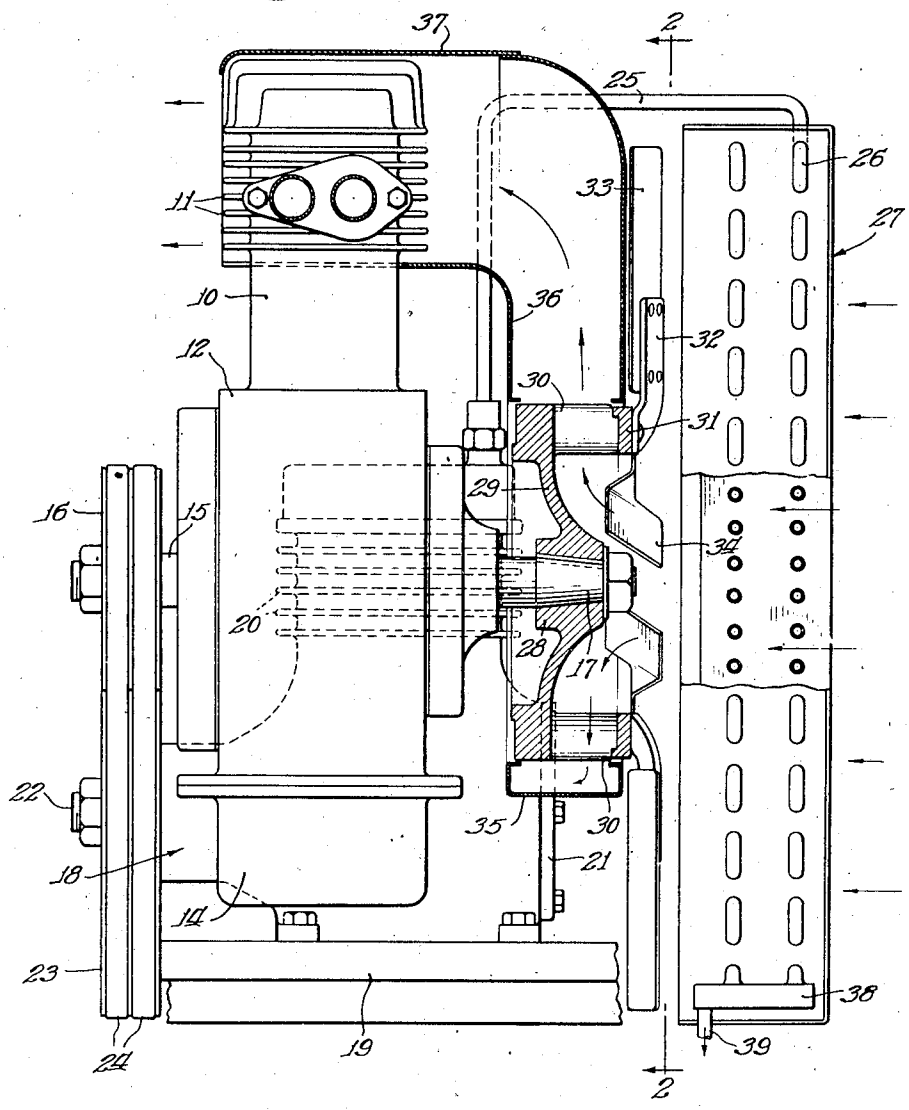
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AIR CIRCULATION SYSTEM FOR REFRIGERATING APPARATUS

