Oct. 16, 1962 W. R. MOBLEY 3,058,651

AIR EXHAUST AND IMPELLER ROTOR FOR TREATING AIR TO PROVIDE COMFORT IN HOT AND COLD WEATHER

Original Filed Aug. 2, 1956

3 Sheets-Sheet 1

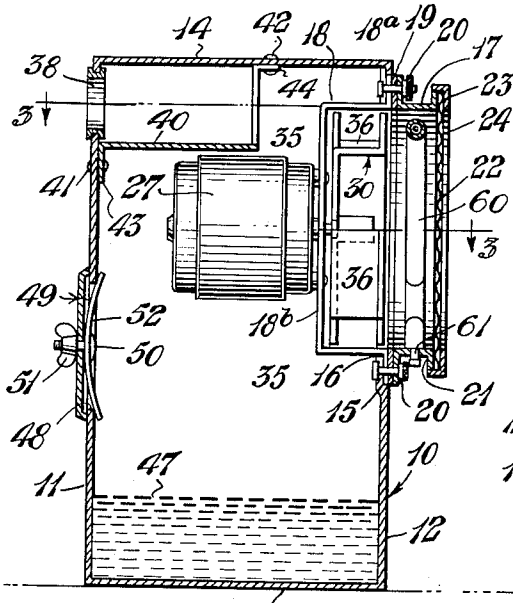


Fig. 2.

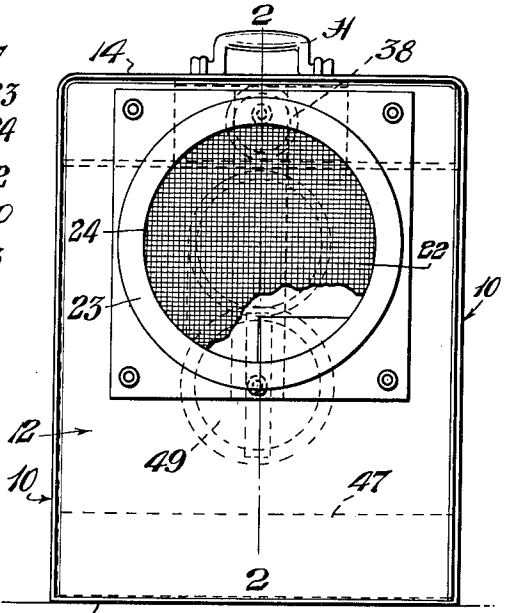


Fig. 1.

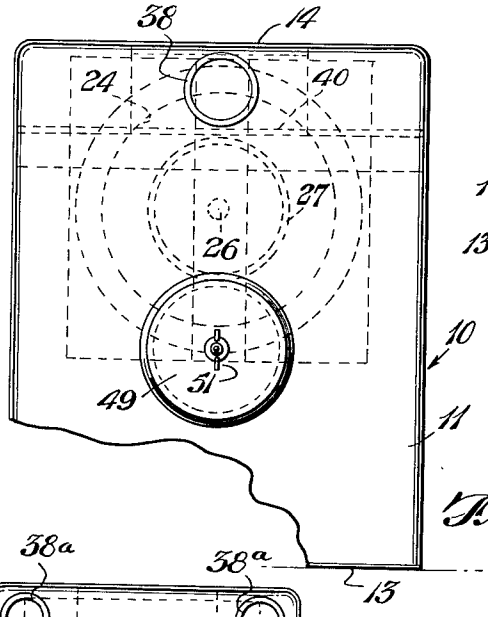


Fig. 4.

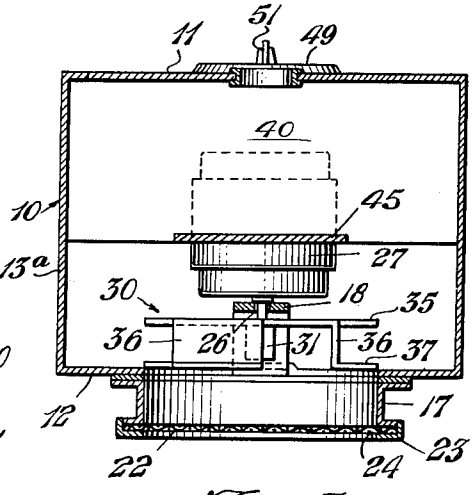


Fig. 3.

