

April 16, 1957

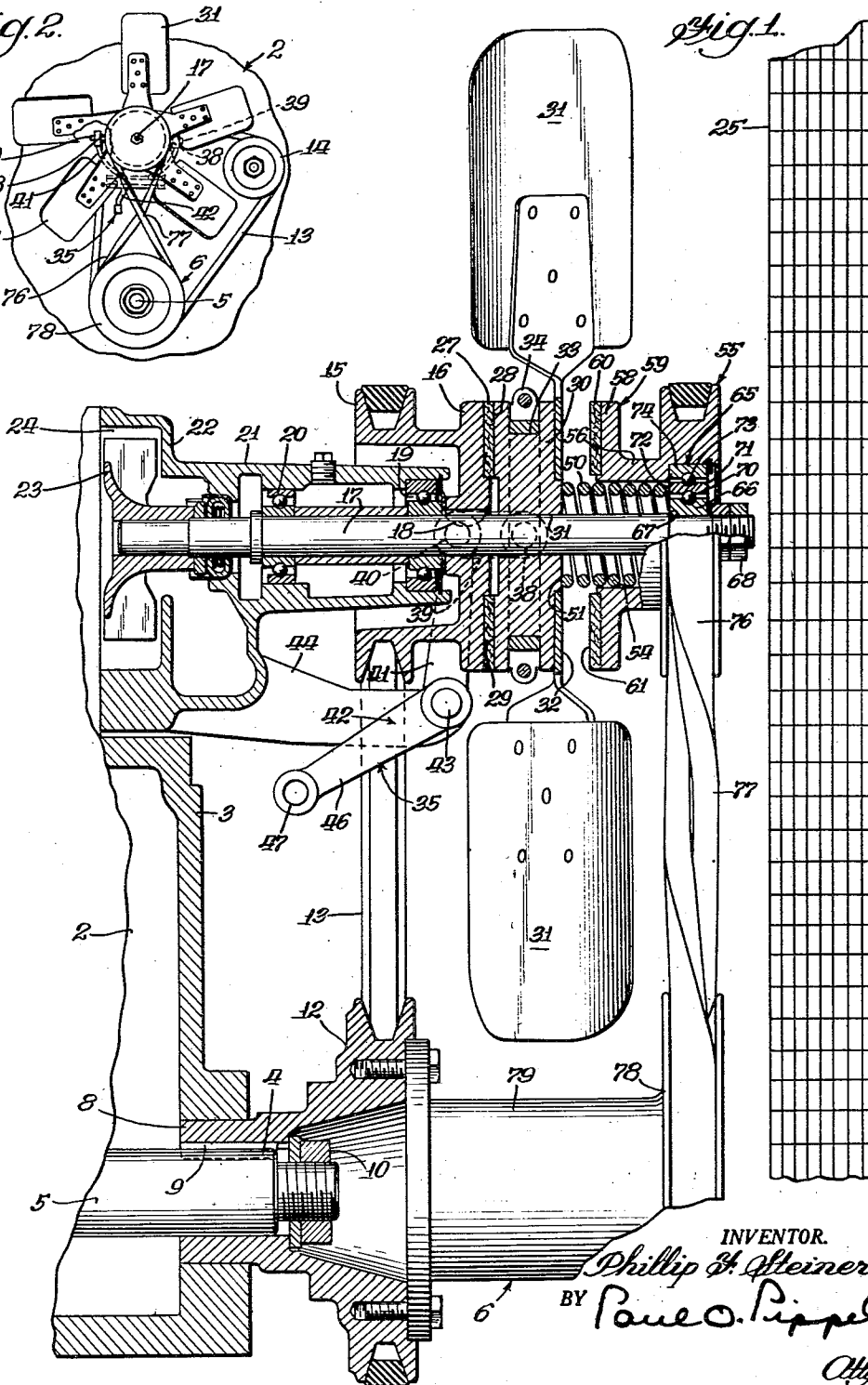
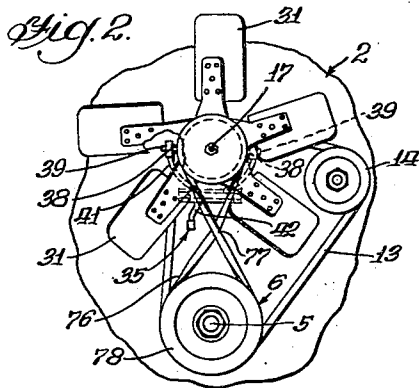
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REVERSIBLE DRIVE FOR ENGINE FANS

