July 2, 1963 H. C. COX 3,095,766

FAN REVERSING MECHANISM

Filed March 31, 1961

FIG. 3

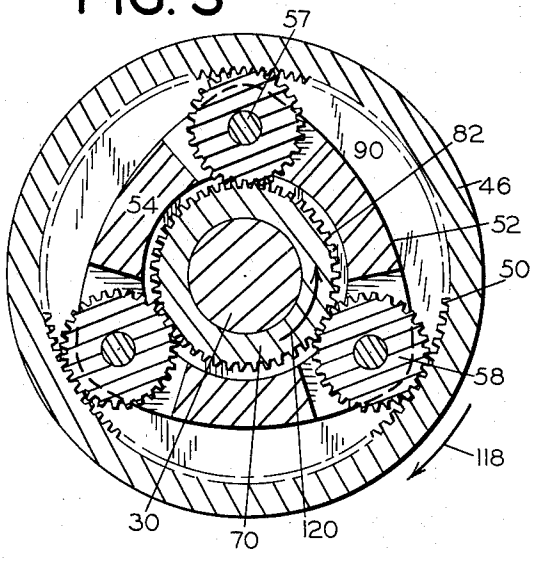
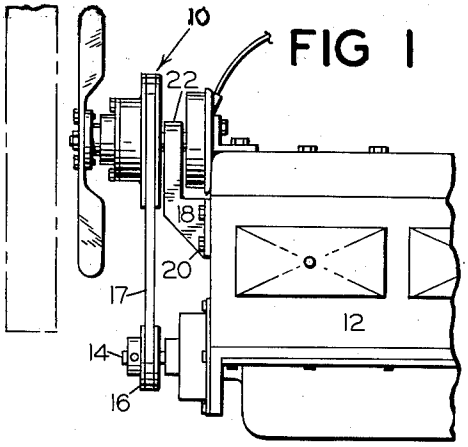


FIG 1



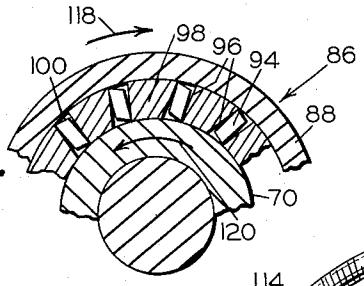


FIG. 4

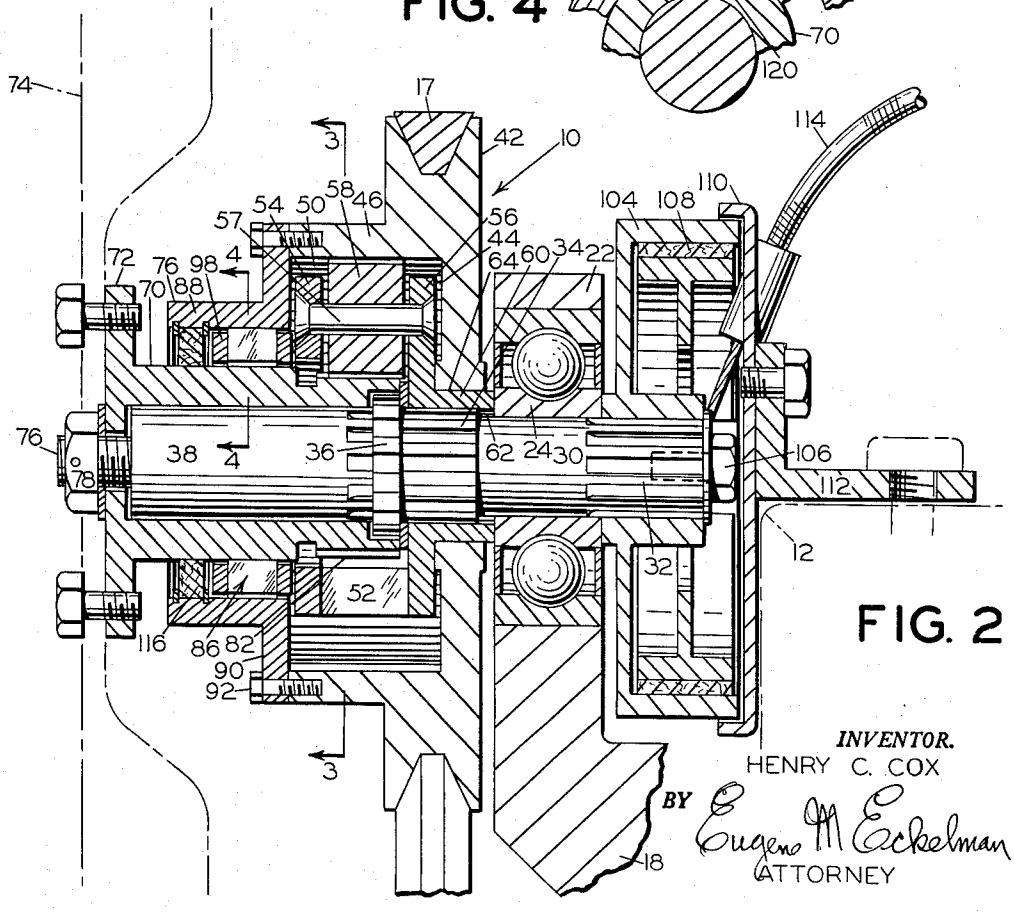


FIG. 2

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FAN REVERSING MECHANISM

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This invention relates to new and useful improvements in fan reversing mechanisms.

