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C. B. SPASE
FAN CONTROL FOR THE COOLING SYSTEMS
OF AUTOMOTIVE ENGINES

2,506,520

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2 Sheets-Sheet 1

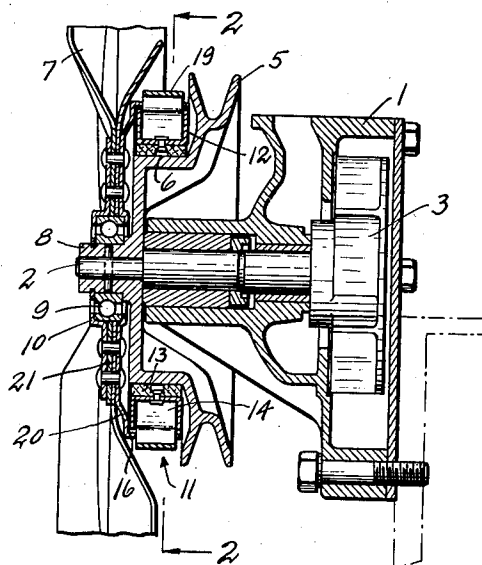


FIG. 1.

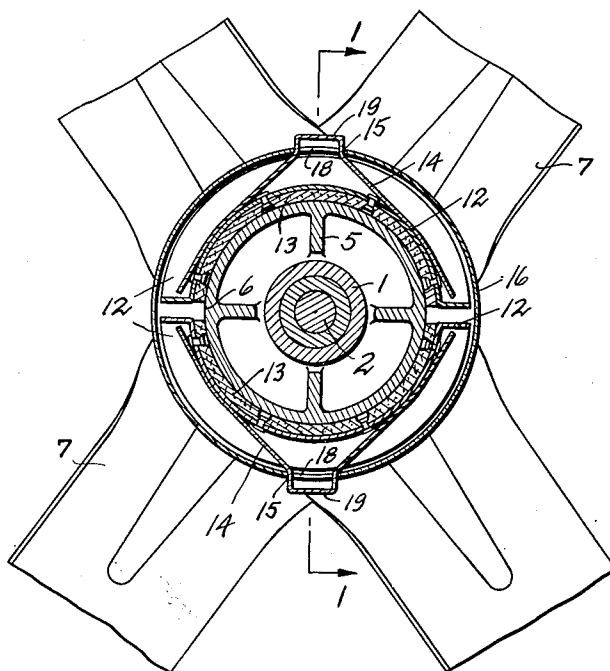


FIG. 2.

INVENTOR:
Charles B. Spase,
BY *Bodell & Thompson*
ATTORNEYS.

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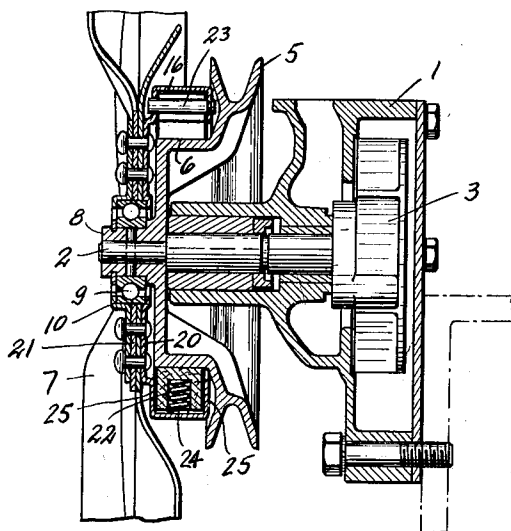


