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Getz et al.

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[54] **GROSS FLOW COOLING SYSTEM**

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[52] **U.S. Cl.** **165/51**, 165/122

[51] **Int. Cl.** **F24h 3/06**

[58] **Field of Search** 165/122, 125, 51, 140

[56] **References Cited**

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[57] **ABSTRACT**

A cooling system, mounted on the rearward end of a tractor, comprises a pair of fans attached to a common drive shaft disposed on the longitudinal axis of the tractor and a pair of vertically disposed and laterally spaced radiators. A vertically disposed baffle is connected between the radiators to define separate chambers for receiving air from the fans.

11 Claims, 3 Drawing Figures

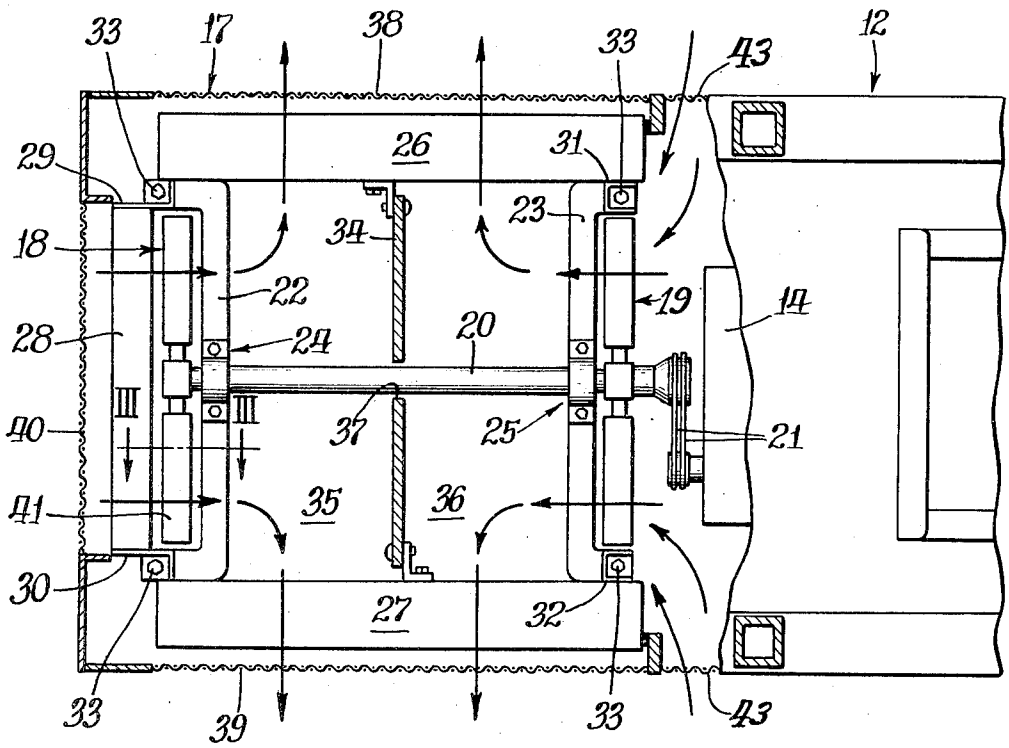


FIG. 1

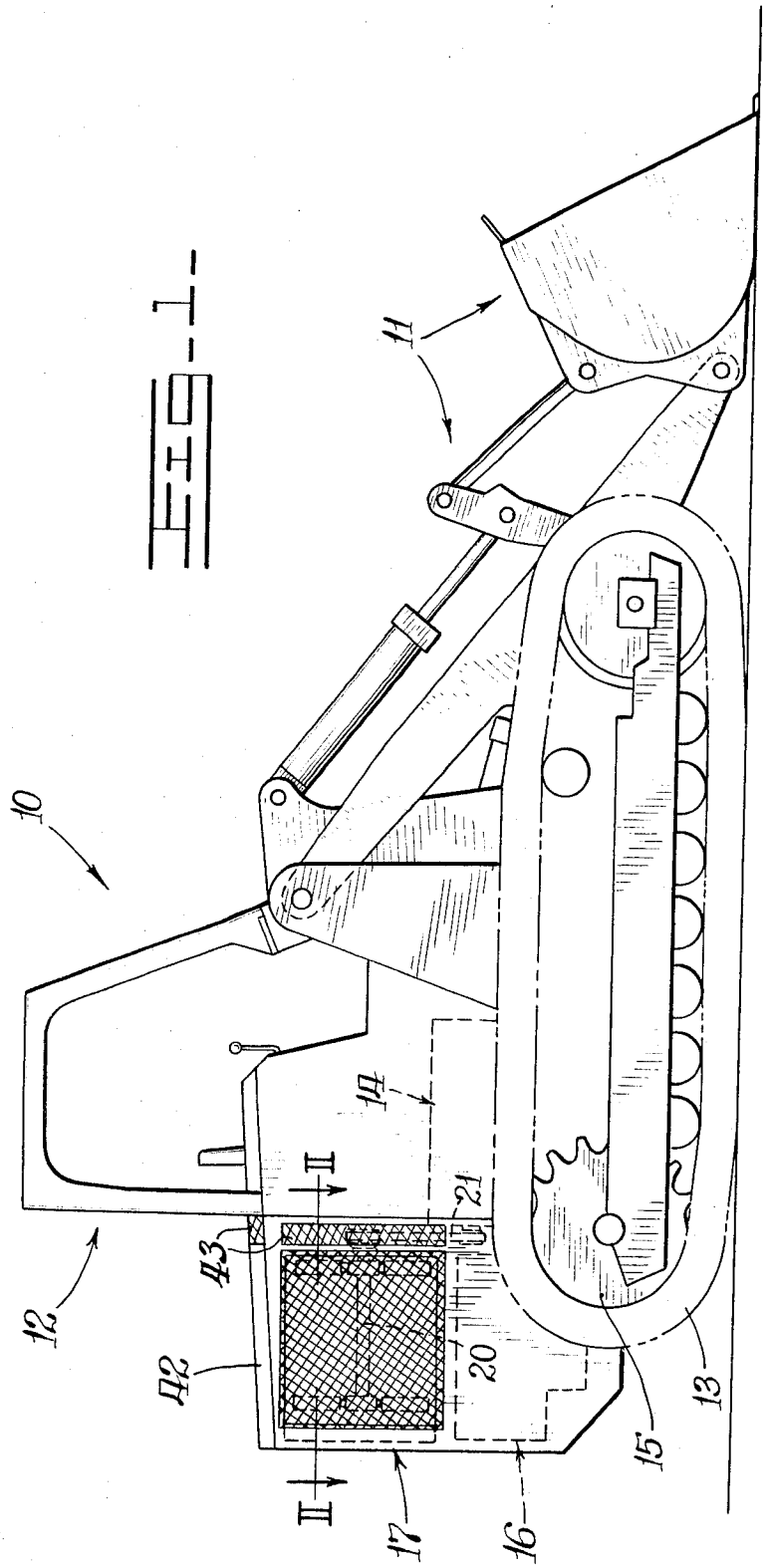
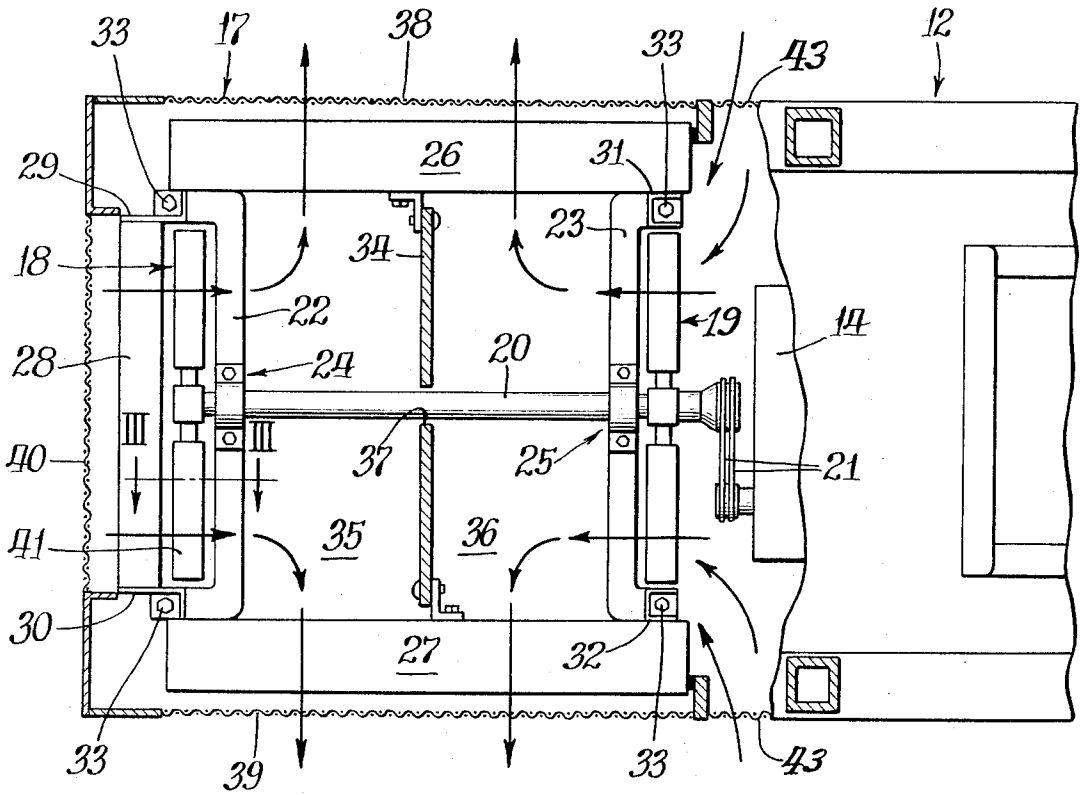


