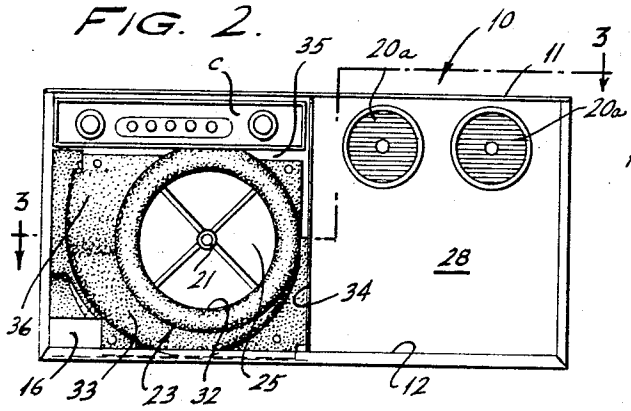
Jan. 23, 1968 K. E. MARSTELLER 3,364,989

AIR CONDITIONER

Filed Sept. 28, 1965

FIG. 2.



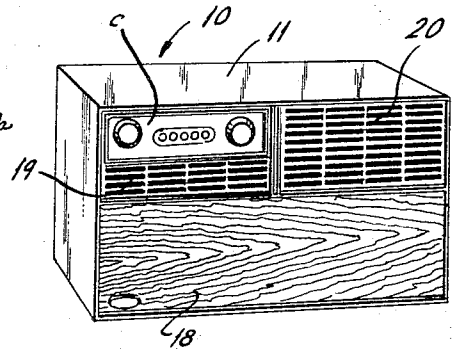
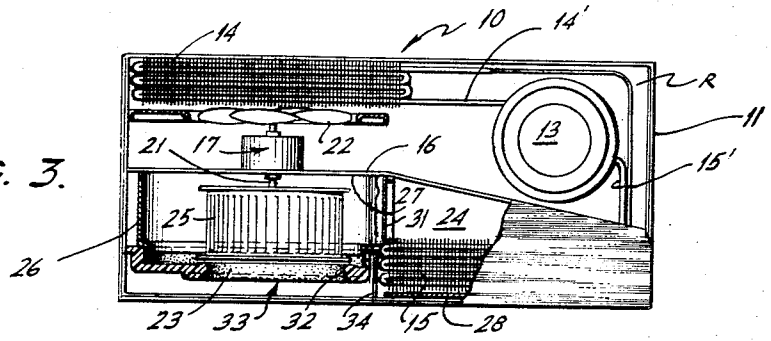


FIG. 1.

FIG. 3.



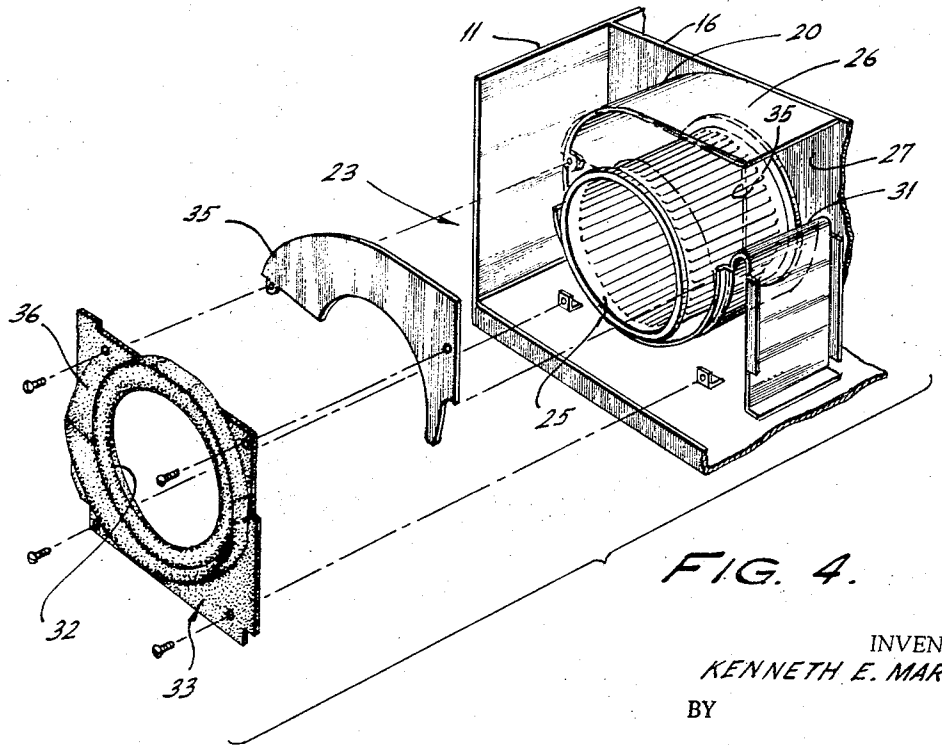


FIG. 4.

