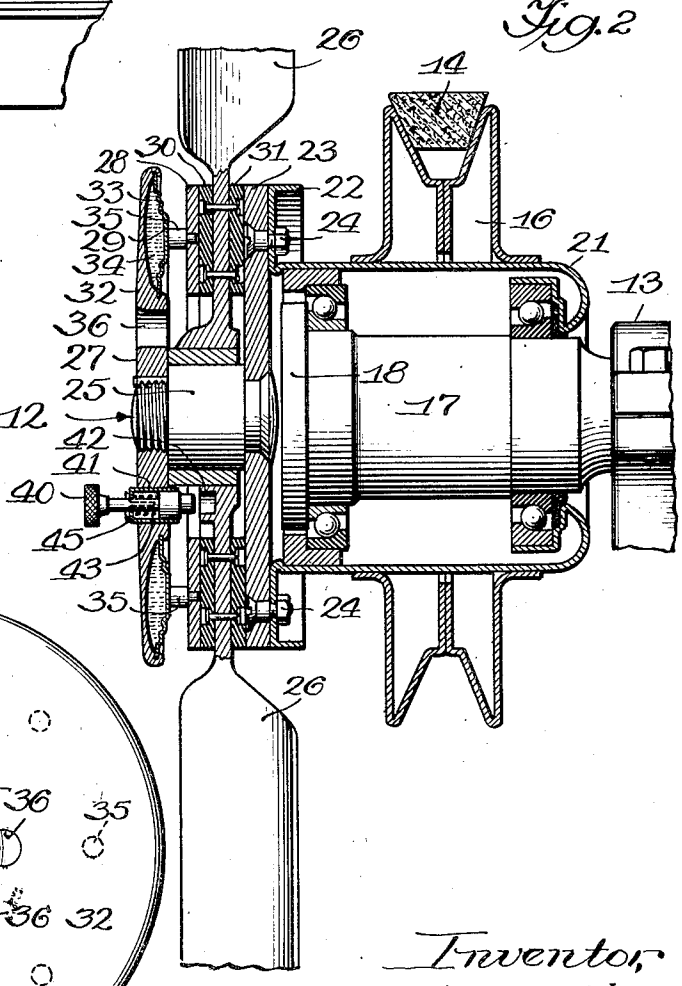
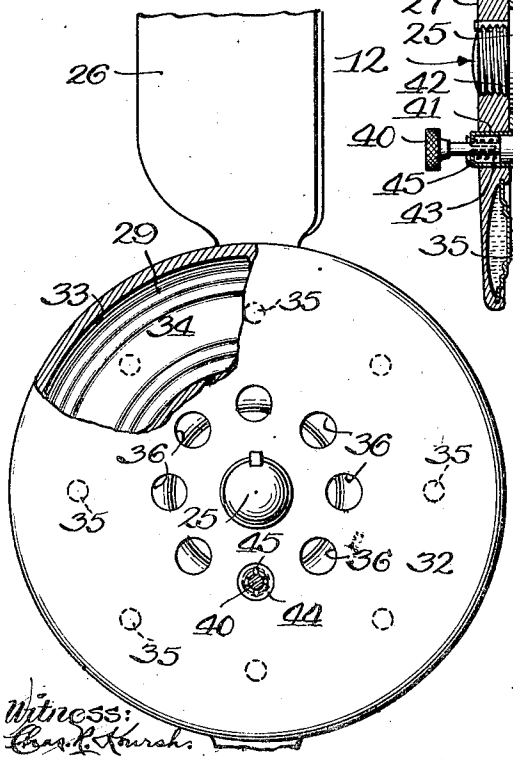


Fig. 2

Fig. 3



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ENGINE COOLING DEVICE

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13 Claims. (Cl. 236—35)

This invention relates to a means for accomplishing the cooling effect of an internal combustion or other engine, in which the cooling is accomplished in accordance with the temperature of a medium employed as a cooling agent to thus effect a saving in the consumption of fuel required to cause cooling of said engine.

