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FRAME FOR ELECTRICALLY DRIVEN FAN

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FIG. 1

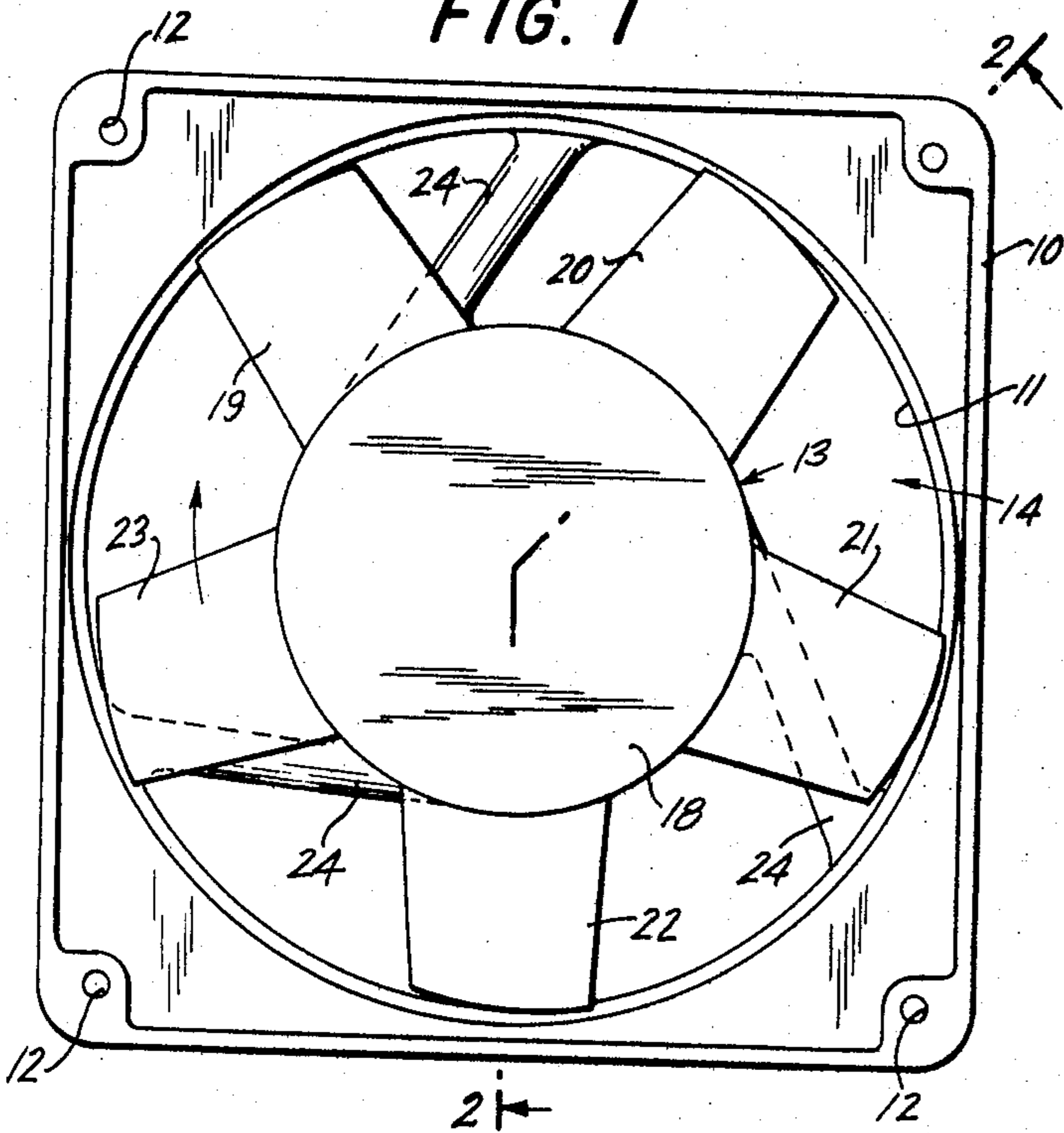


FIG. 2

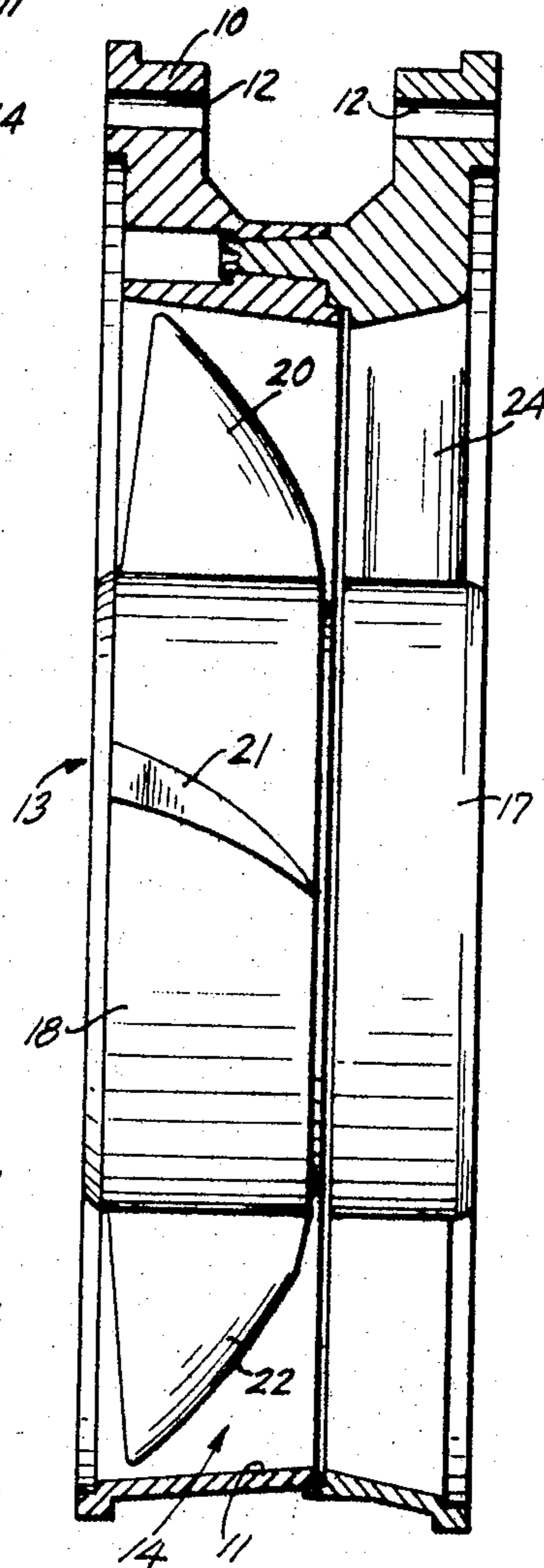
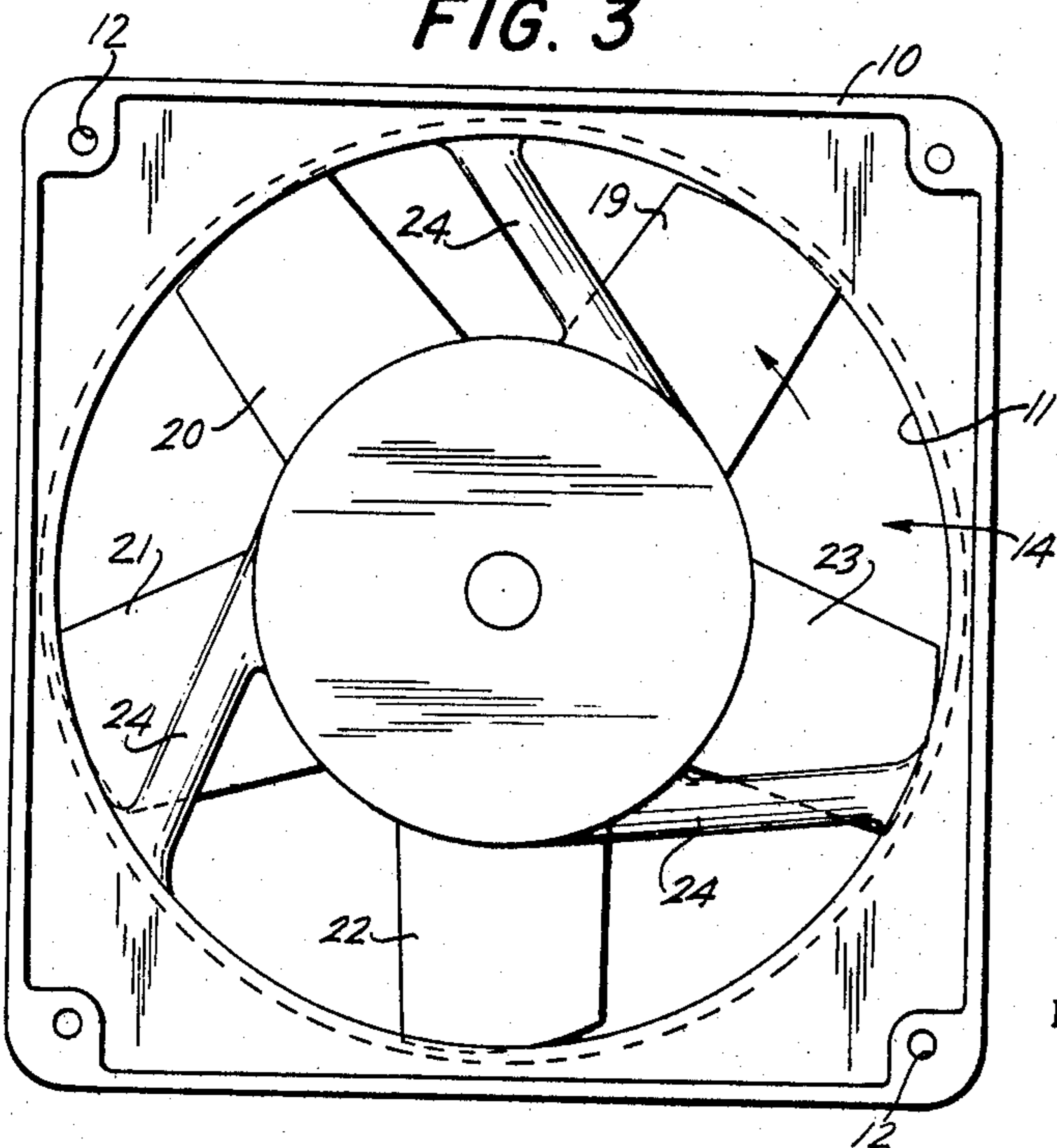


