Nov. 18, 1952 M. L. MALTZ 2,618,432

AXIAL FLOW BLOWER

Filed May 21, 1951

Fig. 1.

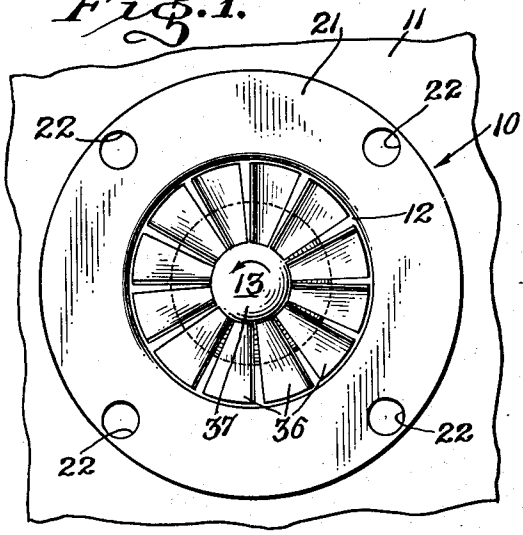


Fig. 2.

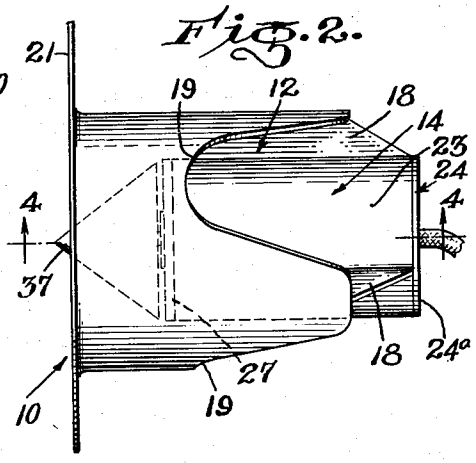


Fig. 3.

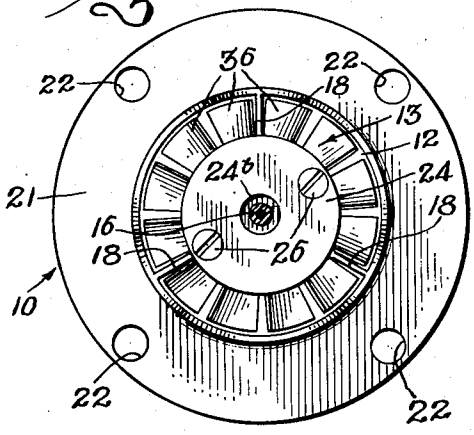


Fig. 4.

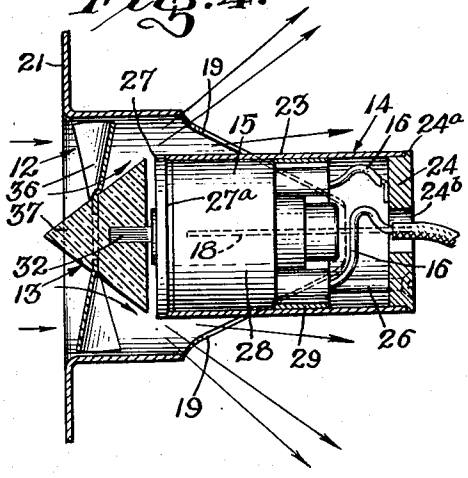
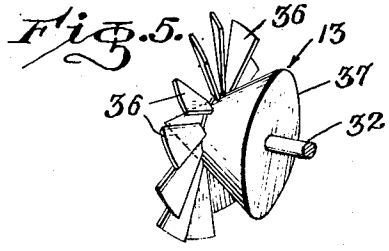


Fig. 5.



INVENTOR.
Max L. Maltz
BY
W. N. Dehn
Attorney.

Patented Nov. 18, 1952

2,618,432

UNITED STATES PATENT OFFICE

2,618,432

AXIAL FLOW BLOWER

Max L. Maltz, Los Angeles, Calif., assignor to American Electro-Mechanics, Pasadena, Calif., a corporation of California

Application May 21, 1951, Serial No. 227,335

2 Claims. (Cl. 230—117)

1

This invention relates generally to an axial flow fan of improved construction, and in particular to a blower of high efficiency and small size, adaptable for the cooling of electronic apparatus mounted in enclosed cabinets.