Filed Feb. 11, 1955

2 Sheets-Sheet 1



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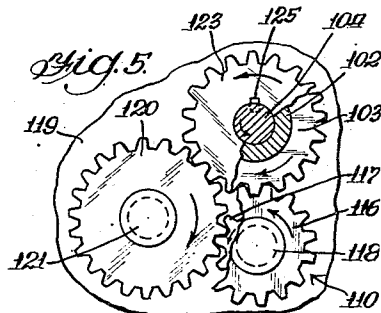
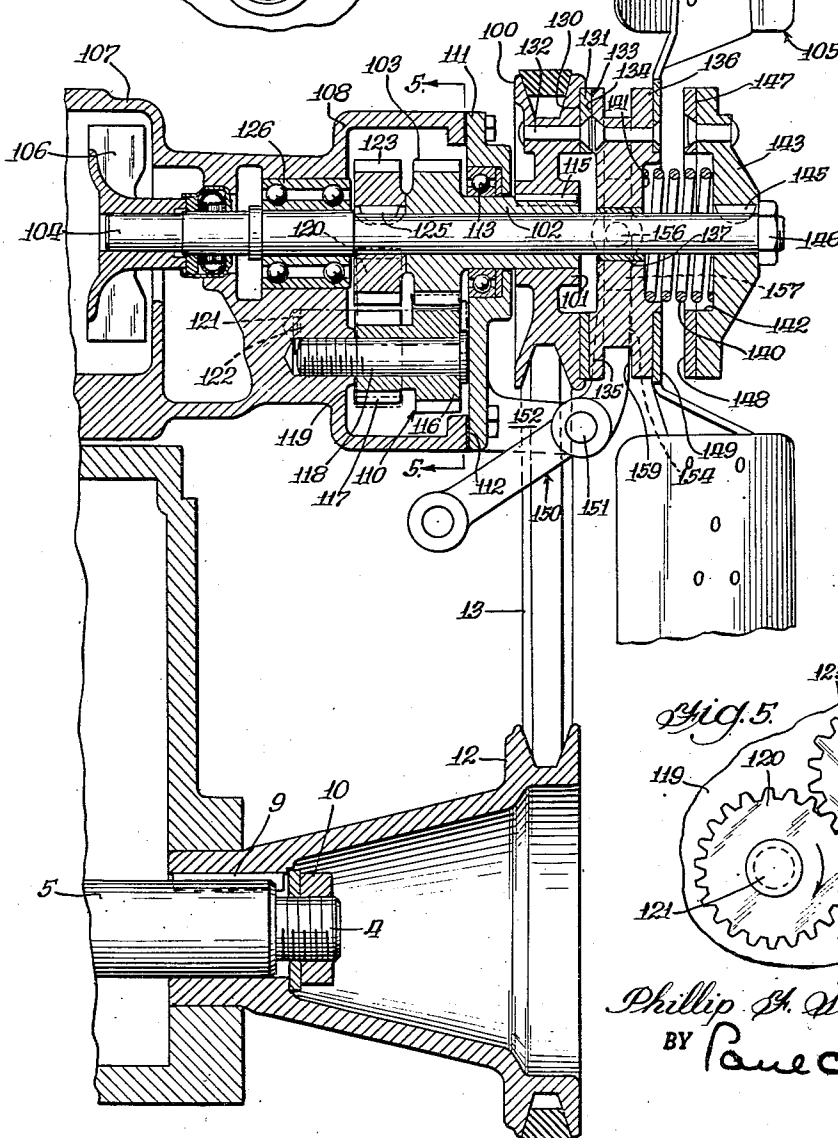
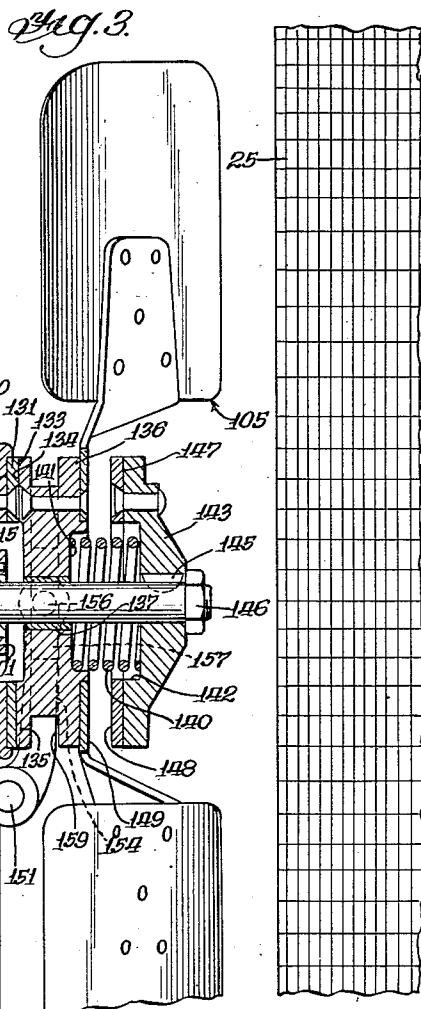
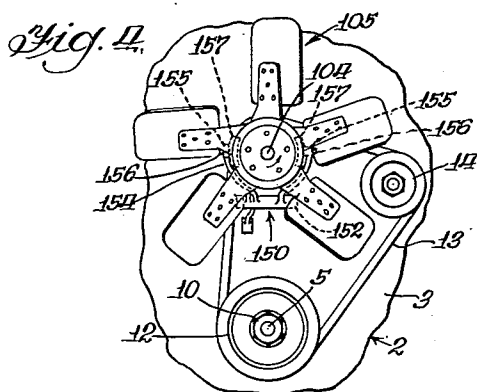
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REVERSIBLE DRIVE FOR ENGINE FANS

