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2,116,539

BLOWER WITH ADJUSTABLE HOUSING

Filed Sept. 16, 1935

2 Sheets-Sheet 1

Fig. 1.

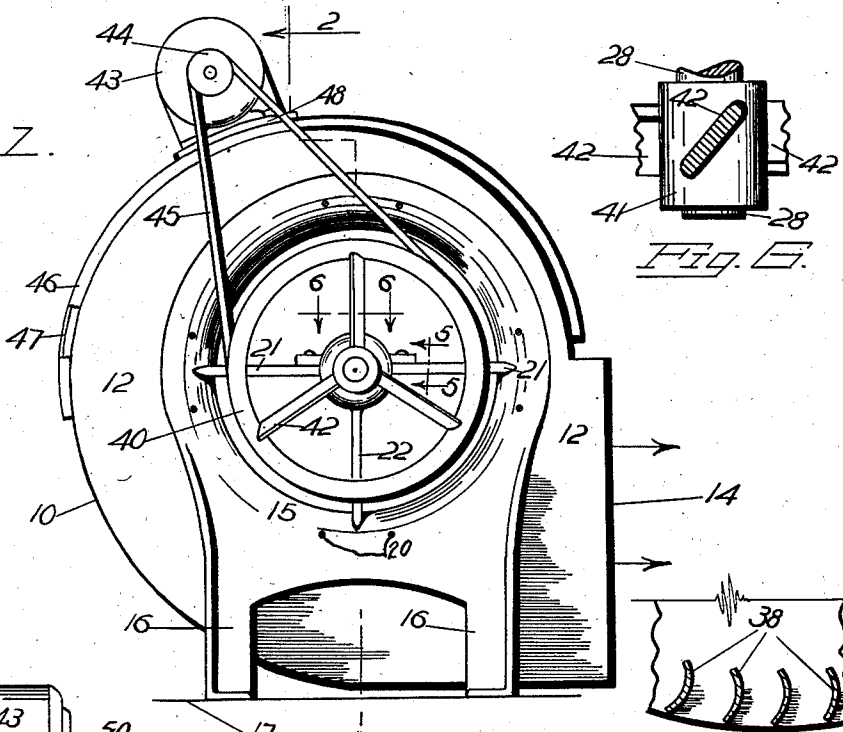


Fig. 6.

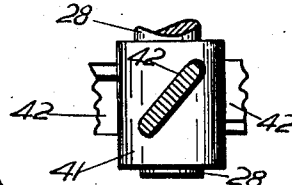


Fig. 2.

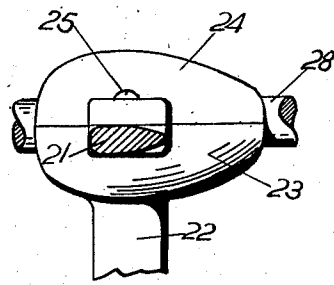


Fig. 5.

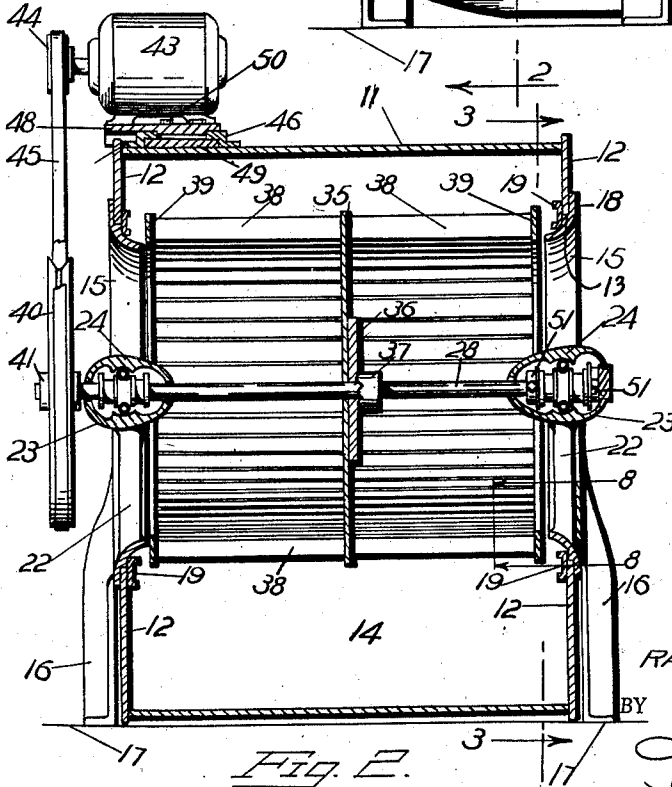


Fig. 4.