The invention has, among its principal objects, the provision of means for accomplishing the above and other objects, the means including air advancing means operable at speeds dependent upon atmospheric temperatures or variations in temperature generated by operation of said engine. The invention also has as an object, the utilization of a thermal responsive element and the combination therewith of an air advancing means, the thermal responsive element providing means for controlling actuation of the air advancing means and causing the same and a means for driving said air advancing means to be actuated at corresponding or relatively different speeds dependent upon atmospheric temperature changes or temperature changes generated by operation of the engine.

The invention also has as an object the provision of means whereby air is caused to circulate into functionally operative relation with the thermal responsive element of the structure to thereby cause the air advancing means and the means for rotating said air advancing means to be moved into and out of effective relation with each other.

It is also an object of the invention to construct the thermal responsive element so that it may confine a volatile.

Another object of the invention is to provide means for releasably locking the air advancing means and the driving means with each other to thereby provide means whereby these devices may, when found necessary or desirable, be positively connected in driving relation with each other.

The invention has these and other objects, all of which will be explained in detail and more readily understood when read in conjunction with the accompanying drawing which illustrates one embodiment of which the invention is susceptible, it being manifest that changes and modifications may be resorted to without departing from the spirit of the appended claims forming a part hereof.

In the drawing:—

Figure 1 is a side elevation of a portion of an automobile and an engine providing a motor therefor, showing the invention applied thereto.

Figure 2 is a central section through the air advancing means illustrated in Figure 1; and

Figure 3 is a front elevation partially in section of the structure shown in Figure 2.

The invention is herein shown and described in conjunction with an automotive vehicle, which embodies the use of an internal combustion engine generally designated 10, having a heat exchange device or radiator 11 connected in the circulatory system for cooling the liquid usually employed for maintaining the engine in a cool condition. An air advancing means, generally designated 12, is shown disposed between the heat exchange device or radiator 11 and the engine 10. This air advancing means generally designated 12, is mounted for support upon an adjustable arm 13, the air advancing means being actuated through the medium of a belt 14, a pulley 15 connected with the crank shaft of the engine, and a pulley 16, the latter being adapted to be connected in driving relation with the air advancing means. The air advancing means, generally designated 12, is, as before stated, mounted upon an adjustable arm 13, the latter having a stub shaft 17 extending from one end thereof upon which the pulley 16 for actuating the air advancing means is rotatably mounted. This stub shaft 17 has an enlarged head 18 to assist in holding the pulley 16 and associated elements such as the air advancing means, generally designated 12, in proper rotatable relation with the shaft 17. The shaft 17 provides a support for the air advancing means and means for actuating said air advancing means, and anti-friction means may be employed to reduce resistance to operation of said means. In the particular structure illustrated for driving the air advancing means a shell 21 is involved to which the pulley 16 is immovably fixed. This shell 21 has an annular flange 22, the latter having a metallic disk 23 secured thereto, the disk being secured to the shell or housing 21 through the agency of a plurality of bolts and nuts 24. This metallic disk 23 provides a support for a stub shaft 25, one end thereof being securely connected with the disk. This stub shaft 25 provides means for rotatably supporting the impeller blades 26 of the air advancing means, generally designated 12, and in addition, provides means for supporting a thermal responsive element, generally designated 27, which is threadedly connected and keyed to the shaft 25 so that said element 27, stub shaft 25 and disk 23 will rotate in unison with the shell 21 and the pulley 16. The thermal responsive element 27