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2 Sheets-Sheet 2



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2,788,775

REVERSIBLE DRIVE FOR ENGINE FANS

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2 Claims. (Cl. 123—41.46)

This invention relates to a drive mechanism for alternately driving the fan of an internal combustion engine in either of two directions.

A general object of the invention is to provide a simple and efficient drive mechanism which is adaptable for incorporation in current fan driving mechanisms without the necessity of extensive or complete reworking of the basic engine or fan mounting or drive structures.

A more specific object of the invention is to provide a novel driving mechanism on the basis of the previous object which functions to reverse the drive and thus the rotation of the fan at the selection of an operator.

The object of reversing the rotation of the fan is to periodically blow air reversely through a radiator which is normally positioned in front of the fan and through which the fan normally draws the air to cool the liquid coolant for the engine, as will be readily understood by those skilled in the art, the reverse blowing functioning to clean the radiator of chaff, dirt and the like.

These and other objects of the invention will become more apparent from the specification and the drawings, wherein:

Figure 1 is a longitudinal vertical sectional view of the fan driving and engine mechanism shown in association with the radiator;

Figure 2 is a front view on a reduced scale of the assembly shown in Figure 1;

Figure 3 is a view comparable to Figure 1 showing a modified form of the invention;

Figure 4 is a front view on a reduced scale of the structure shown in Figure 3; and

Figure 5 is a sectional view on line 5—5 of Fig. 3 of the gear cluster for reversing the drive.

Describing the invention in detail, and referring to Figs. 1 and 2, the engine generally designated 2 may be of any conventional design which includes an engine block forwardly from which projects the front end 4 of an engine crankshaft 5. The forward end 4 of the crankshaft mounts a double pulley unit or structure 6 which includes the hub portion 8 sleeved over and keyed at 9 to the forward end 4 of the crankshaft and retained thereon as by nut 10 threaded on the end 4, as will be readily apparent from Figure 1. The unit 6 incorporates a rear pulley 12 which drives the conventional fan belt 13 which is trained about a generator pulley 14 and a water pump drive pulley 15. The pulley 15 has a radial disk-like portion 16 which is sleeved over the water pump shaft 17, and keyed thereto as at 18 for driving the same.