FIG. 3

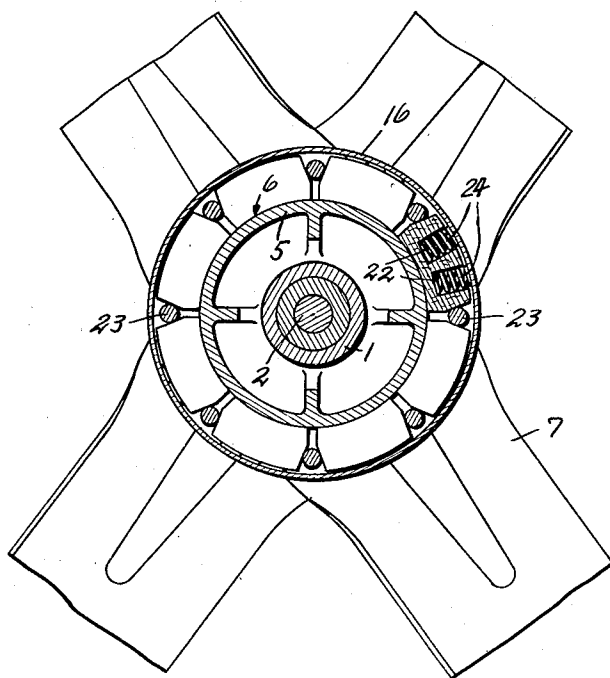


FIG. 4

INVENTOR:
Charles B. Spase,
BY
Bodell & Thompson
ATTORNEYS.

UNITED STATES PATENT OFFICE

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FAN CONTROL FOR THE COOLING SYSTEMS
OF AUTOMOTIVE ENGINESCharles B. Spase, Nedrow, N. Y., assignor to Lipe-
Rollway Corporation, Syracuse, N. Y., a corpo-
ration of New York

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7 Claims. (Cl. 230—271)

1

This invention relates to controls for the fan as the radiator fan of the cooling systems of internal combustion engines, and has for its object a particularly simple and economical construction of the fan control by which the fan is unclutched and free to windmill under the air current created by the vehicle speed above a certain or predetermined R. P. M. of the engine when the fan is not needed, which clutch is controlled by the speed of the fan so that the force required to rotate the fan is delivered at high vehicle speed to the drive wheels of the vehicle and hence, the fuel consumption reduced below what it would be if the fan was always being actuated at engine speeds.

More specifically, it has for its object a centrifugally operated clutch between a drive shaft and the fan, which clutch is operated by the speed of the fan and releases and windmills when a predetermined R. P. M. is developed, but again engages when the windmill effect created by the vehicle speed falls below a predetermined R. P. M. of the fan.

The invention consists in the novel features and in the combinations and constructions hereinafter set forth and claimed.

In describing this invention, reference is had to the accompanying drawings in which like characters designate corresponding parts in all the views.

Figure 1 is a side view, in longitudinal section, on line 1—1, Figure 2.

Figure 2 is an end view at a right angle to Figure 1 on line 2—2, Figure 1.

Figures 3 and 4 are similar views of a slightly modified form of the fan control clutch.

1 designates a water circulating pump casing mounted at the front end of the engine block; 2 the pump shaft on which the rotor 3 of the pump is mounted within the casing 1.

5 designates an engine actuated drive wheel mounted on the front end of the shaft 2, the wheel being here shown as a pulley over which a V belt runs. The wheel 5 is shown as provided with an annular and preferably cylindrical peripheral friction surface at 6. As is well understood, the pump shaft in several makes of automobiles is located in the rear of the radiator of the cooling system. The surface 6 is located on the side of the wheel toward the radiator.

7 designates the fan. The fan has heretofore been mounted to rotate as a unit with the shaft 2, or the drive wheel 5. However, in this control system the fan is mounted to rotate about the shaft 2 and the wheel 5. As here shown, the fan

2

is mounted on the hub 8 of the wheel 5, and an antifriction bearing 9 is located between the hub 8 and the hub 10 of the fan, so that when the fan is released, or unclutched, from the wheel 5, it is free to windmill, or free wheel, the windmilling being caused by the current of air passing through the radiator under the movement of the vehicle into the air. The wheel 5 is an engine actuated wheel or pulley for the shaft 2 on which the fan 7 is mounted through an antifriction or free wheeling bearing 9.

