Aug. 24, 1965 K. W. NICHOLSON ETAL 3,202,144

FAN REVERSING

Filed May 17, 1963

Fig. 1.

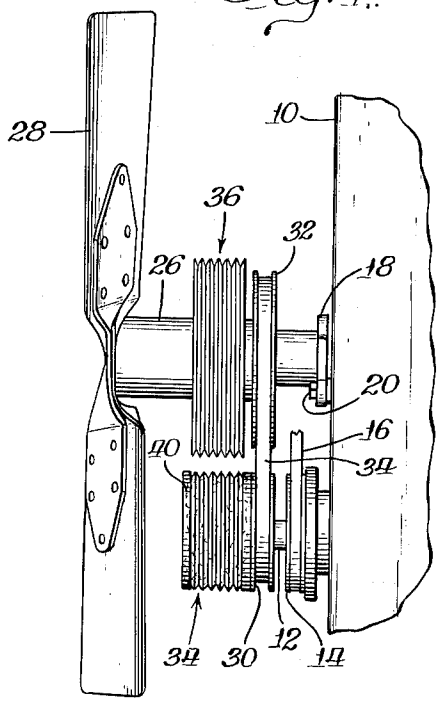


Fig. 2.

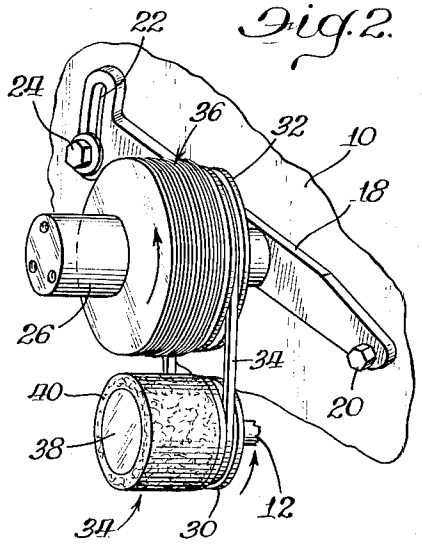


Fig. 3.

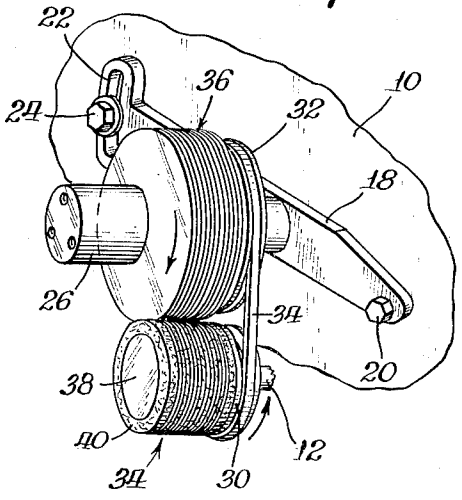
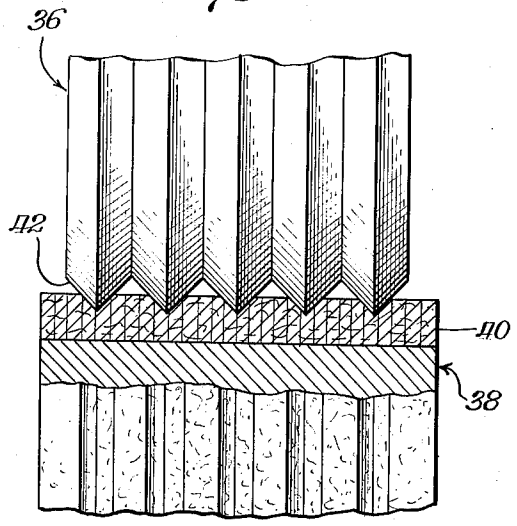


Fig. 4.



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United States Patent Office 3,202,144 Patented Aug. 24, 1965

3,202,144

FAN REVERSING

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Filed May 17, 1963, Ser. No. 281,102
3 Claims. (Cl. 123—41.49)

This invention relates generally to internal combustion engines and more particularly to a mechanism for cleaning the fins of radiators associated with such engines.

Attendant to normal operation of certain agricultural machines such as, for example, combine harvesters, is the build-up of thick clouds of dust. This results in an accumulation of dust and other foreign particles on the fins of radiators associated with internal combustion engines serving to drive the machines. This build-up on the radiator fins causes a serious reduction in effective cooling efficiency, often resulting in overheating of the engine. Cleaning of this dust and other material from the radiator fins is necessary in order to insure proper cooling. Heretofore it has required that operation of the machine be suspended periodically so that such cleaning might take place. The primary object of this invention is to provide means for quickly and easily effecting this cleaning without necessitating interruption in operation of the machine.