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Fig. 1



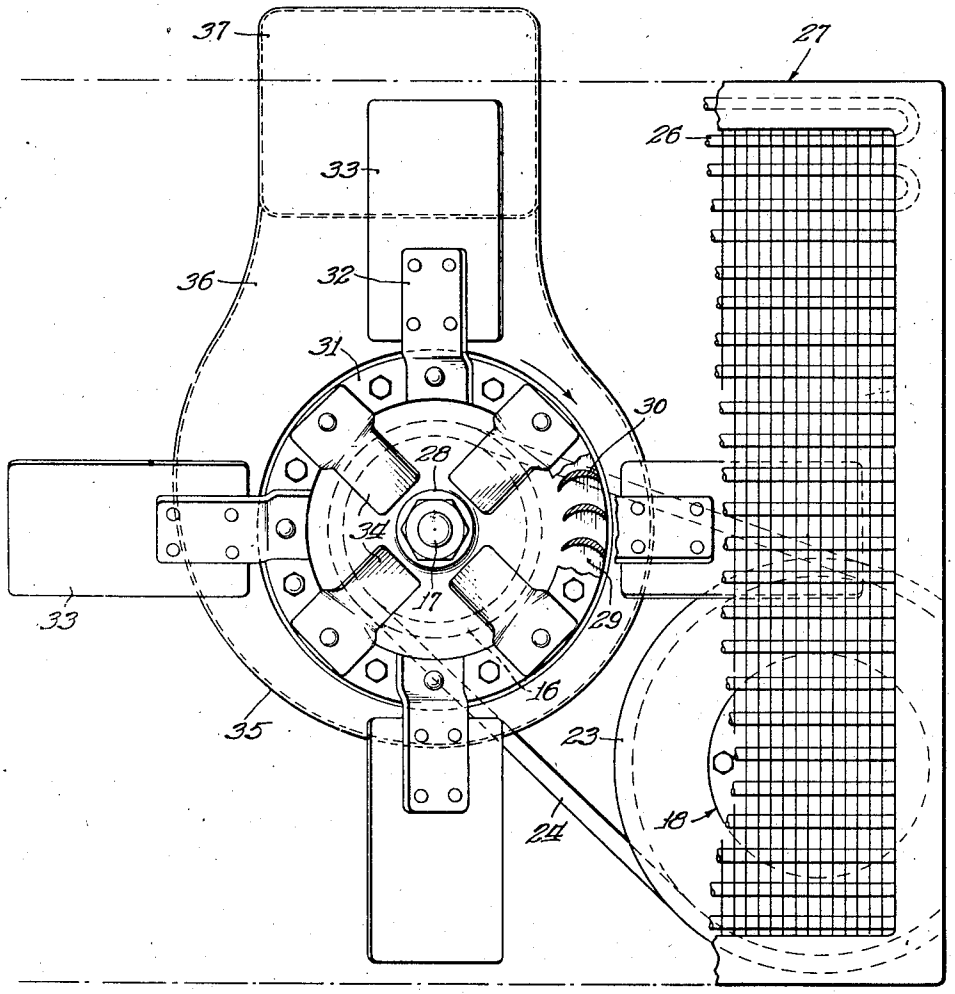

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Fig. 2




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2,416,153

## AIR CIRCULATION SYSTEM FOR REFRIGERATING APPARATUS

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3 Claims. (Cl. 62—115)

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This invention relates to an air-circulation system. More particularly, it relates to a circulation system for cooling air for a gas-engine-driven refrigerating unit. In the conventional refrigerating unit employing a compressor, a condenser, and an expansion coil, it is necessary to have an air-circulating means for cooling the condenser. When the unit is driven by an air-cooled engine, it is also necessary to provide air-circulating means for cooling the cylinder of the engine. This invention relates to an air-circulating system for providing air flow over the condenser and around the cylinder of the engine.

The principal object of the invention is to provide a simplified and compact air-circulating means for cooling an engine cylinder and a condenser.

A more particular object is to provide a fan structure including as a unitary device a radial discharging fan and a secondary fan for discharging air in an axial direction.

Another object is to provide means for delivering air into a centrifugal type fan to improve its efficiency.

The above objects and others which will be apparent from the detailed description to follow are accomplished by a structure such as shown in the drawings, in which:

Figure 1 is a diagrammatic elevation of an engine-driven compressor with the circulation fan system broken away in section; and

Figure 2 is a front elevation of the structure shown in Figure 1 with the condenser broken away to show the fan structure.

In the drawings, only such elements and structure of a gasoline-engine-driven compressor are shown as are necessary to illustrate the air-circulation system of the invention. An air-cooled engine is illustrated having a cylinder 10 with cooling fins 11, a crank case 12, and an oil pan 14. The crank-shaft is shown as projecting at one end 15 on which a double V-pulley 16 is secured. The other end 17 of the crank-shaft projects at the other side of the engine and provides means for mounting and driving the fan structure, as will be hereinafter described.

A compressor 18 is mounted adjacent the engine, a portion of the mounting structure 19 being shown in Figure 1. Said compressor has a finned cylinder 20, a cover plate 21 at one end, and a projection 22 of the crank-shaft at the other end on which a double V-pulley 23 is mounted in alinement with the pulley 16. A pair of V-belts 24 engages the two pulleys for driving the compressor from the engine.

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An outlet conduit 25 from the compressor is shown connecting the compressor with a condensing coil 26 in a condenser structure 27. Said structure is positioned at right angles to the crank-shaft of the engine with the crank-shaft axis of the engine being located substantially centrally of the condenser structure. Only the relative positions of the significant elements necessary to illustrate the invention have been shown as they may be mounted on any suitable frame structure.