Fig. 2.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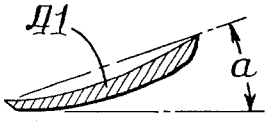
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Fig. 3.

GROSS FLOW COOLING SYSTEM

BACKGROUND OF THE INVENTION

A conventional cooling system for an earthworking vehicle comprises at least one engine-driven fan assembly mounted adjacent to a radiator to pump air therethrough for engine cooling purposes. Various attempts have been made to reduce the unduly high noise level normally occasioned during operation of the fan assembly and its attendant mechanisms, without immolating safety or operating requirements. Such attempts have oftentimes resulted in a substantial increase in the complexity of the cooling system as well as its manufacturing costs.

SUMMARY OF THE INVENTION

An object of this invention is to provide an economical, non-complex and efficient cooling system which exhibits a low noise level and a high degree of safety when placed in operation. The cooling system comprises a pair of axially spaced fans, defining a chamber means therebetween, adapted to be rotated by drive means operatively connected thereto. At least one fluid cooling means, such as an air-cooled radiator, extends transversely between the two fan means to define one side of the chamber means whereby compressed air pumped into the chamber means will exit through the radiator.

In a preferred embodiment of this invention, a baffle plate is positioned between the two fan means to induce substantially uniform and non-turbulent air flow therethrough. In addition, the cooling system is preferably mounted on the rearward end of a vehicle, such as a track-type loader, to aid in impelling dust laterally away from the vehicle during operation thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects of this invention will become apparent from the following description and accompanying drawings wherein:

FIG. 1 is a side elevational view of a track-type loader having the cooling system of this invention mounted on a rearward end thereof;

FIG. 2 is an enlarged, sectional view of the cooling system, taken in the direction of arrows II—II in FIG. 1; and

FIG. 3 is an enlarged section of a fan blade depicting the chordal angle thereof.

DETAILED DESCRIPTION OF THE INVENTION

FIG. 1 illustrates a track-type loader **10** comprising a standard bucket arrangement **11** movably mounted on a forward end thereof. The loader further comprises an operator's station **12** and is mounted for movement on a pair of laterally spaced endless track assemblies **13** (one shown), driven by an engine **14.** In particular, the engine is adapted to selectively rotate a pair of drive sprockets **15** (one shown) via an intermediate drive train, including a transmission **16.**

A cooling system **17** of this invention is mounted on a rearward end of the loader, preferably above transmission **16.** As shown in FIG. **2,** the cooling system comprises a pair of axially spaced first and second fan means **18** and **19** secured to opposite ends of a common drive shaft **20** of a drive means, further including a pair of drive belts **21** driven by a power take-off from engine **14.** The drive shaft is preferably disposed on the

longitudinal axis of the loader and is rotatably mounted on bracing means, such as cross-braces **22** and **23** secured to the loader's main frame, by bearing means **24** and **25,** respectively.

First and second laterally spaced and vertically disposed cooling means **26** and **27,** such as conventional air-cooled radiators suitably integrated into the engine's cooling system, extend transversely between the first and second fan means in at least general parallel relationship with drive shaft **20.** A third fluid cooling means **28,** such as an oil cooler for the transmission, is mounted on a rearward end of the vehicle to extend transversely between cooling means **26** and **27** and adjacent to fan means **18.** A first corner bracket **29** is secured to adjacent ends of cross-brace **22,** radiator **26** and oil cooler **28.**

The opposite end of cross-brace **22** is likewise secured to adjacent ends of radiator **27** and oil cooler **28** by a second corner bracket **30.** The forward ends of radiators **26** and **27** are secured to opposite ends of cross-brace **23** by third and fourth brackets **31** and **32,** respectively. Each of the four brackets is attached to the frame of the vehicle by releasable fastening means, such as bolts **33.**

A baffle means or plate **34,** detachably mounted between radiators **26** and **27,** is preferably positioned intermediate first and second fan means **18** and **19** and in at least general parallel relationship therewith. It should be noted that an air-receiving chamber means, defined on three sides by cooling means **26, 27** and **28,** is thus separated into first and second chambers **35** and **36** by the baffle plate which has a suitably sized aperture **37** formed therethrough to accommodate drive shaft **20.** The cooling system preferably further comprises a protective enclosure, including mesh screens or grills **38, 39** and **40,** suitably integrated therein to facilitate unimpeded air flow therethrough.

