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W. A. GEISE

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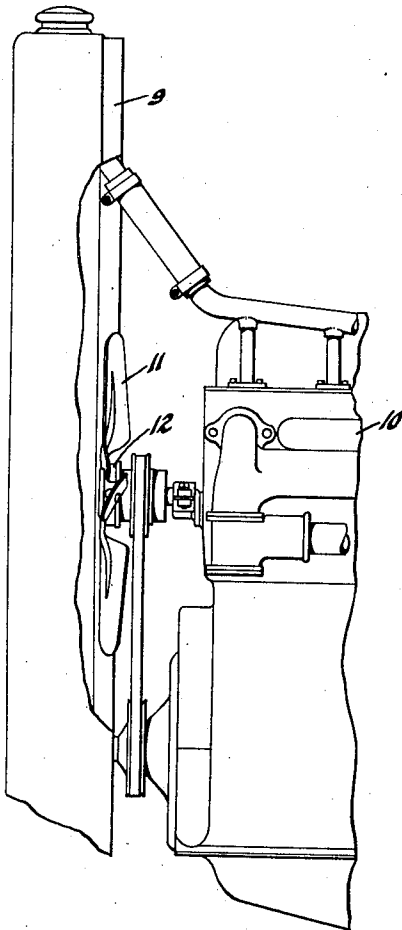


Fig. 1

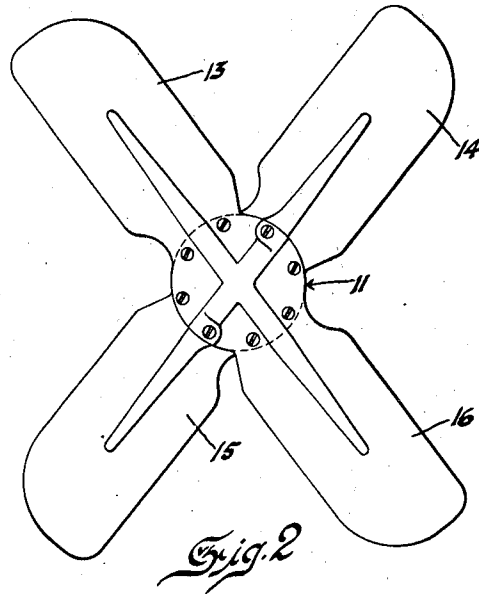


Fig. 2

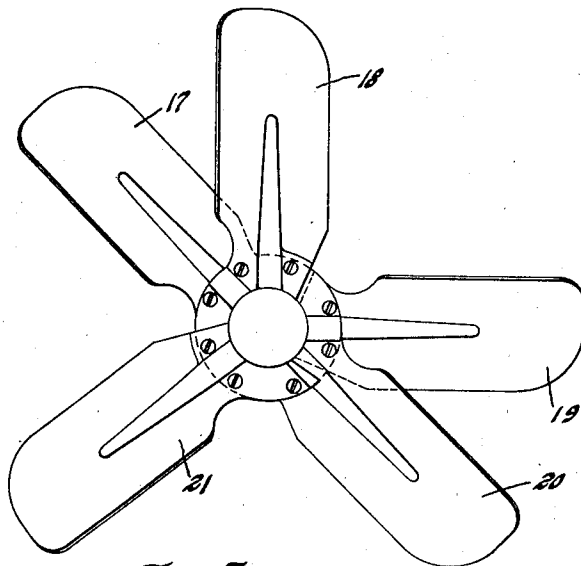


Fig. 3

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1 Claim. (Cl. 170—159)

This invention relates to multi-blade fans of the screw or propeller type, such as those which are used to draw cooling air through the radiator of an automotive vehicle and force it over the propelling engine thereof.

It has been found that the cooling fan of an automotive vehicle is the cause of a large part of the noise which is commonly attributed to the propelling engine of the vehicle and, furthermore, that the noise caused by the fan cannot be eliminated by redesigning the blades or by any other expedient known or practised prior to the time of my invention. During the course of experiments, which were conducted with the object of producing a fan which would operate more noiselessly than the fans then known, I discovered that a much quieter fan was produced when the blades were so arranged that the angle between one blade and the next was greater or less than that between the last-mentioned blade and the following blade.