The water pump shaft 17 is journaled on a pair of axially spaced bearings 19 and 20 which are carried within a bearing holder 21 which is formed integral with the water pump housing 22 of conventional construction, and which is mounted and connected to the engine block 3 in the usual manner as will be understood by those skilled in the art.

The shaft 17 is connected to an impeller 23 which operates within the pump chamber 24 of the housing 22 for circulating the coolant for the engine 2.

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It will be understood that a water pump connection assembly is of the conventional type which has its shaft extending fore and aft of the radiator 25 which is positioned in what is normally known as the front end of the engine unit transversely to shaft 17.

The radial disk portion 16 of the pulley assembly 15 is provided with a friction clutch element 27 connected thereto as by bonding and the friction element 27 provides a radial frictional clutch face 28 which is normally engaged with an opposed radial clutch face 29 on a fan support or carrier 30 which is an annular member provided with a circular, central bore 31 which is sleeved over an outward extension of the shaft 17 for support thereby.

The fan hub member 30 is connected to a plurality of radially outwardly extending fan blade assemblies 31 and intermediate its rear and forward friction clutch faces 29 and 32 is provided with a circumferential groove 33 which receives a split collar assembly 34 therein of an operating assembly generally designated 35. It will be understood that the collar or ring 34 and the fan hub are relatively rotatable and that the ring 34 is provided at diametrically opposite sides with trunnion posts 38 to which are pivoted the forward ends of links 39 which are pivoted at their rear end 40 to the leg portion 41 of a clutch shifter fork 42 which is pivoted at 43 on a fulcrum member 44 which, in the present instance, is shown as projecting forwardly from the pump housing and formed integral therewith and positioned beneath the fan driving assembly. The shifter fork assembly 35 has a downwardly and rearwardly extending operating arm 46 which is adapted for connection at its rear end 47 to an associated operating linkage as will be readily understood by those skilled in the art, such as for example a rod or any adequate linkage which will bring the control within ready reach of an operator at his normal station.

The carrier 30 of the fan assembly is normally urged into engagement with its face 29 against the clutch face 28 of the clutch portion 16 of the rear pulley assembly 15, as constituted by the portions 16 and 27, by means of a compression spring 50 which is sleeved over the outward extension of the shaft 17 of the water pump and seats at its rear end as at 51 against the forward face 32 of the fan hub, the spring 50 extending forwardly into a center-bore 54 of the reverse drive pulley assembly generally indicated 55 and which comprises a hub portion 56 sleeved over the outer forward end of the shaft 17, the rear end of the hub portion 56 being provided with an annular disc-like portion 58 of a clutch assembly generally designated 59, the disk 58 having an annular clutch element or friction member 60 connected to its rear side and the clutch member 60 presents a radial clutch surface 61 on its rear side for complementary engagement with the clutch face 32 on the forward side of the hub assembly of the fan structure.

The front pulley structure 55 is carried on the shaft 17 by means of a bearing assembly 65 which includes an inner race 66 which is sleeved over the shaft 17 and at its inner edge abuts a shoulder 67 and at its outer edge is held tight to the shaft by means of a nut and washer assembly 68 which is on the outer end of the shaft 17. The inner race may carry a plurality of balls 70 which may support an intermediate race 71 which on its inner edge 72 affords a seat for the outer end of the compression spring 50. The intermediate race supports a series of balls 73 which are enclosed within the outer race 74 which is fitted into the front pulley 55 and interlocked therewith between a shoulder thereof and the conventional snap ring as will be readily understood by those skilled in the art.

The front pulley 55 is driven by a belt 76 which is twisted as shown at 77 in order to reverse the rotation

of the pulley assembly 55 as respects to the pulley assembly 15 and the belt 76 is trained about the front pulley 78 which is carried by an extension 79 connected to the principal fan belt driving pulley 12.