The fan structure comprises, in effect, three different sets of fan elements, each operating to provide an independent flow of air for a particular purpose. A blower type of fan mounted directly on the crank-shaft extension 17 consists of a hub 28, a dished disk-like portion 29 extending outwardly from the hub portion adjacent the engine, a plurality of blades 30 arranged around the periphery of the disk-like portion, and a ring 31 joining the ends of the blades 30. This structure comprises a blower of a conventional construction excepting that the ring 31 is often omitted as it provides no function in the conventional blower. In this type of fan or blower, air comes in in an axial direction and is discharged radially entirely around the periphery of the rotating structure.

A plurality of brackets 32 are secured to the ring 31 of the main blower construction and extend radially outwardly to provide attaching means for fan blades 33. Said blades are arranged at an angle to give the required pitch for drawing the maximum volume of air through the condenser structure 27 and over the coil 26. It will be noted that the blades are of a size to substantially cover the area of the condenser structure.

When fan blades such as the blades 33 are operated, there is some tendency for the air to be moved radially at the same time as it is being moved axially. For this reason, such blades have a tendency to draw air away from the center of the rotating fan structure. In the ordinary construction, this action would tend to starve the main blower or fan which delivers air to the engine cylinder. To overcome this action and to provide for both drawing air through the center of the condenser structure and for supercharging to some extent the engine cooling fan, a plurality of additional blades 34 are secured to the ring 31 extending radially inwardly therefrom. Said blades are pitched in the same direction as the blades 32 and act to draw air through the

condenser structure and deliver it to the blades 30.

A collector housing 35 is mounted around the blades 30 to receive the air therefrom and deliver it through a vertically extending housing 36 to a shroud 37 surrounding the cylinder and the portion of the engine to be cooled.

At the bottom of the condenser structure in Figure 1, a header 38 is shown provided with an outlet 39. This outlet conduit would normally lead to an evaporator which would complete the refrigeration unit.

The operation of the air-circulation structure and system forming this invention has been explained in connection with the description of the drawings. A simple unitary structure has been provided which simultaneously cools the engine and provides cooling air for the condenser. The structure of the fans has been so arranged that flow of air over the condenser is relatively uniform over the entire surface, and means has, at the same time, been provided for supercharging or adding to the efficiency of the engine-cooling fan by delivering a portion of the air from the condenser directly to the engine-cooling fan.

It is to be understood that applicants have shown and described only a preferred embodiment of their improved cooling system for refrigeration units, and that they claim as their invention all modifications falling within the scope of the appended claims.

What is claimed is:

1. In a refrigeration unit including an air cooled engine, a compressor, and a condenser, said condenser being spaced from said engine, and in combination therewith, an air circulation system comprising a fan connected to be driven by the engine and positioned between the engine and the condenser, said fan having circumferentially spaced axially extending blades for radially discharging air, means for conducting said air to the engine, said fan also being provided with radially and outwardly extending fan blades for drawing air through the condenser and discharging it toward the engine, and said fan being provided with radially and inwardly extending blades positioned to draw air through the condenser and to deliver it to the circumferentially spaced blades.

2. In a refrigeration unit including an air cooled engine having a crank shaft, a compressor and a condenser, said condenser being spaced from said engine, and in combination therewith, an air circulation system comprising a fan structure mounted on the crank shaft of the engine between the engine and the condenser, said fan structure having circumferentially spaced axially extending blades for radially discharging air, means for conducting said air to the engine cylinder, said fan structure also being provided with radially outwardly extending fan blades for drawing air through the condenser and discharging it toward the engine, and said fan structure being provided with radially and inwardly extending blades positioned to draw air through the condenser and to deliver it to the circumferentially spaced blades.

3. In a refrigeration unit including an air cooled engine, a finned cylinder and a horizontal crank shaft, a compressor and a condenser, said condenser being positioned vertically in a plane at right angles to the crank shaft axis and being spaced horizontally from said engine, an air circulation system comprising a fan mounted on the crank shaft between the engine and the condenser, said fan having circumferentially spaced axially extending blades for radially discharging air, conduit means for conducting said air to the engine cylinder, said fan also being provided with radially and outwardly extending fan blades for drawing air through the condenser toward the engine, and said fan being provided with radially and inwardly extending blades positioned to draw air through the condenser and to deliver it to the circumferentially spaced blades.

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