also involves the use of a friction ring 28, which is secured to a diaphragm 29 of the thermal responsive element, so that upon expansion and contraction of the diaphragm 29 the friction ring 28 will be moved into and out of functional engagement with the friction ring 30 secured to one side of arms which are part of the blades 26. These arms are further provided with a friction ring 31 which, when the diaphragm 29 is actuated, will cause movement of the friction ring 31 into frictional driving relation with the adjacent face of the disk 23 and will thus cause unitary rotation of the fan and disk. The thermal responsive element, generally designated 27, involves in its construction a disk-like member 32 having one face thereof formed to provide an annular recess 33, which is closed by the diaphragm 29 and thus provides a chamber 34 in which a volatile may be confined. This diaphragm or expansible and contractable element 29 is provided with a plurality of pins or connectors 35 which extend from the diaphragm to the ring 28 and thus connect these elements with each other and provide means for transmitting motion from the diaphragm 29 to the ring to thereby apply pressures in varying degrees to the friction rings designated 30 and 31 and the disk 23, which thus causes the fan or air advancing means to be rotated at the same speed as the pulley 16 or at lesser speeds, depending upon the degree of pressure exerted by the thermal responsive element.

It may be here stated that the air advancing means, generally designated 12, is mounted upon the shaft 25 so as to provide for axial movement of the air advancing means relatively to the shaft and therefore under certain conditions of temperature the pulley 16, the disk 23 and the thermal responsive element, may be rotated relatively to the air advancing means and either impart no motion thereto or impart motion at corresponding or lesser speeds than that of the pulley 16. The member 32 of the thermal responsive element, generally designated 27, is provided with a plurality of apertures 36 which allow air to circulate therethrough into functionally operative relation with the diaphragm 29 and the volatile contained in the chamber 34 and cause extension or contraction of the diaphragm and thus move the friction ring into and out of operative relation with the friction rings 30, 31 and the disk 23. The device also involves the use of a means for effecting a positive driving connection between the element 32, associated elements, and the impeller blades of the air advancing means. The means for forming said positive driving connection between the various elements hereinabove referred to may, as illustrated, employ a pin 40 which is mounted for movement in an aperture 41 provided in the member 32. This pin is of a length which allows it to extend through said member 32 and into a recess 42 provided in one of the arms of the impeller and has a spring 43 associated therewith to move and hold said pin in said recess. Said pin 40 is provided with a stop 45, which, when the pin is moved outwardly, disposes the stop 45 so that upon rotation it may cooperate with the face of the housing 44 and hold the pin out of functionally operative relation with said recess 42, it being manifest that when the pin is rotated and released, the catch 45 will be disposed to allow the spring to act and form the positive driving connection hereinbefore referred to.

Since the structure provides a means for operating the air advancing means only when required and at speeds depending upon atmospheric temperature or temperature of air heated by operation of the engine, it is believed evident that a material saving in fuel will thus be effected. It is also manifest that atmospheric temperatures below a certain degree will affect the diaphragm and cause its contraction sufficiently to prevent cooperation between the air advancing means or impeller and the driving element therefor, which will thus prevent operation of the impeller and eliminate consumption of power to cause its actuation. It is further evident that the structure is such that temperature rises of air will affect the diaphragm and cause the impeller to be driven at variable speeds resulting in a saving in consumption of power necessary to cause operation of the impeller. It is also believed evident that the structure embodies means for effecting a positive driving connection between the impeller and the driving means and, therefore, should it be found necessary or desirable, these elements may be connected with each other for operation in the usual manner.

Having thus described the invention, what I claim and desire to cover by Letters Patent is:—

1. In a device of the kind described, the combination of air advancing means, means for actuating said air advancing means a shaft extending from said actuating means upon which said air advancing means is mounted and temperature responsive means mounted upon said shaft for effecting a driving connection between said actuating means and air advancing means, said shaft being rotatable with said temperature responsive means and the actuating means and said air advancing means being located between said actuating means and said temperature responsive means.

2. In a device of the kind described, the combination of air advancing means, and rotatable means for actuating said air advancing means, said rotatable actuating means including temperature responsive means unitarily connected for rotation with said actuating means and having a portion movable into functionally operative and inoperative relation with said air advancing means to effect rotation and release of the latter.

3. In a device of the kind described, the combination of air advancing means, and means for driving said air advancing means, said driving means including a rotatable member temperature responsive means and an element connecting said rotatable member and temperature responsive means for unitary rotation independent of said air advancing means, said air advancing means being mounted upon said element, an element of said temperature responsive means being movable into functionally operative and inoperative relation with said air advancing means to effect releasable rotation of the latter.