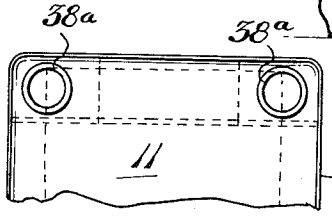


Fig. 9.

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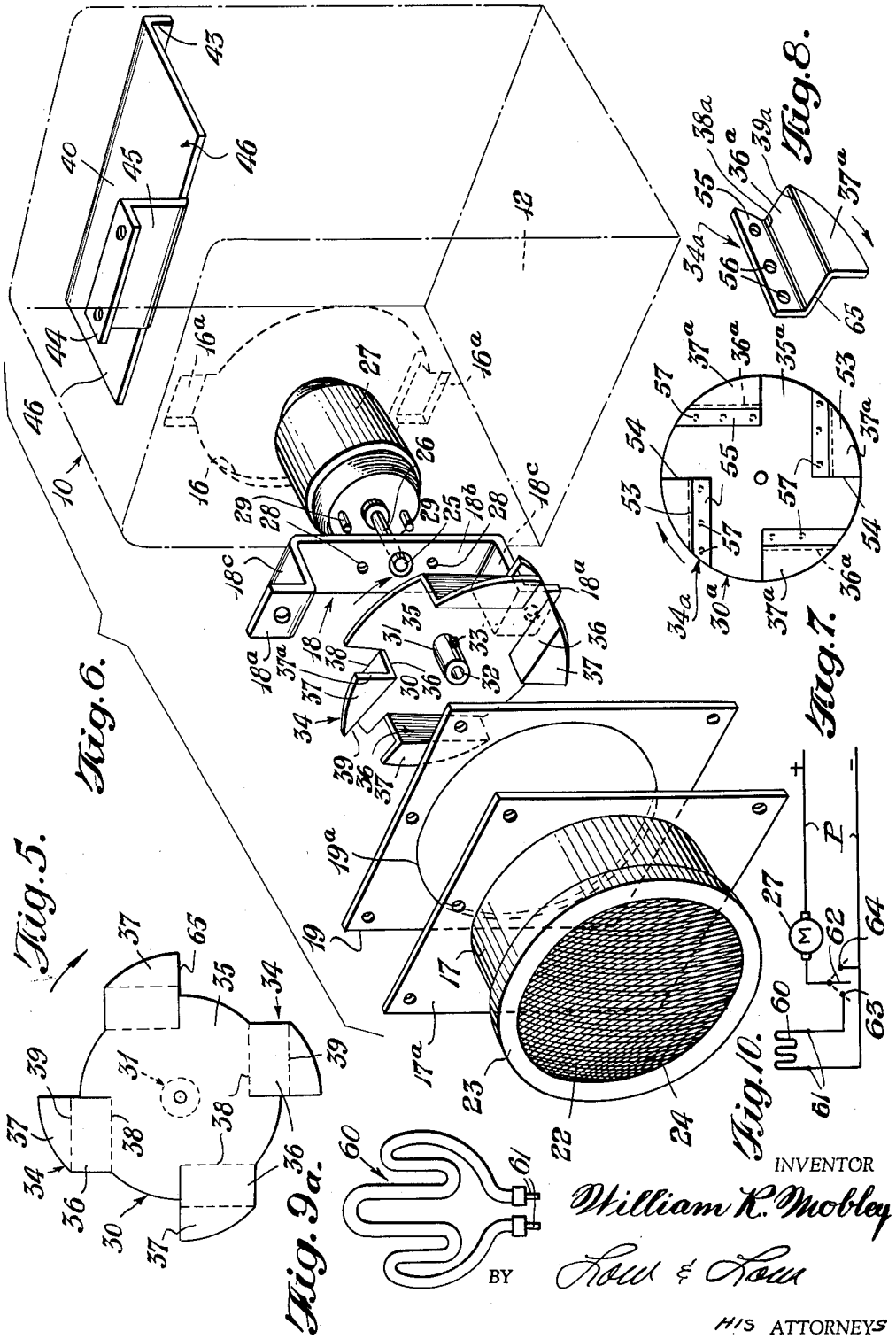


Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9a.