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AIR CONDITIONER

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3 Claims. (Cl. 165—122)

ABSTRACT OF THE DISCLOSURE

The blower wheel of a room air conditioner has an axial length longer than the width of the discharge opening in the scroll housing. The eye of the scroll is especially formed and the discharge portion of the scroll is especially tapered toward the discharge opening to accommodate the longer blower wheel and to provide smooth transition to the narrower discharge opening.

This invention relates to air conditioners, and more particularly to the form and construction of the air inlet and discharge assembly of a centrifugal room air fan associated with the cooling coil of a room air conditioner.

Air conditioners of the aforementioned type are characterized by compactness of construction that limits, among other things, the width of the room air fan discharge opening, and consequently the axial dimension of generally cylindrical air impellers commonly used in such fans. In an air conditioner where such limitations as these prevail, in order to achieve higher air flow rates it has been conventional practice to increase the rotational velocity of the impeller. However, increases in rotational velocities have disadvantageously resulted in increased overall noise levels.

It is a general objective of this invention to provide fan means of the aforementioned type that is characterized by both operation at a low noise level and improved efficiency in achievement of increased air flow rates.

In achievement of the foregoing general objective, the invention contemplates that air blower means associated with a room air conditioner be provided with a blower wheel that is substantially longer than the width of the blower discharge air opening, and that the blower housing air inlet and discharge assembly be specially formed and tapered to accommodate the longer blower wheel and to provide a smooth transition to the relatively narrow air discharge opening, without changing the overall dimensions of the air conditioner.

The manner in which the foregoing as well as other objectives and advantages of the invention may best be achieved will be more clearly understood from a consideration of the following description, taken in light of the accompanying drawing in which:

FIGURE 1 is a perspective view of air conditioning apparatus embodying the invention;

FIGURE 2 is an elevational showing of the apparatus seen in FIGURE 1, with a part removed;

FIGURE 3 is a view, partly in section and with parts removed, looking downwardly on the air conditioner as seen in FIGURE 2, generally in the direction of arrows 3—3 applied to the latter figure; and

FIGURE 4 is an exploded view of a portion of the apparatus seen in FIGURES 2 and 3.

With more particular reference to the drawing, and first to FIGURES 1, 2 and 3, air conditioning apparatus **10** embodying the invention preferably is of the relatively compact, room type comprising an outer cabinet **11** provided with a base member **12** that supports a refrigerating unit assembly including a compressor **13**, a condenser coil **14**, and an evaporator coil **15**. The elements of the unit assembly are connected in the usual series refrigerant flow circuit by conduit means **14'** and **15'** and by capillary tube restrictor R. Compressor **13** and condenser coil **14** are disposed in a compartment separated from evaporator coil **15** by a vertically standing partition **16** that extends substantially centrally of the housing.

A decorative panel **18** (FIGURE 1) overlies the front of cabinet **11**, and includes air inlet louvers **19** and outlet louvers **20** associated with air moving means housed within the cabinet and hereinafter to be more fully described. Panel **18** also includes an opening disposed for registry with a conventional control panel C associated with operating elements of the air conditioner. For convenience, panel **18** has been removed in each of FIGURES 2, 3, and 4.

A fan motor **17** is supported in the left hand region of partition **16** in such position and arrangement that its shaft **21** extends transversely of the partition. Motor shaft **21** drives fan means **22** at one end to induce flow of outdoor air over the condenser coil and compressor, and drives fan means **23**, at the other end, to induce flow of indoor, or room, air over the evaporator coil.

Room air fan means **23** therefore is disposed laterally of evaporator coil **15**, which is of the conventional fin and tube type, and is in air flow communication with the region about the evaporator coil by means of an air duct **24** formed in part by partition **16**, as best seen in FIGURE 3.

In especial accordance with the invention, and as seen to further advantage in FIGURE 4, room air fan means **23** comprises a blower wheel **25** of the so-called "squirrel cage" type that extends coaxially with motor shaft **21** and is surrounded by a scroll shaped housing **26** provided with an air discharge duct means provided with opening **27** and formed, collectively, by the fan cut-off **31**, by the upper peripheral portion of the housing **26**, by the evaporator coil end partition **34**, and by an upper, vertically extending panel segment **35**. For convenience of illustration, panel segment **35** has been shown in broken lines in its assembled position and in full lines in its exploded position.