My invention may be embodied in multi-blade fans which have even or uneven numbers of blades; and in either type of fan, the angle between one blade and the following blade may be different than the angle between every other pair of adjacent blades or the angle between one blade and the following blade may be different than the angle between another pair or other pairs of adjacent blades but equal to the angle between still another pair or other pairs of adjacent blades. In the case of multi-blade fans which have even numbers of blades, in number at least four, the blades may be arranged in a special manner which has obvious advantages, viz. that in which the center lines of pairs of the blades are aligned. In this construction, the angle between one blade and the following blade will differ from the angle between the last-mentioned blade and the next blade, but the angles between the diametrically opposite pairs of blades will, of necessity, be equal.

For a better understanding of the nature and objects of my invention, reference is made to the following specification in which are described the preferred embodiments of my invention which are illustrated in the accompanying drawing, in which:

Figure 1 is a fragmentary side elevation of the front end of an automotive vehicle on which is installed a cooling fan in which is embodied my invention.

Figure 2 is a front elevation of the cooling fan which is shown in Figure 1.

Figure 3 is a front elevation of a modified form of cooling fan.

In the drawing, referring particularly to Figures 1 and 2, the reference character 9 indicates the water cooling radiator of an automotive vehicle and the reference character 10 the propelling engine thereof. To draw cooling air through the radiator and force it over the engine, there is provided a cooling fan 11 which is arranged to be driven through any ordinary or suitable mechanism by the propelling engine 10.

The fan 11, which is shown in Figures 1 and 2 consists of a hub 12 to which there are secured and on which there are mounted four propeller or screw type fan blades 13, 14, 15 and 16. As will be apparent from a glance at Figure 2, the center lines of the blades 13 and 14 are aligned, respectively, with the center lines of the blades 16 and 15, and, consequently, the angle between the center lines of the blades 13 and 14 is equal to the angle between the center lines of the blades 15 and 16 and the angle between the center lines of the blades 13 and 15 is equal to the angle between the center lines of the blades 14 and 16. But, as will also be apparent from a glance at Figure 2, the angle between the center lines of the blades 13 and 15 and the blades 14 and 16 is considerably greater than the angle between the center lines of the blades 13 and 14 and the blades 15 and 16. The value of the difference between these angles which will give the most highly satisfactory results will depend upon the characteristics of the vehicle in which the fan is installed and may be determined experimentally. In the fan which is shown in Figures 1 and 2 the angle between the center lines of the blades 13 and 14 and the blades 16 and 15 is 76 degrees, while that between the center lines of the blades 15 and 13 and the blades 14 and 16 is 104 degrees. A fan in which the blades are arranged as described in the preceding sentence has been found to be the most satisfactory for use on the series 8-50 models of the present Buick automobiles.

In Figure 3 of the drawing, there is shown a fan which consists of a hub (not shown) to which there are secured and on which there are mounted five propeller or screw type fan blades 17, 18, 19, 20 and 21. It will be apparent from an inspection of Figure 3 that the angle between the center line of each blade and the center line of the following blade differs from that between the center lines of every other pair of adjacent blades.

When a fan in which is embodied my invention is operated, much less noise results than when a fan of equal capacity in which all blades

are equi-angularly spaced is operated. The improvement is obviously the result of the difference in the angular arrangement of the blades in the two types of fans and apparently results from

5 the fact that blades of my fans set up in the current of air generated by the fan vibrations of different frequencies which interfere with and tend to attenuate each other and thus reduce the total volume of noise created by the operation of the fan. To eliminate unbalance in my
10 fans, when it exists, some of the blades may be made heavier, or larger and heavier than others or counterweights may be applied to the fan assembly.

15 Although I have shown and described as preferred embodiments of my invention, four-blade and five-blade fans, it will be understood that the principles underlying my invention may be incorporated in fans which have a greater number of blades as well as in two-blade and three-
20 blade fans.

In the claim, the word "blade" is used to designate a main blade as distinguished from an auxiliary vane of a compound blade.

I claim:

In an automotive vehicle, the combination of 5
a radiator, an internal combustion engine, and a rotary fan which is located between the radiator and the engine and operated by the engine to draw air through the radiator and circulate
it over the engine and which consists of a plu- 10
rality of substantially coplanarly disposed blades arranged around the axis of rotation so that the angle which separates one blade from the following blade so differs from that which separates the last-mentioned blade from the following
15 blade that the sound waves set up by the blades have such characteristics that the noise created during the operation of the fan is audible to a minimum degree.

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