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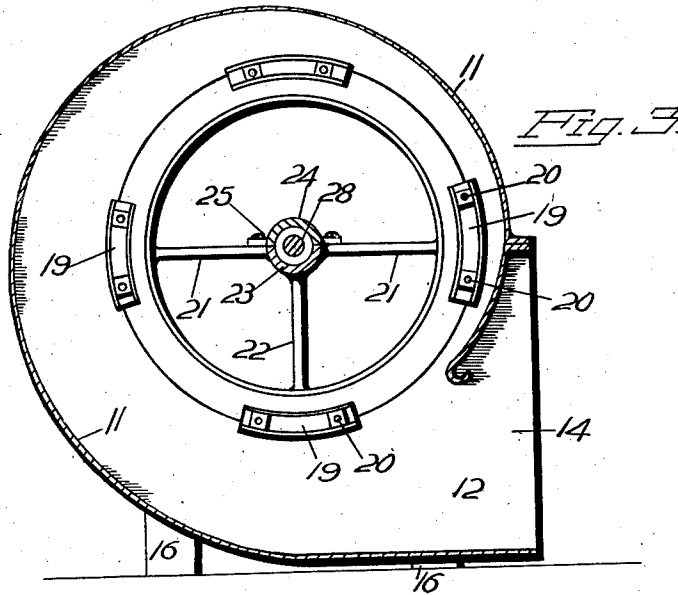
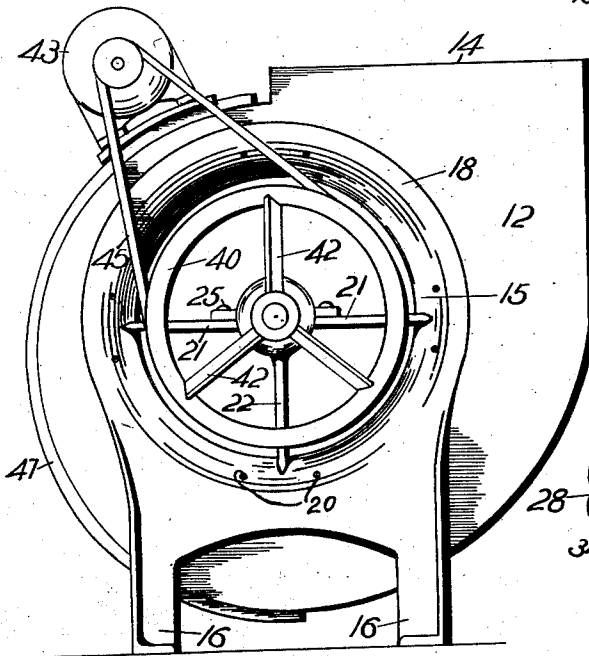
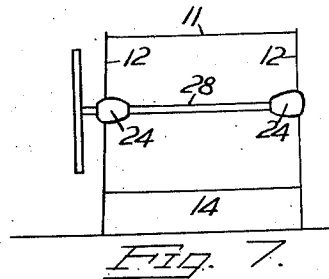
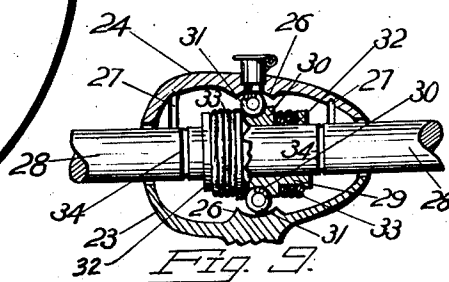
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BLOWER WITH ADJUSTABLE HOUSING

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Application September 16, 1935, Serial No. 40,710

1 Claim. (Cl. 230-133)

This invention relates to improvements in centrifugal fans or blowers and has reference more particularly to a blower intended to be used primarily in connection with heating and ventilating systems, but which can also be used for other purposes.

In the fast developing field of air conditioning the air is nearly always circulated by means of fans or blowers and it is necessary that the blowers must operate as silently as possible, as any noise would be highly objectionable. Another requirement is that the blower must consume as little power as possible so as to keep the cost of operation at a minimum.

Another requirement of such blowers is that they must be so constructed that the discharge outlet can be turned so as to discharge the air upwardly, downwardly, horizontally or at any other angle.