The means for disengaging the fan when a predetermined R. P. M. is developed comprises friction clutch members 11 carried by and rotatable with the fan, these being shown in Figures 1 and 2 as two oppositely disposed nearly semi-circular sections 12 having arcuate friction linings or shoes 13 embracing and spring biased to normally contact the friction surface 6 of the wheel 5. The sections 12 are pressed to engage the shoes 13 with said surface by spring means, as pairs of spring arms 14, each pair being anchored at 15 at their outer ends to a holder 16 rotatable with the fan. The holder encircles the sections 12 to which the friction lining or sleeves of the clutch are attached. The sections 12 are shown as in the form of a channel with the friction sleeves secured to the outer side of the bottom of the channel. The holder is a cylindrical band formed with slots or perforations 18, and each pair of springs is formed with a projection 19 interlocked into the perforations 18. The spring arms 14 extend tangentially inwardly in the channels of the sections 12 and press on the inner side of the bottom of the channel and hence, press the friction shoes 13 against the surface 6.

The holder 16 is coupled by means of an inwardly extending annular flange 20 to the web 21 of the fan between the fan blades and the hub 10 of the fan, so that the holder 16 rotates with the fan. As the engine, and hence the pump shaft 2 and the fan develop a certain R. P. M. the spring arms 14 and the sections 12 are thrown outwardly by the centrifugal force, carrying the friction shoes 13 off the face 6 and thus releasing the fan so that it is no longer actuated by the pump shaft and is free to windmill under the air current created by the vehicle when the vehicle is traveling at a predetermined speed.

When the engine speed and hence the speed of the shaft 2 is high and the vehicle speed low, as when the vehicle is in second or low gear, the fan windmills too slowly to hold the centrifugal members disengaged, the clutch reen-

3

gages and the fan rotates at high engine speed.

In Figure 3, the friction shoes are in the form of blocks and compression springs 24 are located in radial bores 22 in the blocks between the bottoms of the bores and the peripheral wall of the holder 16 which rotates with the fan, and these blocks are held from circumferential shifting and confined to radial shifting under the action of the centrifugal force by transverse pins 23 between the sides 25 of the holder 16 which, in Figures 3 and 4, is channel shaped. The holder 16, in Figures 3 and 4, is connected to the fan by an inwardly extending flange 20 similar to that shown in Figure 1.

The fan control thus comprises a normally engaged spring biased clutch including two co-acting elements, one element being an engine actuated driver, as the wheel 5, and the other element being fixed to the free wheeling fan and having centrifugally operated means carried thereby, as the friction sections 12, Figure 1, or the friction blocks, Figure 4, coacting with the annular outer friction face 6 on the wheel 5, and shiftable out of engagement therewith under the centrifugal force of the fan to release the fan of the engine actuated shaft.

In either construction, as the predetermined R. P. M. is reached, the fan is released under the action of the centrifugal force, and the fan is again cut in when needed when the R. P. M. drops below the predetermined R. P. M. In either construction, the fan is unclutched when the vehicle is traveling at a comparatively high speed and the engine running above a predetermined R. P. M. and the cooling effect, due to the vehicle traveling through the air, is sufficient to cool the engine and also cause the fan to windmill. When the engine speed is high as, for instance, above 1200 R. P. M., and the vehicle speed low so that the air current created by the vehicle as it travels is not sufficient to cause the fan to windmill or over-run the shaft 2, the clutch reengages and the fan is again actuated at engine speed.

What I claim is:

1. A fan control for the cooling systems of automotive engines including an engine-driven shaft, an engine-actuated drive wheel mounted on the shaft and adapted to rotate therewith, a fan freely rotatably mounted on the said drive wheel in advance thereof, a normally engaged spring biased clutch including a part of the drive wheel as one element thereof and another element fixed to the said fan, said other element including centrifugally operated means carried thereby to disengage the clutch when a predetermined R. P. M. of the fan is attained and allowing the fan to freely rotate relatively to the wheel and the shaft.