A panel **33** is cooperably disposed with respect to the peripheral portion of housing **26** to enclose the outboard end of blower wheel **25**, and has a circular opening **32**, formed in an offset portion of the panel and comprising the fan inlet port aligned with the eye of blower wheel **25**. The fan inlet port is in air flow communication with inlet louvers **19** provided in decorative panel **18**. As is clear from FIGURES 3 and 4, blower wheel **25** extends axially for a distance that is greater than the width of the fan duct means and discharge opening **27**. The relatively long blower wheel preferably has a blade density of unity (i.e. the ratio of blade area to circumferential area=1). I have found that this ratio affords optimum air flow rates characterized by reduced velocities over the blades. Panel **33** is especially formed to accommodate the relatively longer blower wheel, and further is tapered at **36** to provide a smooth transition of the housing from the fan inlet port to the narrower discharge duct means and the opening **27** that communicates with duct **24** leading to evaporator coil **15**. Air discharged by the fan is caused to flow over evaporator coil **15**, through rotatably adjustable louvers **20***a* in a sub-panel **28** overlying the evaporator coil, and finally through louvers **20** into the room or other region to be air conditioned.

Panel **33** conveniently is formed of a foamed plastic, of known type, molded in a single piece into the illustrated configuration. However, if desired it could be formed of bent sections of sheet metal, or even sheets of plastic material.

It will be appreciated that the disclosed noise reduction structure has particular utility in combination with the

compact, side-by-side fan means **23** and evaporator coil **15** in the illustrated air conditioner. Advantageously, the inventive structure permits enlargement of the blower housing into unused space adjacent the evaporator coil. By way of example, the housing width in an air conditioner of this type has been extended to 5½ inches from an original width of 4½ inches. In order to retain the original 4½ inch width of discharge opening, apertured panel **33** has been tapered, as seen at **36**, from the extended surface portions thereof in overlying registry with the extended blower wheel, to the discharge duct means and opening.

By extending the apertured panel portion of the blower housing to accommodate use of the longer blower wheel in the evaporator coil air flow circuit, it is possible advantageously to use the same speed motor while achieving an increased air flow rate. Moreover, since the same motor is used, the same condenser air fan can also be used.

I have found that the invention provides for a gentle squeezing of the air by the tapered panel, at noise levels less than would be expected. The construction also accommodates retention of the thin overall depth dimension of a room air conditioner while achieving increased air flow without the penalty of increased noise.

In comparison tests of apparatus utilizing conventional blower arrangements with apparatus embodying the invention, there was found to be a reduction in operating sound level of 7 dba for the latter. The sound levels were obtained and recorded, under identical conditions, in a semi-reverberant room with the microphone placed 3 ft. in front of the air discharge grill **20**.

While a single preferred embodiment of the invention has been described, it will be understood that the invention is susceptible of use in air conditioning apparatus having slightly different coil and blower arrangements. In any event, such modifications are contemplated by the scope of the appended claims.

I claim:

1. A housing for a blower device having a scroll-shaped outer wall, a substantially flat side wall joined to one lateral edge portion of said outer wall, a fan wheel having a first portion rotatably mounted within the portion of said housing defined by said recited walls, and a second portion thereof extending axially beyond the free lateral edge portion of said outer wall opposite the recited one lateral edge portion, and panel means overlying the open side of said scroll-shaped outer wall and including

a first, planar portion cooperatively disposed relative to said scroll-shaped wall and said first side wall to form discharge duct means for said device of substantially the same width as the scroll-shaped outer wall, and a second portion recessed to receive the protruding portion of said wheel, said recessed portion defining an opening positioned in registry with the eye of said wheel, said recessed portion further including a surface region extending with angularity with respect to the plane of the eye of said wheel and toward said first, planar portion of said panel means.

2. A housing according to claim **1**, and characterized in that at least said second, recessed portion of said panel means is of molded, foamed-plastic construction.

3. In an air conditioner, the combination of a cooling element, and fan means for circulating air into heat exchange relation with said cooling element and discharging it into a space to be conditioned, said fan means comprising: a rotary impeller wheel of predetermined length; means defining a wall adjacent one end of said wheel; a scroll of lesser width than the length of said wheel and partially enclosing the latter, and panel means overlying the open side of said scroll, and including a first, planar portion cooperatively disposed relative to said scroll and said wall to form discharge duct means extending substantially the width of said scroll, and a second, recessed portion receiving the protruding portion of said wheel, said second portion defining an opening positioned in registry with the eye of said wheel, said second portion further including a surface portion extending with angularity with respect to the plane of the eye of said wheel and toward said first planar portion of said panel means.

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