It is the object of this invention to produce a blower of the centrifugal type in which all of the requirements above enumerated shall be taken care of and which in addition shall have other desirable features of construction to which attention will be directed as the description proceeds.

The blower, which forms the subject of this application, will now be described in detail, and for this purpose reference will be had to the accompanying drawings in which the invention has been illustrated, and in which:

Figure 1 is a side elevation of the blower showing the discharge outlet extending horizontally; Figure 2 is a vertical section taken on line 2-2, Figure 1;

Figure 3 is a section taken on line 3-3, Figure 2;

Figure 4 is a side elevation showing the blower with the discharge outlet extending vertically;

Figure 5 is a section taken on line 5-5, Figure 1 and shows the shape of the bearing support and also that of the bearing housing;

Figure 6 is a section taken on line 6-6, Figure 1;

Figure 7 is a diagram showing an exaggerated case of unparallel end walls;

Figure 8 is a section taken on line 8-8, Figure 2; and

Figure 9 is a section through one of the bearings.

In the drawings, reference numeral 10 designates the impeller or fan housing, including the spirally curved wall 11 and the two end walls 12. The end walls are identical in size and shape, and are attached to the edges of the wall 11 in any approved manner, as by a crimped connection, welding or in any other way. Each end wall is provided with an opening 13 and the openings in the two end walls are in axial alignment or in register. The impeller or fan housing is provided with a tangential discharge outlet or opening 14.

The housing is supported by two members, one at each end. Each of these supports comprises an annular member 15 having two radial arms 16 that rest on a supporting surface 17. The parts 15 will be referred to hereinafter as supports, and have their outer surfaces convex with their inner edges projecting inwardly, as shown in Figure 2.

Each support is provided on its inner surface with a circular shoulder, lugs, bolts or other suitable means, against which the edge of the plate surrounding the opening 13 rests, and which serve as bearings for the housing.

Each support is also formed with an annular flange 18 that extends beyond the opening 13 and rests against the outside of the corresponding side wall.

Attached to the inside of the supports so as to overlap that portion of the end walls adjacent the openings 13 are channel bars 19 and these are secured to the supports by bolts 20 which can be turned from the outside while the nuts are located in the channels and are held against rotation by the flanges of the latter.

When the bars 19 are loosened the fan housing 10 can be turned so as to bring the discharge outlet 14 into any desired angular position. After adjustment has been made the bolts 20 are tightened and the housing clamped in adjusted position.

Each support has a horizontal diametrical bar 21 that extends across the opening therein and a vertical supporting bar 22. At the junction of bars 21 and 22 is a bearing housing comprising a lower portion 23 and a removable cover or top portion 24 that is held in place by screws or bolts 25. The construction of the bearing has been shown most clearly in Figure 9, from which it will be seen that two parts of the bearing housing are each provided with an inwardly extending flange 26 whose inner surface is spherical.

The cover 24 is also provided on its inner surface with two grooves 27 which serve to collect the oil, and from which the oil drops or flows into the sump in the lower part.

The fan shaft 28 extends through the bearing housing and carries a boxing 29 which is made of brass, bronze or any other suitable material. The boxing is provided on its outer surface with a

central annular groove 30 in which is located a coil spring 31 whose ends are connected together to form an endless elastic band. The diameter of the bottom of groove 30 plus twice the diameter of the spring 31 is equal to or very slightly greater than the diameter of the spherical surface on the flange 26. When the bearing is assembled, as shown in Figure 9, the shaft and the boxing will be held in concentric relation with the spherical surface on flange 26 by the action of the spring 31 which is resilient and slightly yieldable, and which can also roll slightly in the groove.

Since the inner surface of the flange 26 is spherical it is evident that the shaft and boxing can have a limited rocking movement about the center of the spherical surface which permits the angular relation of the shaft and the supports to be varied slightly without producing any objectionable pressure between the shaft and the boxing.

The boxing is provided at each end with a flange 32 so as to provide two grooves, one on each side of the center, for the reception of mixed wool and cotton yarn 33.

The bottom of each of the end grooves has an opening in communication with the shaft. The oil in the lower bearing portion 23 is maintained high enough to contact with the yarn and is carried upwardly by capillary attraction and lubricates the shaft. Any excess oil will be thrown off from the shaft by centrifugal force. The grooves 34 in the shafts prevent the oil from traveling beyond these points as it will be discharged by the centrifugal force as fast as it accumulates in these grooves. The grooves 27 in the cover 24 serve to collect the oil and guide it in its movement to the sump.