4. In a device of the kind described, the combination of air advancing means and rotatable means for actuating said air advancing means, said actuating means including spaced elements connected with each other for rotation independent of said air advancing means, one of said elements providing temperature responsive means movable into functionally operative and inoperative relation with the said air advancing means to effect releasable rotation of the air advancing means, said air advancing means being located between said elements of said actuating means.

5. In a device of the kind described, the combination of air advancing means and rotatable

means for actuating said air advancing means, said actuating means being rotatable independently of said air advancing means, said actuating means having a portion rotatable therewith providing a friction surface and having a shaft extending from said portion providing a support for said air advancing means, temperature responsive means secured to said shaft for rotation with said shaft, said temperature responsive means having an element spaced from said aforementioned friction surface, and said temperature responsive means being operable to effect releasable engagement between said element thereof, the air advancing means and said friction surface of said actuating means to thereby cause releasable rotation of said air advancing means.

6. In a device of the kind described, the combination of air advancing means, and rotatable means rotatable independently of said air advancing means for actuating said air advancing means, said rotatable actuating means including a driving element and temperature responsive means connected for unitary rotation with said driving element and having a frictional element movable into and out of functionally operative relation with said air advancing means to effect rotation and release of the latter.

7. In a device of the kind described, the combination of air advancing means and means rotatable independently of said air advancing means for actuating said air advancing means, said actuating means including a pulley and temperature responsive means connected with the pulley for unitary rotation with said pulley, the temperature responsive means having a portion movable to effect rotation of the air advancing means with said pulley.

8. In a device of the kind described, the combination of air advancing means and means rotatable independently of said air advancing means for actuating said air advancing means, said actuating means including a pulley and temperature responsive means connected to provide a unit rotatable relatively to air advancing means and having a portion movable relatively to the pulley to effect releasable engagement of the air advancing means and said pulley.

9. In a device of the kind described, the combination of air advancing means and means rotatable independently of said air advancing means for actuating said air advancing means, said actuating means including a pulley, a member extending from said pulley upon which said air advancing means is mounted, temperature responsive means connected to an end of said member, said temperature responsive means having a portion movable to effect movement of said air advancing means longitudinally of said member to thereby releasably engage the air advancing means and cause rotation thereof by said pulley.

10. In a device of the kind described, the combination of air advancing means, and means for actuating said air advancing means, said last mentioned means including a rotatable member, having a plate one face of which is formed to provide a chamber, said chamber being closed by a temperature responsive element which is movable to effect releasable engagement between said actuating means and air advancing means.

11. In a device of the kind described, the combination of air advancing means, and rotatable means for actuating said air advancing means, said rotatable means including a pulley and temperature responsive means unitarily connected for rotation with said pulley, said temperature responsive means being mounted in spaced relation to an end of said pulley, a shaft extending from said end of said pulley upon which said temperature responsive means is immovably fixed, annular friction elements secured to said air advancing means and said temperature responsive element being formed of a rigid plate having one face formed to provide a chamber, a distendable and contractable element closing said chamber and having means for cooperating with one of said frictional elements to effect driving engagement of said air advancing means with said pulley.

12. In a device of the kind described, the combination with an engine, air advancing means, temperature responsive means connected with the engine for constant rotation during operation of the engine, said temperature responsive means providing means controlling operation of said air advancing means by said engine.

13. In a device of the kind described, the combination of a pulley, an element carried by said pulley located at one side of said pulley providing a friction surface, a stud shaft fixed to said element, a temperature responsive element arranged in spaced relation to said element and secured to said stud shaft, said temperature responsive element, pulley and first mentioned element providing a rotatable unit, air advancing means mounted upon said stud shaft, said unit being rotatable independently of said air advancing means and said temperature responsive means providing an element of means for causing unitary rotation of said air advancing means and said rotatable unit.

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