The radiators of heavy equipment, either stationary or movable, are frequently subjected to dust or other debris which soon collects thereon in an amount sufficient to cause overheating of the engine. When this condition exists, it is necessary to shut the equipment down and clean the radiator. The shutting down of such equipment comprises a loss of valuable working time for the equipment and personnel. It is therefore a primary object of the present invention to provide improvements in fan reversing mechanisms of the type adapted to provide a reverse flow of air through the radiator for cleaning the latter.

More particularly, it is an object of the present invention to provide a fan reversing mechanism which is more effective in removing dust or debris from a radiator than conventional devices.

A further object is to provide a fan reversing mechanism having ratio drive means in a reverse direction accomplishing efficient cleaning of the radiator.

A further object is to provide a fan reversing mechanism which is relatively inexpensive to manufacture and which may be installed readily on new or existing equipment.

Briefly stated, the present fan reversing mechanism embodies structure supported at the forward end of an engine behind the radiator on a bearing and bearing support. This mechanism employs means for rotating the fan normally in a forward direction with the engine crankshaft and in reverse direction by means under the control of the operator. For the purpose of reversing the fan there is employed a stub shaft upon which is operative a braking mechanism and a reversing gear mechanism, and by an arrangement to be more fully described hereinafter, upon holding the shaft in a stationary position by the brake means the fan is driven in the reverse direction at a greater speed by a ratio arrangement of the reversing gear mechanism.

The invention will be better understood and additional objects will become apparent from the accompanying specification and claim considered together with the drawings wherein:

FIGURE 1 is a side elevational view of the present fan reversing mechanism as installed on an engine;

FIGURE 2 is a longitudinal sectional view through the fan reversing mechanism;

FIGURE 3 is a sectional view taken on the line 3—3 of FIGURE 2 illustrating particularly the reversing gear mechanism; and

FIGURE 4 is a fragmentary sectional view taken on the line 4—4 of FIGURE 2 showing one-way clutch means which is operative in the normal or forward functioning of the fan.

Referring now in particular to the drawings and first to FIGURE 1 the present reversing mechanism, designated generally by the numeral 10, is adapted to be mounted on the forward end of a vehicle engine 12 having the usual crankshaft 14, drive pulley 16, and fan belt 17. For mounting the reversing mechanism 10 on the engine there is employed an upstanding bearing bracket 18 secured to the forward end of the engine by suitable means as by studs 20. Referring particularly to FIGURE 2, bearing bracket 18 integrally supports on its upper end a bearing 22 having an inner race 24 supported on a

stub shaft 30. Inner race 24 is mounted on the shaft 30 in a fixed condition, as by means of a press fit.

Shaft 30 has a pair of splined portions designated as rearward splined portion 32 and forward splined portion 34, an enlarged spline ring 36 at the forward end of the splined portion 34, and a machined forward bearing surface 38.

Driven by fan belt 17 is a fan pulley 42 having a forwardly opening groove 44 and a forwardly extending flange 46. The inner periphery of pulley 42 has gear teeth forming a ring gear 50.

Housed interiorly of pulley 42 is a planet gear assembly 52, FIGURES 2 and 3 having end mounting plates 54 and 56 rotatably supporting by means of pins 57 planet gears 58 which mesh exteriorly with ring gear 50. End plate 56 of the planet gear assembly has a rearwardly projecting hub 60 with internal splines 62 meshing with splines 34 on the stub shaft 30, the hub 60 being confined longitudinally between bearing 22 and spline ring 36. Fan pulley 42 has a central opening 64 receiving the hub 60 in a rotatable bearing connection.

Journaled on the forward bearing surface 38 of shaft 30 is a sun gear hub 70 having a flange 72 to which is suitably secured a fan 74. For the purpose of holding the hub 70 on the shaft 30 the latter is provided with a forwardly projecting threaded stud 76 for receiving a nut 78 bearing on the forward end of the hub.

The inner or rearward end of the hub 70 is provided with gear teeth 82 forming a sun gear meshing with planet gears 58 whereby a gear connection is provided between the fan pulley 42 and the hub 70. A gear ratio in reverse drive, to be described more fully hereinafter, is provided in this gear assembly, said gear ratio comprising preferably about two and one-half to one, although other ratios may be utilized. More particularly the gear assembly is such that in reverse rotation and with the shaft 30 locked in non-rotative position, the fan will be caused to rotate two and one-half times as fast as the pulley 42.