Mode of operation

In operation the mechanism is disposed in its normal position, as shown in Figure 1, whereat drive is established from the crankshaft 5 through the pulley 12, the belt 13, the sheave assembly 15, to the clutch 27 which is engaged with the hub member 30 through the influence of the spring 50 which is compressed between the hub assembly 30 and the bearing assembly 65, the fan assembly thus rotating in the same direction as the sheave assembly 15.

The sheave assembly 15 also drives the shaft 17 and thus the impeller 23 in order to circulate the coolant fluid through the engine.

If the operator should wish to reverse the drive for rotation of the fan assembly in order to blow the air forwardly through the radiator and thus blow out dirt and chaff and the like which accumulates therein, the operator manipulates the fork assembly 35 by rotating it in a clockwise direction, as seen in Figure 1, whereupon the hub clutch 30 of the fan is disengaged from the clutch 16, 27 and moved forwardly against the compression of the spring 50 to engaged position of the forward face 32 of the fan hub with the rear friction face 61 of the clutch portion of the front pulley 55 and inasmuch as this pulley assembly 55 is rotating reverse to the pulley assembly 15 because of the reversed belt 77, the fan will be rotated in a direction reverse to that normally rotated and, therefore, will blow the air forwardly through the radiator there in front.

To discontinue this drive the operator merely releases the fork assembly 35 and the release spring 50 will expand and will disengage the hub 30 from the friction element 60 and engage it with the friction elements 27 disposing the parts in the position shown in Figure 1.

Describing Figures 3-5, the general arrangement is similar to the previous and wherein parts are identical with those of the previous embodiment of Figures 1 and 2 they are identified by corresponding reference numerals. The fan belt 13 is trained about and drives a sheave or pulley 100 which has a hub 101 sleeved over the hollow shaft or tubular member 102 of a gear 103 which is sleeved over the shaft 104 which serves as a combination support for the fan assembly, generally designated 105, and the drive for the impeller 106 which operates within the pump housing 107, which housing 107 incorporates a gear case 108 which encloses the beforementioned gear 103 and a countershaft gear cluster generally designated 110. The forward edge of the casing 108 is provided with a closure plate 111 which is bolted to the forward margin 112 of the gear case portion 108 and carries a bearing 113 which journals the hub extension 102 of the gear 103. The pulley 100 is keyed as at 115 to the member 102 and thus drives the gear 103 which meshes with the gear 116 of the countershaft gear cluster 110. The gear 116 is formed integral with the coaxial gear 117 and both gears, 116 and 117 being journaled on the countershaft 118 which is carried by the inner wall portion 119 of the gear case portion 108. The gear 117 drives an idler gear 120 which is carried on a shaft 121 which in turn is supported at 122 from the rear wall portion 119 of the gear case 108. The idler gear 120 meshes with the output gear 123 which is sleeved over the pump propeller shaft 104 and keyed thereto as at 125 for transmitting drive to the shaft 104, the shaft 104 being rotatably supported by bearing 126 in the rear wall portion 119 of the gear case 108 and extending into the pump housing and thereat being connected to the impeller 106.

The sheave 100 has a forward radial face 130 to which is connected as by rivets a radial clutch member 131

of a suitable friction material such as brake lining and connected to the sheave as by rivets 132. The clutch member 131 has a forward facing radial side 133 which engages an opposed radial clutch face 134 of a clutch member 135 disposed at and connected to the back side of a fan hub assembly 136. The fan hub assembly 136 is sleeved over the shaft 104 and journaled thereon as by bearing 137 and provided with a plurality of outwardly extending fan blade assemblies 105.

