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FLUID DISPLACING ROTOR DEVICE

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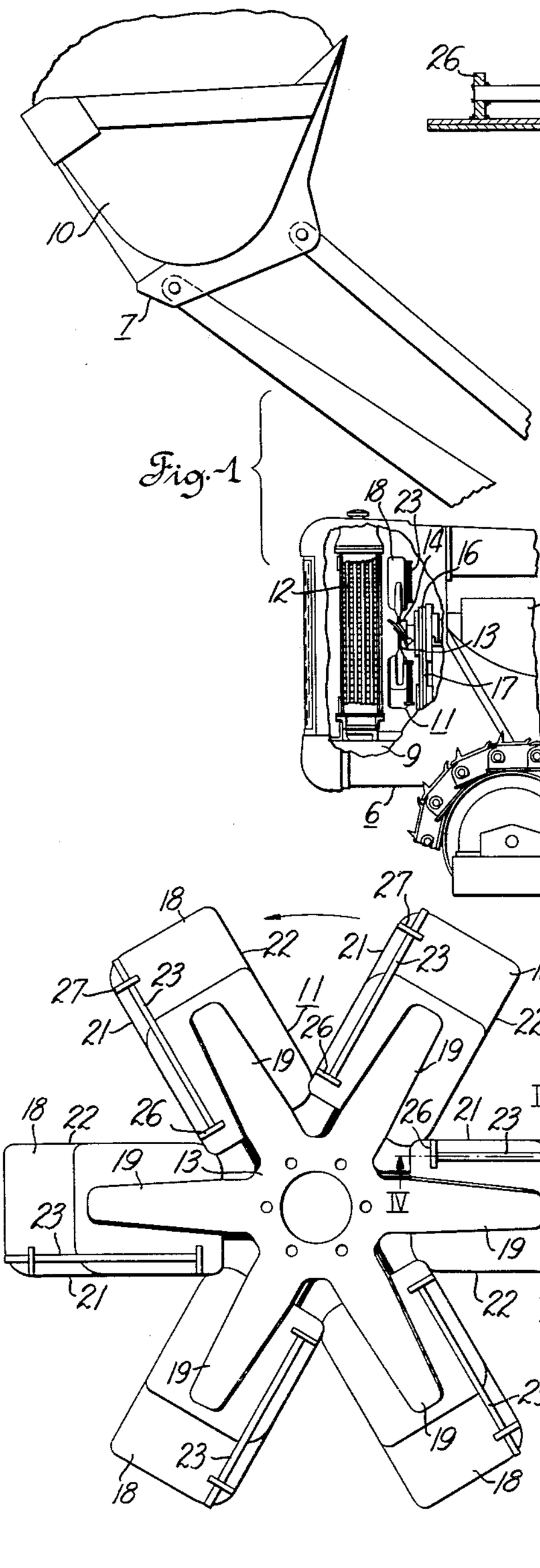

Fig. 1

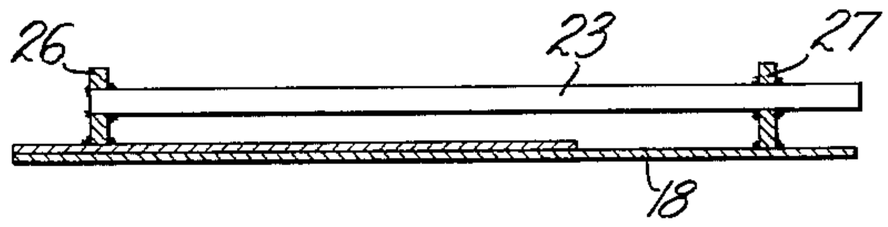

Fig. 4

Fig. 3

Fig. 2

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FLUID DISPLACING ROTOR DEVICE

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This invention is concerned generally with fluid displacing rotor devices such as air fans and is more particularly concerned with an improved pusher type fan assembly.