Included in the reversing mechanism is a one-way clutch or drive assembly 86, FIGURES 2 and 4, having an outer ring 88 provided with a flange 90 by means of which the said ring 88 is bolted by bolts 92 to the forward end of flange 46 of pulley 42. The inner surface of ring 88 and the outer surface of sun gear hub 70 serve as the clutching surfaces for teeth or inserts 94 confined in slots 96 in a cage member 98, the slots 96 being outwardly inclined in the direction of forward rotation, and the teeth 94 having inclined ends 100 whereby a drive connection between ring 88 and hub 70 is provided in one direction only, i.e. in a forward direction. Thus, in forward operation the one-way clutch establishes a drive connection between the pulley 42 in sleeve 70, and the entire assembly including said pulley and sleeve and the planet gear assembly rotate together in a one-to-one drive.

Means are provided for locking the shaft 30 against rotation to thus provide a reverse drive for the fan, such means comprising a brake drum 104 having a splined connection with the rear portion 32 of the shaft. Drum 104 is held on the shaft by a stud 106 threadedly mounted in the end of the shaft. Brake shoes 108 and an end plate 110 are securely supported on an angle anchor bracket 112 secured to the upper forward end of the vehicle engine. A brake shoe operating cable 114 extends from the brake shoe assembly to the operating controls of the vehicle, whereby the operator can apply the brake when desired which operates to lock the shaft 30 in a non-rotative position.

The present reversing mechanism is provided with

suitable and necessary seals and spacers according to conventional practice.

Operation

In all operations of the vehicle, including forward and reverse rotation of the fan, fan pulley **42** and of course its flange **46** and the clutch ring **88** are operated in a clockwise direction as viewed in FIGURES 3 and 4, i.e., in the direction of arrows **118** in these figures. In the normal or running operation of the vehicle the brake shoes **108** are disengaged from the drum **104** whereby the shaft **30** is permitted to turn. In such normal operation, the teeth **94** of clutch **86** establish a drive connection between ring **88** and hub **70** and thus, the pulley **42**, planet gear assembly **52**, and the hub **70** rotate as a unit.

When it is desired to reverse the fan to clean out dust or debris from the radiator, the cable **114** is operated to cause brake shoes **108** to engage drum **104** and thus lock the shaft **30** against rotation. Since hub **60** of the planet gear assembly **52** is splined to the shaft **30** such assembly will also remain stationary. Therefore, as clearly seen in FIGURE 3, upon rotation of ring gear **50** in the direction of arrow **118**, sun gear **82** on the sun gear hub **70** is caused to rotate in a reverse direction, i.e. in the direction of arrows **120**, the clutch mechanism **86** in this reverse drive being in free wheeling. The fan thus rotates in reverse, and by the gear ratio provided, the fan is caused to rotate at high speed, especially when speeding up the vehicle engine. Such high rotational speed of the fan efficiently belows out dust or debris from the radiator.

While operating the reversing mechanism, the equipment, if of the movable type, may or may not be halted, it being preferred however that the equipment be stationary so that the full air velocity from the fan is utilized to clean the radiator and no air velocity resulting from forward movement resists such cleaning action. The present reversing mechanism may also serve to speed up engine warming in that, when reversed, it will not pull in cold air through the radiator.

It is to be understood that the form of my invention, herewith shown and described, is to be taken as a preferred example of the same, and that various changes in

the shape, size and arrangement of parts may be resorted to, without departing from the spirit of my invention, or the scope of the subjoined claim.

Having now described my invention and in what manner the same may be used, what I claim and desire to protect by Letters Patent is:

A fan reversing mechanism for a vehicle engine comprising a pulley having a forwardly projecting annular flange the inner surface of which has gear teeth to form a driving gear member, a shaft, bearing bracket means disposed rearwardly of and adjacent said pulley and engageable with said shaft, said bracket having a projecting portion adapted to be secured to a vehicle engine and support the mechanism on a vehicle engine, a planet gear assembly splined to said shaft and disposed interiorly of said flange, said planet gear assembly being in meshing relation with said driving gear member, a fan supporting sun gear rotatably mounted on said shaft and meshing with said planet gear assembly, a one-way clutch having a positive drive connection between said fan supporting sun gear and said driving gear member in forward drive, radially expandable locking means engageable with said shaft rearwardly of said bearing bracket means for locking said shaft in a non-rotative position to hold said planet gear assembly stationary and produce reverse rotation of said fan supporting sun gear, said planet gear assembly establishing a ratio drive in reverse rotation for driving said fan supporting sun gear at a greater speed than said driving gear member, and anchor bracket means on said locking means adapted to be secured to a vehicle engine to assist said bearing bracket in supporting the mechanism on the engine.

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