During loader operation, fan means **18** and **19** function to pump air into chambers **35** and **36,** respectively. The area forward of fan **19** is open to ambient to insure a sufficient air supply thereto. The air is compressed in the chambers and flows substantially uniformly through the cores of radiators **26** and **27** at a substantially increased pressure and density. The noise level of the cooling system is held to an acceptable low level in that baffle plate **34** functions to deter undue air turbulence by inducing uniform air flow through the chambers.

The air pressure in chambers **35** and **36** may be uniformly balanced by providing different chordal angles for two or more blades **41** employed on fan means **18** and **19.** For example, referring to FIG. **3,** a first chordal angle *a* for the blades of fan means **18** may approximate 27° whereas a second and lesser chordal angle for the blades of forwardly disposed fan means **19** may approximate 24°. During testing, the two such fan means were found to circulate air at approximately 11,800 cfm through the system, when rotated at 600 rpm, to provide the required cooling desiderata.

The impellment of air through screens **38** and **39** aids in carrying dust, normally raised by track assemblies **13** at drive sprockets **15,** laterally outwardly from the vehicle. Such a dust-carrying function aids in permitting the fan means to pump relatively dust-free air therethrough and further aids in increasing the operator's visibility, comfort and safety. It should be noted that the major portion of the cooling system can be expeditiously re-

moved as a module by merely removing bolts **33**, fan belts **21**, and a detachable engine hood **42** (FIG. **1**).

The present cooling module affords an additional advantage in that service can be accomplished without disturbing sound suppressing material now used to protectively line most operators' stations. Such material must be carefully placed to seal all openings or avenues for possible transfer of noise toward the operator. It is for this reason forwardly disposed, relatively remote screens or grills **43** are provided for introducing cooling air at the forward end of the module.

What is claimed is:

1. A cooling system, mounted on a frame, comprising:

a pair of axially spaced and rotatable first and second fan means for pumping air into chamber means defined therebetween,

drive means operatively connected to each of said first and second fan means for selectively rotating the same, baffle means comprised of a single plate disposed within said chamber,

said drive means comprising a drive shaft extending through said baffle means and connected at opposite ends thereof to said first and second fan means,

first fluid cooling means extending traversely between said first and second fan means to define a first side of said chamber means whereby air pumped into said chamber means will exit through said first fluid cooling means,

a second fluid cooling means extending traversely between said first and second fan means in at least generally parallel and laterally spaced relationship relative to said first fluid cooling means to define a second side of said chamber means,

further comprising a third fluid cooling means extending traversely between said first and second fluid cooling means and adjacent to said first fan means to define a third side of said chamber means, and each of said first and second fan means comprising a plurality of fan blades, a first chordal angle of the fan blades of said first fan means being greater than a second chordal angle of the fan blades of said second fan means.

2. The cooling system of claim **1** wherein each of said first and second fluid cooling means constitutes a radiator.

3. The cooling system of claim **1** wherein said third cooling means constitutes an oil cooler.

4. The cooling system of claim **1** further comprising a pair of axially spaced first and second bracing means detachably connected to a support and extending traversely between and connected to said first and second fluid cooling means.

5. The cooling system of claim **4** further comprising a bracket secured to each end of each of said first and second fluid cooling means and further secured to each of said first and second bracing means, each of said brackets removably attached to said support by releasable fastening means.

6. The cooling system of claim **4** wherein said baffle means extends transversely between and connects to said first and second fluid cooling means to separate said chamber means into first and second chambers.

7. The cooling system of claim **4** wherein said a drive shaft is rotatably mounted on each of said first and second bracing means by bearing means and connected at opposite ends thereof to said first and second fan means.

8. The cooling system of claim **1** wherein said frame is disposed on a rearward end of a vehicle adapted for movement along a longitudinal axis thereof and further comprising an operator's station mounted on said vehicle, forwardly of said cooling system.

9. The cooling system of claim **8** wherein said vehicle comprises a pair of endless track assemblies, a drive sprocket operatively connected to each of said endless track assemblies and means for rotating said drive sprockets.

10. The cooling system of claim **9** wherein said drive sprockets are positioned vertically below and adjacent to said cooling system and wherein said fluid cooling means is disposed at least generally parallel to the longitudinal axis of said vehicle whereby air exiting from said fluid cooling means will impel dust raised by said track assemblies laterally away from said vehicle.

11. The cooling system of claim **1** wherein said first chordal angle approximates 27° and said second chordal angle approximates 24°.

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