The fan blade assembly 105 is normally biased or urged rearwardly into engaging position of the clutch members 135 and 131 along their faces 134, 133 whereby the fan is rotated in the same direction as the sheave 100, by means of a compression or return spring 140 which at its rear end extends into a well or a pocket in the front side of the hub assembly 136 and seats against a forwardly facing seat surface 141 of said hub. The spring 140 is sleeved over and concentric with the shaft 104 and at its forward end extends into a pocket 142 of a reverse drive clutch member 143 which is a substantially radially extending disk-like member sleeved over the shaft 104 and keyed thereto as by a key 145 and retained on the shaft by means of a nut 146 threaded on the forward outer end of the shaft 104. The clutch member 143 is provided with a clutch element 147 which presents a radial clutching friction surface 148 engageable with a complementary forwardly facing forward clutch surface 149 provided on the front side of the fan hub assembly 136.

Operation of the embodiment of Figures 3-5

In operation the fan assembly 105 is normally driven in the direction of rotation of the sheave 100 and the shaft 104 is driven in the reverse direction through the medium of the countershaft gear cluster 110.

Should the operator desire to periodically reverse the direction of the rotation of the fan assembly 105, he would merely actuate the shifting fork assembly 150 by rotating it in a clockwise direction, as seen in Figure 3, about the axis of the shaft 151 upon which it is mounted, the shaft 151 being carried on a fulcrum member 152 which is formed integral with the cover plate 111 of the gear case portion of the pump assembly. Such rotation of the shifter fork assembly 150 will move the upright fork members 154 to the right and rotate the upper ends 155 about the journal or trunnions 156 carried by bearing block or actuator members 157 at opposite sides of the hub assembly 136 within an annular groove 159 therein. The described movement of the shifter fork assembly 150 is reflected in a forward movement to the right as seen in Figure 3 of the hub assembly 136 of the fan mechanism 105 whereby disengaging the clutch members 130 and 135 and engaging the forward clutch face 149 of the hub assembly with the rear clutch face 148 of the reversely driven clutch member 143, as respects to the sheave 100. If the operator desires to obtain normal operation, he merely releases the fork lever assembly 150 and the spring 140 which has been compressed expands and urges the hub assembly 136 into engagement with the sheave 100.

What is claimed is:

1. For use with a liquid-cooled power unit of the type embodying an engine having a crankshaft with a belt pulley member keyed thereto for rotation therewith, a radiator in front of the engine, and a combined fan mounting and water pump impeller drive shaft member rotatably supported from said engine and projecting toward the radiator, the improvement comprising: a rear clutch element and a forward clutch element mounted on the shaft and spaced axially from each other, means drivingly interconnecting said rear clutch element with said shaft member for rotating the latter, a sheave connected to said rear clutch member, a belt drivingly interconnecting said pulley member with said sheave for driving the latter and constituting the primary drive, another

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pulley member connected to said crankshaft, means including a twisted belt drivingly interconnecting said front clutch element with said other pulley member for rotation in a direction reverse of that of said rear clutch member, a fan assembly having a hub rotatably mounted on said shaft member, said hub interposed between said front and rear clutch elements and having a rear clutch face normally engageable with said rear clutch member and having a front clutch face engageable with said front clutch member, said hub selectively shiftable axially on said member to engaged position of its rear clutch face with said rear clutch member for rotation therewith in one and the principal direction and said hub member shiftable to engaged position of its front clutch face with said front clutch member for rotation in the reverse direction.

2. In a reversing drive for a fan of an internal combustion engine, a support including a rotatable shaft extending outwardly therefrom, a pair of axially spaced clutch elements mounted on said shaft, a fan assembly having a center portion interposed between said elements and spindled upon said shaft for rotation and axial movement relative thereto, means for driving said clutch elements in reverse directions, a return spring compressed between one of said elements and said center portion for

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urging the center portion axially of said shaft into engagement with the other of said elements for rotation thereby, shifting means operatively associated with said center portion and operative to move said fan assembly axially of the shaft, attendant to compression of said spring, into engagement of its center portion with said one element for rotation thereby, and in combination an engine crankshaft driven pulley assembly, and a separate belt driving each clutch element from said pulley assembly, one of said belts being twisted for reversing the drive and associated with said one clutch element and disposed outwardly of said fan assembly on the end of said shaft remote from said support, said other element and associated belt being disposed close to said support and constituting the main and normal drive for said fan assembly.

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