Another object of this invention is to provide means for changing the direction of air flow passing over the radiator fins so as to blow dust and foreign particles therefrom.

Another object of this invention is to provide means for reversing the direction of rotation of the radiator fan so as to cause a reversal in the direction of airflow over the radiator fins, thereby clearing the fins of dust and other foreign particles accumulated thereon.

Another object of this invention is to provide means for reversing the direction of rotation of the radiator fan, which means also serves to absorb thrust generated by the fan during its rotation in the reverse direction.

These and other objects of this invention will become apparent to one skilled in the art upon examination of the specification herein along with the accompanying drawing in which:

FIGURE 1 is a diagrammatic side elevational view showing the reversing mechanism;

FIGURE 2 is a diagrammatic perspective view showing the drive means in the forward driving position;

FIGURE 3 is a diagrammatic perspective view showing the drive means in the reverse driving position; and

FIGURE 4 is an enlarged diagrammatic view showing the reverse drive and reverse thrust absorbing means.

Briefly, the invention involves a fan normally rotated in a forward direction by V-drive means which in turn is driven from an associated internal combustion engine. Rotation of the fan in its forward direction directs a stream of air past the fins of an associated radiator, which air stream tends to transfer heat from water flowing through the radiator. Disengagement of the V-drive means is effected by pivotal movement of a lever which thereupon engages friction drive means so as to rotate the fan in a reverse direction. Reverse rotation of the fan directs a rapid stream of air in the reverse direction past the fins of the associated radiator. This reverse flow cleans dust and foreign particles from the fins, thereby insuring proper efficiency of the cooling process. The reverse drive means is so constructed and arranged as to be self-aligning and to absorb thrust developed by the fan during its reverse rotation.

Turning now more specifically to the drawing, an internal combustion engine 10 is provided with a countershaft 12 upon which is secured a V-belt pulley 14. Cooperative with V-belt pulley 14 is a V-belt 16 which serves to transmit power from the engine drive shaft (not shown) to countershaft 12.

An arm 18 is pivotal relative to engine 10 about a pivot pin 20 secured thereto. The end of arm 18 is enlarged and forms a slot 22 through which extends a locking nut 24. A shaft 26 extends from arm 18 in a direction generally parallel to countershaft 12. Shaft 26 is mounted on a suitable bearing (not shown) which allows free rotatability of shaft 26 and a fan 28 secured thereto.

A pair of V-belt pulleys 30 and 32 are mounted respectively on countershaft 12 and shaft 26. A V-belt 34 cooperates with V-belt pulleys 30 and 32 to transfer power from countershaft 12 to rotate shaft 26 and its associated fan 28. Alternatively, power may be transferred directly from the engine drive shaft to shaft 26, thereby eliminating countershaft 12. In this event pulley 30 and friction drive wheel 38 would be mounted on the engine drive shaft.

Friction driven wheel 36 and friction drive wheel 38 are mounted respectively on shaft 26 and countershaft 12. Friction drive wheel 38 may be formed from an abrasive material such as, for example, that used to form brake linings, or may include an abrasive outer portion formed from such a material. Friction driven wheel 36 provides a plurality of hard, serrated or poly-V-grooves at its outer surface 42 for engagement with abrasive portion 40 of friction drive wheel 38.

It has been found that frictional engagement between outer surface 42 of friction driven wheel 36 and abrasive portion 40 of friction drive wheel 38 causes complementary grooves to be cut in the surface of abrasive portion 40. This results in frictional contact along a much greater surface area than what otherwise would be provided by the frictional engagement of flat surfaces. The mounting of friction drive wheel 38 and friction driven wheel 36 is not critical as alignment of these wheels is not necessary. This situation obtains, of course, because grooved outer surface 42 of friction driven wheel 36 cuts complementary grooves in abrasive portion 40 of friction drive wheel 38 as these two wheels are engaged. This is, in effect, self alignment.

Arm 18 may be secured in the position shown in FIGURE 2 by tightening down nut 24. In this position V-belt 34 engages V-belt pulleys 30 and 32. Assuming that V-belt 16 drives countershaft 12 in the counterclockwise direction as shown in FIGURE 2, V-belt 34 will transfer power from countershaft 12 to shaft 26 so as to rotate shaft 26 in the counterclockwise direction as shown in FIGURE 2. This causes fan 28 to rotate in its forward direction, directing air across the fins of an associated radiator so as to provide a cooling effect.