FIG. 3



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## FRAME FOR ELECTRICALLY DRIVEN FAN

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2 Claims. (Cl. 230-117)

This invention relates to electrically driven fans, and more particularly to such fans wherein the motor is supported at the center of a mounting frame.

In these fans, the frame is adapted to be mounted, by some convenient means, within or near the region in which air is to be circulated. The frame is provided with a central opening, to permit air to move through it, and the electric motor for rotating the fan blades is located at the center of the opening. Struts for supporting the motor extend across the opening between the motor and the frame. Ordinarily, the struts are arranged substantially along lines extending radially from the center of the motor, since such a line represents the shortest distance between the motor and the frame. These struts present an obstruction to the flow of air set into motion by the rotating fan blades, and thus produce sharp increases in the noise level of the fan each time a fan blade crosses one of the struts.

It is an object of the present invention to minimize this problem by reducing and leveling out the noise produced by the moving air passing around the motor-support struts of an electric fan.

Toward this end, the present invention provides an electric fan having blades which extend radially from the motor, and motor-support struts each arranged at an angle to a line extending radially from the motor and intersecting the strut. As a result of this arrangement, an entire fan blade does not cross an entire strut at one time, as is usually the case where blades and struts are all arranged radially. Rather, as a result of the present invention, fan blades and struts cross each other in increments over an extended arc of rotation. Thus, there is no sudden obstruction to the moving air when a blade crosses a strut and hence no sharp increase of noise. Instead, the noise produced by a blade crossing a strut, in a fan according to this invention, is reduced because only a portion of the moving air is obstructed at any one time, and furthermore, any noise which is produced due to the obstructive effect of the struts is spread out over a longer period of time than is usual with conventional fans.

Other features of the invention are the arrangement of the support struts tangentially with respect to the motor housing, and the employment of three struts and five fan blades.

Other objects and advantages of the invention will be apparent from the following description in which reference is made to the accompanying drawings.