The reason for employing self-aligning bearings in this blower will now be explained and for this purpose, reference will be had to Figure 7, which shows the fan housing including the spiral outer wall 11 and the end walls 12, the bearing, whose covers have been designated by numeral 24 and the shaft 28.

In the construction of the fan housing it is very difficult to get the end walls absolutely parallel, and since the supports are attached to the end walls and the latter can turn relative to the supports it is evident that the latter will be given a wobbling motion when the housing is turned for the purpose of getting the discharge opening 14 into the desired position.

By employing self-aligning bearings the wobbling movement of the supports will not result in any binding action between the shaft and the bearings.

The shaft carries a rotor comprising a central plate 35 secured to the flange 36 of a hub 37. The outer wall of the rotor is formed from parallel, transversely curved strips 38 whose ends are connected by rings 39. Since there is nothing new in the construction of the rotor it will not be described in greater detail.

One end of shaft 28 is provided with a pulley 40 having a V-shaped groove. The rim of the pulley is connected with the hub 41 by means of flat spokes 42 that are angularly inclined with respect to the plane of rotation and which function as propellers to urge the air inwardly. This construction of the spokes overcomes or eliminates the resistance that would be offered by a pulley having spokes of ordinary shape.

The rotor is driven by an electric motor 43, which is provided with a pulley 44 which trans-

mits power to the pulley 40 through the belt 45. The motor is preferably positioned at or near the top of the fan housing as shown in Figure 1. The blower housing may be rotated on its supporting structure to effect a discharge of air in any desired direction; from the horizontal as shown in Figure 1 to the vertical as illustrated in Figure 4. This angular positioning of the discharge outlet, is usually done at the time of installation, and thereafter it will remain so fixed, the rotatable feature being provided, primarily, as an installation utility. When the blower is installed in the position shown in Figure 4, a shorter driving belt 45 may be used if the motor is to be kept near the top of the housing as shown, or the motor may be rotated with the blower and the same belt as shown in Figure 1 can be used in all positions of the blower.

For minor adjustments or tightening of the belt the motor may be moved with reference to the housing along rails on the outer surface thereof, to vary the distance of the motor pulley from the blower pulley as will be explained below.

Two Z-bars 46 and 47 are secured in spaced parallel relation to the outer surface of the spiral wall member 11 as shown in Figures 1 and 2. A base plate 48 is supported by the Z-bars 46 and 47, whose outer flanges project toward each other; this plate is provided with shoulders that engage the edges of the flanges on the Z-bars to form guides. A clamping plate 49 is located in the space between the outer surface of the wall 11 and the inside of the flanges of the Z-bars and is secured to the base plate 48 by bolts 50, and when these bolts are tightened they draw the plates 48 and 49 together and clamp them in position. Since the wall 11 is spirally curved it is obvious that when the motor is moved, the distance between the centers of the motor shaft and the fan shaft will be increased or decreased, depending on the direction in which the motor is moved, and this feature is taken advantage of for tightening the belt.

Shaft 28 is held against longitudinal movement by two collars 51 (see Figure 2). By having both of the thrust collars at one end, the shaft and the bearing at the other end can automatically adjust themselves to any variations in the distance due to inaccuracies in the width of the spiral wall 11.

Attention is called to the fact that the parts subjected to air flow have been streamlined so as to reduce air resistance to a minimum.

The adjustability of the fan housing so as to bring the discharge opening into any desired angular position relative to a horizontal plane makes it possible to employ this blower or fan in any installation and makes it unnecessary to carry many different forms in stock, as a blower constructed as above described will fit all layouts.

The use of self-aligning bearings in a blower whose housing is rotatable about the blower shaft is important and believed to be novel.

Having described the invention, what is claimed as new is:

A centrifugal fan comprising, in combination, a fan housing having a spirally curved outer wall provided with a discharge opening, the housing having end walls provided with aligned circular openings, the two end walls being substantially parallel, an annular support for each end wall, each support having means for engaging a supporting surface and having a circular flange of greater diameter than the opening in the corresponding side wall, each support having circu-

5 larly positioned means for engaging the surface of the side wall surrounding the opening therein, clamping means carried by the supporting member for engaging the side of the end wall opposite the flange to hold the two parts in assembled position while permitting the housing to be turned relative to the supports, a self aligning

bearing carried by each support, a shaft extending through the housing and the bearings, and a fan carried on the shaft, the said clamping means serving to hold the housing and supports in rotatably adjusted position.

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