2. A fan control for the cooling systems of automotive engines including a rotatable driving shaft, means for driving the said shaft, a drive wheel fixedly secured and rotatable with the said shaft, a fan, the drive wheel having an annular surface serving as one element of a clutch and a laterally extending extension of smaller diameter upon which the fan is adapted to freely rotate relative thereto, another element of the clutch fixedly secured to the fan and including spring biased clutch members which normally engage the annular surface of the drive wheel and rotatable therewith and which members, due to centrifugal force, when a predetermined R. P. M. has been reached, disengage from the annular surface of the drive

4

wheel and allow the fan to rotate relatively to the said wheel and shaft.

3. A fan control for the cooling systems of automotive engines including a driving element and a driven fan element and a driving shaft, the driving element being affixed to and rotatable with the driving shaft, the fan element being mounted on and capable of rotating relative to the said driving element and shaft, each element having clutch means embodied therewith, said clutch means comprising friction elements solely resiliently retained in the driven element and which friction elements are normally in frictional engagement with the complemental element of the clutch of the driving element, and the said friction elements being adapted to move radially outwardly to be disengaged from the driving element due to centrifugal force and allowing the driven element to freely rotate relative to the driving element and the said shaft.

4. A fan control for the cooling systems of automotive engines including a rotatable shaft, a driving wheel fixed to and rotatable with said shaft and including an annular friction means engaging surface and a reduced laterally extending hub portion, a fan concentrically rotatably disposed with respect to said shaft and the reduced portion of the driving wheel and mounted on the said reduced portion of the wheel, a substantially circular clutch housing fixed to the said fan, spaced friction elements solely resiliently retained in the said housing and normally resiliently and frictionally in engagement with the said annular surface on the driving wheel to drive the fan with the said wheel, and when the said friction elements are resiliently urged by centrifugal force away from the annular surface on the said wheel due to rotation of the fan, the fan will thus be allowed to rotate freely relative to the said wheel and shaft.

5. A fan control for the cooling systems of automotive engines including a rotatable shaft, a driving wheel fixed to and rotatable with said shaft and including an annular friction means engaging surface and a reduced laterally extending hub portion, a fan concentrically rotatably disposed with respect to said shaft and the reduced portion of the driving wheel and mounted on the said reduced portion of the said wheel, a substantially circular clutch housing fixed to the said fan, spaced friction block elements disposed in the housing for free radially inward and outward movements, a spring bearing against an outer portion of each of the said friction elements and the interior of said housing to solely resiliently normally engage the said friction elements with the annular surface of the said wheel to drive the fan with the said wheel, and when the said friction elements are resiliently urged by centrifugal force away from the annular surface on the said wheel due to rotation of the fan, the fan will thus be allowed to rotate freely relative to the said wheel and shaft.

6. A fan control for the cooling systems of automotive engines as defined in and by claim 5, wherein the said friction applying blocks are each provided with a recess, and a coil spring is partially positioned in said recess with the exposed end of the springs in engagement with the interior wall of the clutch housing.

7. A fan control for the cooling systems of automotive engines including a rotatable shaft, a driving wheel fixed to and rotatable with said shaft and including an annular friction means engaging surface and a reduced laterally extend-

5

ing hub portion, a fan concentrically rotatably disposed with respect to said shaft and the reduced portion of the driving wheel and mounted on the said reduced portion of the wheel, a substantially circular clutch housing fixed to the said fan, friction elements retained in said housing, spring means including arms carried by said housing and extending tangentially relative to the annular surface embracing each of the friction elements to normally resiliently frictionally engage the said annular surface on the driving wheel to drive the fan with the wheel, and when the said friction elements are resiliently urged by centrifugal force away from the annular surface on said wheel due to rotation of the fan, the fan

6

will thus be allowed to rotate freely relative to said wheel and shaft.

CHARLES B. SPASE.

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