In the drawings:

FIG. 1 is a front elevational view of an electric fan according to this invention;

FIG. 2 is a cross-sectional view taken on line 2-2 of FIG. 1; and

FIG. 3 is a rear elevational view of the fan.

The fan chosen to illustrate this invention includes a frame 10 having a central opening 11. In the present example, the frame 10 has a substantially square outer contour, and the opening 11 is circular. At its corners, the frame 10 is provided with holes 12 for accommodating suitable fasteners (not shown). By means of these fasteners, the frame can be mounted in or near a region in which air is to be circulated.

Arranged at the center of the opening 11 is an electric motor 13. Since the opening 11 is circular, it is desir-

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able that the outer contour of the motor also be circular, in order to define an annular space 14 of constant width between the motor 13 and the frame 10. The illustrative motor 13 includes a stationary portion 17, and a hub 18 which rotates with respect to the portion 17 when electric power is supplied to the motor. The means for supplying power to the motor has not been shown. Fixed to and projecting radially from the hub 18 are a series of blades 19, 20, 21, 22 and 23, suitably shaped to move air in an axial direction through the space 14 when the hub 18 rotates. The longitudinal axis of each blade 19 coincides with a line extending radially from the center of the motor 13.

Struts 24 extend across the space 14 between the stationary portion 17 of the motor 13 and the frame 10 in order to support the motor at the center of the opening 11. The struts 24 do not extend radially with respect to the motor 13. Rather, as may be seen clearly in FIGS. 1 and 3, the longitudinal axis of each strut is arranged at an angle to a line which intersects it and extends radially from the center of the motor. In other words, if the direction of rotation of the fan blades (FIGS. 1 and 3) is considered the forward direction, the end of each strut adjacent to the frame is spaced forwardly from the end of the strut adjacent to the motor. Preferably, in fact, one edge of each strut extends tangentially with respect to the outer surface of the motor.

Due to the orientation of the struts as described, and the radial orientation of the fan blades, it will be appreciated that all points along the length of a fan blade do not cross any strut at the same time. This would be the case if the struts were radially arranged with respect to the motor. Rather, assuming the blades are rotating in the direction of the arrows in FIGS. 1 and 3, the innermost portion of each blade first crosses any particular strut, as indicated by blade 19. As the blades continue to rotate, the central portion of the blade crosses the strut, as indicated by the blade 21. Finally, continued rotation of the blades brings the outermost portion of the blade into registry with the strut, as shown by blade 23. Consequently, at any one time, only a portion of the air being moved by a blade is obstructed by a strut. In conventional fans with radial struts, the air being moved along the entire length of the fan blade is obstructed at one time. Hence, a fan according to this invention produces substantially less noise than a conventional fan since at any one time they is only a partial obstruction of the air set into motion by any blade. In addition, the noise which is produced by a fan according to this invention occurs over a longer period than does that produced by conventional fans, since it takes longer for one of the blades of the present invention to cross one of the struts. Thus, it may be seen that the present invention produces both a lower and steadier noise level than that produced by conventional comparable fans.

It has been found advantageous to employ five fan blades and three struts as shown in the drawings. As a result of this combination, at any one time no blade and strut pair is ever in the same orientation as any other blade and strut pair. In addition, this combination has been found to produce the steadiest and most acceptable noise level.

The invention has been shown and described in preferred form only, and by way of example, and many variations may be made in the invention which will still be comprised within its spirit. It is understood, therefore, that the invention is not limited to any specific form or embodiment except insofar as such limitations are included in the appended claims.

What is claimed is:

1. An electrically driven fan comprising a frame having a central opening, an electric motor having a circular

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outer contour arranged at the center of said opening, a plurality of fan blades adapted to be rotated about the axis of said motor; each of said blades having straight side edges, and a plurality of struts for supporting said motor extending between said motor and said frame, the end of each strut adjacent to said frame being spaced forwardly in the direction of rotation of said blades from the end adjacent to said motor, whereby as said blades rotate, the portion of each blade closest to said motor will first cross any particular strut, thereafter the central portion of said blade will cross the strut, and still later the portion of the blade closest to said frame will cross said strut so that at any one time only a portion of the air being moved by a longitudinal section of the blade is obstructed by the strut.

2. An electrically driven fan as described in claim 4,

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wherein said struts are arranged tangentially with respect to said motor.

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