Fig. 10.

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Fig. 11.

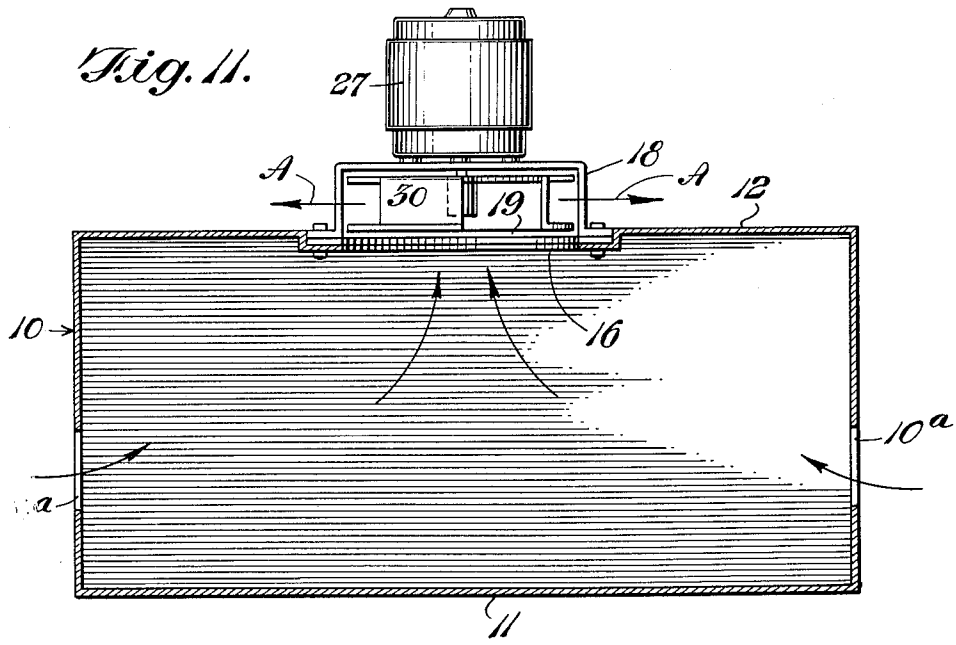
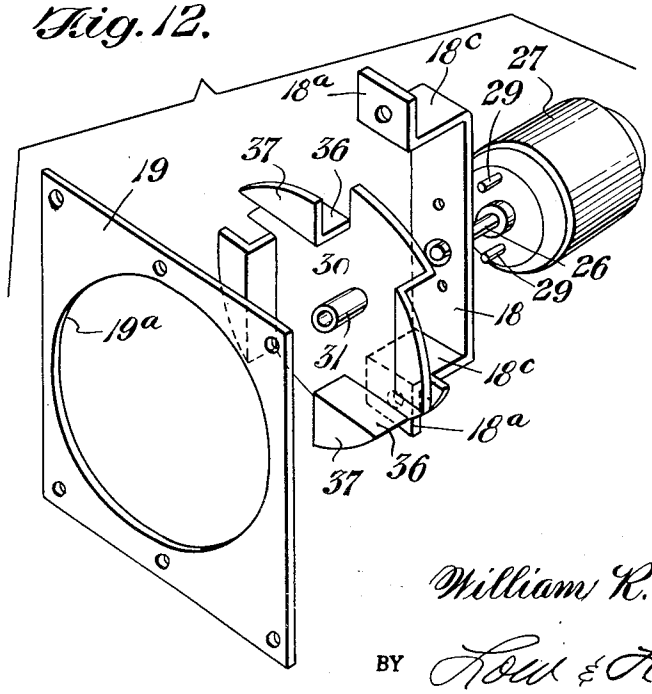


Fig. 12.



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AIR EXHAUST AND IMPELLER ROTOR FOR TREATING AIR TO PROVIDE COMFORT IN HOT AND COLD WEATHER

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Original application Aug. 2, 1956, Ser. No. 601,765, now Patent No. 2,967,051, dated Jan. 3, 1961. Divided and this application Dec. 22, 1960, Ser. No. 77,641

3 Claims. (Cl. 230—134)

The invention relates to a method and means for conditioning or treating air to create a localized comfort zone of expanding air in a ventilated room or area, and has for its objects to provide certain new and useful improvements in former procedure and devices of this character. This application constitutes a division of my pending application Serial No. 601,765, filed August 2, 1956, now Patent No. 2,967,051, for Means for Treating Air To Provide Comfort in Hot and Cold Weather.