Tractor vehicles having front end loaders or shovel attachments are usually equipped with cooling systems including a pusher type fan positioned behind a radiator assembly. In this arrangement the air is blown or pushed through the radiator core and away from the operator's compartment. This is, of course, a very desirable feature since the operator's visibility and general working conditions are not impaired because of sand, dirt and other foreign matter being blown into his face by the fan.

When a tractor loader equipped with a pusher fan operates, for example, in a sand and gravel pit, air borne particles of sand are continuously being drawn into the air stream of the fan. This condition is especially aggravated when considerable amounts of sand spill from the shovel during a loading operation. These air borne particles of sand are drawn through the fan and are blown against the radiator core. This process is commonly known as sand blasting and if allowed to persist will rapidly wear away the metal of the fins and tubes on the air entering side of the radiator core.

Additionally there is the hazard of larger air borne particles of sand or gravel being struck by the fan blades and propelled at an extremely high velocity against the radiator core causing severe damage to the fins and particularly to the tubes already worn thin by sand blasting. This continuous sand blasting together with the bombardment of larger sand particles can cause a radiator to leak after being put into operation only a very short time.

In the past some attempts have been made to overcome this difficulty such as by installing a screen between the fan assembly and the radiator core. The theory is obviously to intercept or strain out the foreign particles before they reach the fins and core tubes. It has been found, however, that in order to realize an appreciable improvement, the screen must be of such a fine mesh that the air flow through the radiator core is substantially reduced thereby lowering the efficiency of the cooling system to an unacceptable level.

It is, therefore, an object of the present invention to provide an improved pusher type fan that will overcome the difficulties hereinbefore pointed out in an entirely satisfactory manner.

It is a further object of the present invention to provide a fluid displacing rotor device which will deflect particles of foreign matter out of the fluid being displaced without substantially reducing the efficiency of the device.

It is a further object of the present invention to provide an improved pusher type fan assembly for a cooling system of the type including a radiator core, wherein sand blasting to the radiator core will be reduced without substantially reducing the cooling efficiency of the system.

It is a further object of the present invention to provide a improved type of fan blading which will deflect foreign particles out of the air being drawn into the fan.

Other objects and advantages of the improved displacing rotor device will become apparent to those skilled in the art when the following description is read in conjunction with the attached drawings in which:

FIG. 1 shows a side view of the front portion of a crawler tractor of the type mounting a front end shovel loader, a portion of the radiator guard being cut away

to show the part of the tractor's cooling system including the improved pusher type fan assembly and the radiator core;

FIG. 2 shows the fan assembly with deflector bars attached as viewed from the air entering side after being removed from the tractor;

FIG. 3 is a longitudinal section through a fan blade and deflector bar taken along line III—III in FIG. 2; and

FIG. 4 is a cross sectional view of a fan blade and deflector bar taken along line IV—IV in FIG. 2.

Referring to FIG. 1, a crawler tractor indicated by reference numeral **6**, is of the conventional type and is equipped with the well known front end shovel attachment being indicated by the reference character **7**. Crawler tractor **6** has an engine **8** mounted on the forward portion of the main frame **9**. The tractor's cooling system includes a radiator core **12** mounted on main frame **9** forwardly of engine **8** in the usual manner; and a pusher type fan assembly **11** carried on the engine and being interposed between the latter and the radiator **12**. The term pusher fan, of course, refers to the well known type of axial flow propeller fan wherein air is blown or pushed through the radiator core rather than drawn through from the side of the radiator core remote from the fan assembly.

Shovel attachment **7**, as shown, has a loaded bucket **10** disposed in the raised position. It will be readily apparent that a portion of the material being handled such as dirt, sand or gravel is very apt to spill over the sides of the bucket **10** from whence it will be drawn into the air stream on the air entering side of pusher fan assembly **11**.

Referring to FIGS. 1 and 2, the fan assembly **11** includes a spider or hub member **13** which in the assembled condition is coaxial with and is fixed on a flanged portion **14** of a rotatable pulley assembly **16** mounted on engine **8**. Assembly **16** rotates on an axis and is driven by the tractor engine through a fan belt **17** in the conventional manner.