Recent developments in the field of electronics include complicated multicircuit electronic devices, which for purposes of convenience in handling and storage have been enclosed in relatively small cabinets. The space required for the circuits is reduced to a minimum by overlapping the circuits and compactly arranging them within one another. A serious limitation to which the space required for the circuits may be reduced lies in the fact that there must be sufficient space within the cabinet to allow cooling of the circuits by the air therein contained and surrounding the circuits. Electronic circuits are subject to considerable heating due to the ultra-high frequency currents utilized therein and their effect on electronic components in the circuit. In order to prevent excessive and injurious increases in temperature it is necessary to keep the ambient temperature of circuit surroundings at a minimum. The most feasible and least expensive method of doing this is to provide means whereby a draft of cooling air is drawn from outside the cabinet and directed over the heated electronic components to withdraw heat. Vents may be provided for the emission of air from the cabinet after it has passed over the heated components of the electric circuit.

A primary object of this invention is to provide a small, light weight and efficient high-speed fan mounted in a port provided therefor in the cabinet wall of an electronic machine and adapted to draw air into the cabinet and direct it over the heated components of the electronic circuit.

A further object of this invention is to provide an axial flow fan and duct, the duct having a minimum of resistance to the free flow of air induced by the fan.

Still a further object of this invention is to utilize a conical fan hub to provide and maintain a continuously diverging flow of air.

Still another object is to provide an improved motor fan unit of compact design and high efficiency.

Referring now to the drawing:

Figure 1 is a front view of an axial flow blower constructed in accordance with the present invention;

Figure 2 is a side view of the axial flow blower;

Figure 3 is a back view of the blower;

Figure 4 is a longitudinal section of the blower taken on line 4—4 of Figure 2; and

Figure 5 is a perspective view of the improved multi-bladed impeller utilized in the present invention.

Referring again to the drawing, and particularly to Figures 1 and 2, an axial flow motor fan unit constructed in accordance with the present invention is indicated generally by the reference character 10 and is seen to comprise basically a cylindrical duct 12, a motor casing 14 within duct 12, and an impeller 13 driven by electric motor 15 positioned within casing 14. A flat rigid flange 21 formed at the front or intake end of duct 12 and extending outwardly from the peripheral edge thereof is utilized to affix the fan unit to a conventional cabinet wall, a portion of which is indicated by the reference character 11. Referring to Figure 1, the inside surface of the flange 21 is seen to abut the outside wall of the cabinet around a suitable aperture through which the duct 12 extends.

2

Flange 21 is formed with a plurality of equally spaced holes 22 and adapted to receive screws or bolts to secure the blower unit rigidly to the cabinet wall.

The back or discharge end of duct 12 has three deep arcuate cutaway recesses or serrations cut therein at equal intervals and three support fins or webs 18 extend perpendicularly inwardly toward the longitudinal axis of the duct. Each of the fins 18 is positioned on the duct wall midway between adjacent arcuate serrations at the points of maximum duct wall length. The motor casing 14, generally cylindrical in shape, is rigidly supported concentrically in duct 12 on supporting fins 18.

Referring to Figures 3 and 4, motor casing 14 is seen to comprise a cylindrical side wall 23 carrying rigid support fins 18, and integral therewith in a preferred form, a detachable rear wall 24, and a front wall 27. Rear wall 24 is sized to fit snugly within wall 23 except for an enlarged peripheral shoulder 24a which abuts the end of wall 23. Front wall 27 is formed on its inner side with a reduced diameter circular shoulder 27a which forms a seat for the front end of the wall.

Motor proper 15 is positioned immediately adjacent front wall 27 of the casing and is suitably fixedly secured thereto. It includes a stator 28 rigid with wall 27, an end casing 29, and an unshown armature the shaft 32 of which is mounted suitably in unshown bearings and which extends forwardly through front wall 27. A pair of elongated screws 26 with their heads recessed in rear wall 24 extend to motor end casing and exert a force to draw the motor toward the end wall, and in so doing to draw both end walls against the ends of casing 23. An insulating sleeve 31b surrounds end casing 29, which in a preferred form includes the brush holders and insulates that portion of the motor from side wall 23. Current-carrying leads 16 extend from the motor through an opening 24b in rear wall 24 and are adapted to connect to a suitable source of current.

Referring to Figures 1 and 5, it is seen that

impeller 13 comprises a plurality of radially extending blades 36 rigidly set at equal intervals in a single continuous circle in the conical outer surface of hub 37, the plane of rotation of said blades being parallel to the base of the hub and perpendicular to motor drive shaft 32. The blades are pitched so that on rotation of the impeller in its operative direction air is induced to flow from the apex of and over the surface of conical hub 37 to and through duct 12. Conical hub 37 is rigidly fitted to the projecting end of motor shaft 32, its flat base facing and extending parallel to the outer surface of front wall 27.