When dust and other foreign particles have coated the fins of the radiator, or at periodic intervals before such coating forms, the direction of rotation of fan 28 may be reversed so as to clear and clean the fins of the radiator to insure maintenance of proper cooling efficiency. This is accomplished by loosening nut 24 and pivoting arm 18 from the position shown in FIGURE 2 to the position shown in FIGURE 3, whereupon nut 24 may again be tightened. In this position V-belt 34 is disengaged from V-belt pulleys 30 and 32. Friction driven wheel 36 engages friction drive wheel 38 and grooved outer surface 42 of friction driven wheel 36 cuts cooperating grooves in the surface of abrasive portion 40 of friction drive wheel 38. Of course, once grooves have been cut in abrasive portion 40 by grooved outer surface 42, continued operation of the machine results in no more than normal wear. Assuming counterclockwise rotation of countershaft 12, as shown in FIGURE 3, the

direct frictional engagement between friction drive wheel 38 and friction driven wheel 36 causes shaft 26 to be rotated in the clockwise direction. Thus fan 28 is now rotated in its reverse direction.

Although reverse rotation of fan 28 might normally be expected to place an abnormal reverse thrust on the bearing about which shaft 26 rotates, this thrust is absorbed due to the interlocking engagement of grooved outer surface 42 with cooperating grooves cut in the surface of abrasive portion 40. This absorption of thrust eliminates the necessity of providing other than the conventional bearing for mounting of shaft 26.

Although a simple nut has been shown as the means for securing arm 18 in either of its positions, spring means may be substituted therefor so as to maintain tension on V-belt 34 when desired. It is to be understood that other pivoting means and a more sophisticated locking means may be provided and may be coupled with the associated machine in such a manner as to provide engine fan reversal at specified times during operation.

Should it be desirable to direct a stronger stream of air in the reverse direction than is normally directed in the forward direction, the fan blades may be so designed as to accomplish this while running in the reverse direction at slower speeds or at the same speed as in the forward direction.

Terms such as clockwise and counterclockwise rotation, blowing and drawing air, etc., are relative and should not be considered in an absolute sense.

Although one preferred embodiment of this invention has been illustrated and described hereinabove, it should be apparent that modifications thereof may be developed without departing from the scope of the following claims.

We claim:

1. In combination with a machine having an internal combustion engine including a radiator, an arm pivotally mounted on said machine, a driven shaft rotatably mounted on said arm, a fan secured to said driven shaft for rotation therewith contiguous to said radiator, a countershaft rotatably mounted on said machine, means interconnecting said engine and said countershaft for rotating said countershaft, a pair of pulleys secured to said shafts for rotation therewith, a belt engageable with said pulleys for rotating said driven shaft and said fan in a forward direction so as to draw air through said radiator, a pair of friction wheels secured to said shafts for

rotation therewith, said friction wheels being engageable for rotating said driven shaft and said fan in a reverse direction so as to blow air through said radiator faster than air is drawn through said radiator, one of said friction wheels having a relatively hard surface defining a plurality of grooves and the other of said friction wheels having a relatively soft surface engageable with said grooves for formation of a plurality of cooperating grooves in said relatively soft surface upon engagement of said friction wheels, and means for pivoting said arm between a first position engaging said belt with said pulleys and a second position engaging said friction wheels.

2. The invention according to claim 1 wherein said relatively soft surface of said other of said friction wheels is formed from an abrasive material.

3. In combination with a machine having an internal combustion engine including a radiator, an arm pivotally mounted on said machine, first and second shafts rotatably mounted respectively on said arm and said machine, a fan secured to one of said shafts for rotation therewith contiguous to said radiator, means interconnecting said engine and the other of said shafts for rotating same, a pair of pulleys secured to said shafts for rotation therewith, a belt engageable with said pulleys for rotating said fan in a forward direction so as to draw air through said radiator, a pair of friction wheels secured to said shafts for rotation therewith, said friction wheels being engageable for rotating said fan in a reverse direction so as to blow air through said radiator, one of said friction wheels having a relatively hard surface defining a plurality of grooves and the other of said friction wheels having a relatively soft surface engageable with said grooves for formation of a plurality of cooperating grooves in said relatively soft surface upon engagement of said friction wheels.

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