Referring to FIGS. 1, 2 and 3, a plurality of fan blade members **18** are rigidly attached to the radially extending arms **19** of spider **13**. Fan blades **18** are generally of the known type having a concavo-convex cross section, as shown best in FIG. 3. In the assembled condition blades **18** extend radially outwardly of spider or hub **13** and have a fixed pitch angle.

Referring now to FIGS. 2, 3 and 4, each of the blade members **18** has a leading edge **21** and a trailing edge **22** which will be apparent when it is considered that the fan rotates in a counterclockwise direction, as indicated by the arrow in FIG. 2. A deflector bar or rod **23** is attached on each blade **18** at the back or air entering side thereof. Since each rod is to be assembled with a respective blade in the identical manner, only one such assembly will be described in detail. Rod **23** is located in spaced relation to and extends longitudinally of blade **18** and is parallel to and positioned slightly toward the trailing edge from the leading edge **21**. Brackets **26** and **27** which are respectively welded to the blade as well as to each end of the rod **23**, as is best shown in FIG. 4, serve as a means for rigidly connecting rod **23** to blade **18**. It should be understood, however, that it is not intended to limit this invention to the particular means for attaching the rod to the fan blade nor is it intended that it be limited to the cross sectional shape or size of the deflector rod. The rod which has been selected is of circular cross section because it has been produced from ordinary bar stock. Bar stock is, of course, desirable since it is readily obtainable in a wide variety of sizes. However, a bar having an air foal cross section would

be preferable since it would present a minimum of air resistance.

Operation

The deflector bars **23** are positioned on the fan blades in such a manner that they extend longitudinally of the blades and are spaced from the leading edges, as shown in FIG. 1, so that air borne particles of sand or gravel or other foreign matter being drawn into the fan's air stream at the air entering side must first pass bars **23** before coming into contact with the blades. During operation most of the air borne particles coming toward the fan will be deflected radially outwardly and away from the fan blades upon striking bars **23**. Any particles passing between the back side of the fan blade and the bar will tend to be deflected rearwardly or back into the air stream on the air entering side rather than passing through the fan. Most of the rearwardly deflected particles will then be struck by the bar on the succeeding fan blade and this is, of course, repeated for each successive fan blade.

Since sand blasting is due to the air borne particles passing through the fan, it will readily be apparent how this tendency is reduced. Also, the impact damage to the radiator core resulting from the bombardment of large foreign particles that are struck by the front side of the fan blading has been all but eliminated. The larger particles are usually slower moving in comparison to the angular velocity of the deflector bars and after being drawn into the air stream they will readily be deflected away from the path of the successive fan blades as previously described.

Considering the operation of fan assembly **11** from a general point of view, it will be apparent that the deflector bar on one blade deflects foreign particles from the path of the succeeding blade and so on around for each successive blade. It is to be understood, however, that it is not intended to limit the invention to a deflector bar attached on each of the fan blades since some degree of improvement would be obtainable by attaching only one deflector bar on the fan assembly.

From the foregoing detailed description it will be readily apparent that a new and useful fan blade construction has been illustrated which has a simple design and may easily be incorporated into most standard types of fan assemblies. In operation this construction has proven itself by effectively reducing sand blast damage to radiator cores without materially reducing the efficiency of the cooling system.

It should be understood that although only one embodiment of the invention has been shown and described in detail it is not intended to limit the patent granted hereon otherwise than is necessitated by the scope of the appended claims.

What is claimed is:

1. A fan assembly for moving air through a radiator core of a vehicle, comprising: a hub member rotatable on an axis, a plurality of fan blades carried by and extending radially from said hub, each of said blades having a leading edge and a trailing edge, a deflector rod intermediate the leading and trailing edges of each blade and extending substantially coextensive with and parallel to the leading edge of the latter, and means securing said rods to said blades, respectively, in axially spaced relation to said leading edges, respectively, in the direction of the incoming air.

2. The structure set forth in claim 1 wherein said rods are secured to said blades, respectively, at points adjacent the opposite ends of said rods.

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