In the operation of a device constructed in accordance with the present invention the blower unit 10 is mounted on the exterior of wall 11 of a conventional cabinet. The intake or impeller end of the unit is directed toward the atmosphere exterior to the cabinet. The discharge of the duct 12 is directed into the cabinet and toward the electronic circuits positioned therein. The rotation of impeller 13 by motor 15 induces a flow of air from the atmosphere exterior to the cabinet over the surface of conical hub 37 and into duct 12. Hub 37 deflects the air flow from a normal axial direction and directs it outwardly in a path the limits of which approximate the projection of the hub and the outer surface of motor casing 14. In order that the expanding flow of air so produced will not be constrained to parallel relationship upon entering duct 12 the arcuate serrations 19 in the latter are cut sufficiently deep as not to interfere with the expanding flow of the larger part of the air in its movement into the cabinet and over the components to be cooled. The advantage of the arcuate serrations is two-fold, first, cooling efficiency is increased because of the greater area of coverage of the cabinet interior obtained by the continuing expanding flow of air, and, second, by eliminating, as far as possible, all restriction to free uninterrupted expanding flow, the back pressure of the fan is reduced to a minimum, thus increasing fan efficiency.

While the particular apparatus herein shown and described in detail is fully capable of attaining the objects and providing the advantages hereinbefore stated, it is to be understood that it is merely illustrative of the presently preferred embodiments of the invention and that no limitations are intended to the details of construction or design herein shown other than as defined in the appended claims.

I claim:

1. In an axial blower of the class described, a cylindrical duct formed with a peripheral flange at the front end thereof adapted to affix the blower unit rigidly to the wall of a conventional cabinet, said duct being formed with arcuate serrations in one end to permit free flow of an expanding stream of air from said duct, said duct being formed with a plurality of arcuately spaced radially extending webs directed toward the longitudinal axis of the duct, an enclosed motor housing supported by said webs concentrically within said duct, said housing including a cylindrical side wall and a detachable rear wall, a motor positioned in said housing and including a rotatable shaft and a large circular end plate through which said shaft extends, said end plate having a peripheral shoulder seating the front

end of said cylindrical side wall to close the front end of said housing and to position said motor relative to said side wall and to said duct, a multibladed impeller including blades and a conical hub rigidly affixed to the projecting end of said motor shaft with the apex thereof directed from said motor and housing, the blades of said impeller being arranged in a circular row on said hub and pitched so that on rotation of the impeller in its operative direction air is induced over the apex of said hub, through the said blades, thence over the remaining conical surface of said hub in an expanding flow, into and through said duct and thence out through the arcuate serrations in the discharge end of said duct, characterized in that said serrations extend sufficiently forwardly in said duct that a major portion of the induced air flow is free to expand radially immediately upon leaving said hub, and in that the forward extensions of said serrations are intersected by an imaginary projection of the surface of said conical surface of said hub.

2. In an axial blower of the class described, a cylindrical duct formed with a peripheral flange at the front end thereof adapted to be affixed rigidly to the outside wall of a conventional cabinet, the rear end of said cylindrical duct being deeply crenelated, said duct being formed with a plurality of webs spaced midway between adjacent crenelations and at the point of maximum duct wall length, said webs extending radially from the inner surface of said duct toward its longitudinal axis, an enclosed motor housing supported by said webs concentrically within said duct, said housing including a cylindrical side wall and detachable front and rear walls, said front wall having a peripheral seat adapted to receive the front end of said cylindrical side wall, a drive shaft extended through said front wall and positioned relative to said cylindrical side wall and to said duct thereby, a multibladed impeller rigidly affixed to the projecting end of said drive shaft immediately forward of said front wall, said impeller having a conical hub having a maximum diameter substantially equal to the diameter of said housing with the apex thereof directed away from said housing and having blades arranged in pitched relationship in a single continuous circular row on said hub, said construction being characterized in that the crenelations in said duct extend sufficiently forwardly as to be intersected by an imaginary projection of the conical surface of said hub in order to provide freedom for radial expansion for a large portion of the air flow induced by the rotation of said fan immediately upon said flow moving longitudinally beyond said hub in said duct.

MAX L. MALTZ.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,284,141	Funk	May 26, 1942
2,488,945	Troller	Nov. 22, 1949

FOREIGN PATENTS

Number	Country	Date
477,449	Great Britain	Dec. 30, 1937