A primary object of the invention is to provide a method and means whereby air may be circulated in a ventilated room after treatment of the air, by discharging the air under pressure into said room or area, thereby creating a zone of comfort for the benefit of the user of the improvement.

A further object is to provide a centrifugal suction fan, blower, impeller or pump which may be die pressed or cast in a single piece of metal, or which alternatively may be cast from plastic material as a single unit, including the hub of the fan or rotor.

Another object of the invention is to provide a blower and suction type fluid impeller which may be substituted for all conventional centrifugal or other types of impellers, and adapted to operate in conventional housing for subjecting fluids such as air to pressures above or below atmospheric.

Another object of the invention is to provide an impeller to operate within an air inlet opening substantially equal to the diameter of the impeller to permit the air to flow freely and thereby eliminate air noise otherwise caused by restricting the air inlet opening.

Another object of the invention is to provide a method of treating air to create and maintain a zone of expanding air which will more readily absorb heat and moisture from the body of the individual and provide comfort in hot weather.

Another object of the invention is to provide a method and means of treating air as by heating during cold weather to provide comfort in an enclosed room or building.

Another object of the invention is to provide a means and method to contract air and to more efficiently compress the contracted air and to utilize the expansion of the discharged pressurized air to maintain a zone of air in a state of expansion to provide comfort in hot weather by direct absorption of the heat and moisture from the body of the individual using the device.

A further object of the invention is to provide a device of the character described which is simple and economical of construction and capable of being conveniently transported for use in any desired enclosed locality, which is preferably under ventilation for ready admission of air thereto.

These objects are accomplished by forming the rotor impeller blades or vanes in uniformly spaced relation around a circular disc which is designed to be axially revolved as by an enclosed electric motor. The air propelling blades or vanes which may be integral with or constitute separate elements attached to the flat rotor disc, are disposed laterally of and at right angles to the disc so as to advance in a circular path of travel with the outer terminal edges of the blades disposed coextensive with and in laterally spaced offset relation to the periphery of the rotor disc portion. To this end each blade or vane member comprises an axially extending air propelling flange spaced radially outwardly from the rotor axis, said flange terminating in a right angularly and radially outwardly disposed flange for desired cooperation with the air propelling flange of the blade. Said radially extending terminal blade flanges each includes at its forward end a straight radial edge terminating at its outer end in an arcuate edge coextensive with and generated by the radius of the flat rotor disc body portion.

A rotatable fan or blower unit constructed in this manner and which may also be employed as a fluid pump, has been found to create desirable relative low and high pressures on opposite sides of the rotor so that the incoming low pressure air is entrained against the impeller blades in a direction parallel to the axis of the rotor, and thereafter centrifugally projected transversely of said axis for air treating purposes prior to the air being ejected at superatmospheric pressure into the localized zone or area occupied by the person or persons using the device.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description which, taken in conjunction with the drawings discloses a preferred embodiment thereof.

In said drawings:

FIG. 1 is a view in rear elevation of a preferred embodiment of the invention, looking toward the low pressure air inlet end thereof.

FIG. 2 is a vertical section on line 2—2 of FIG. 1.

FIG. 3 is a horizontal section on line 3—3 of FIG. 2.

FIG. 4 is a view in front elevation, looking toward the high pressure outlet end of the device.

FIG. 5 is a plan view of the rotatable air exhaust and impelling member of the unit, illustrated as die cut for example from a flat sheet of material such as metal or plastic, all parts of the rotor as illustrated being of uniform thickness.

FIG. 6 is an exploded view in perspective of the component parts of the apparatus or device for carrying out the present invention, as viewed from the rear or low pressure side thereof.

FIG. 7 is a view similar to FIG. 5 but showing a slightly modified form of the rotatable fan or blower unit.

FIG. 8 is a detail perspective view of one of the fan blades or vanes, a plurality of which are illustrated in FIG. 7 as affixed to the rotatable air propulsion or exhaust fan unit.

FIG. 9 is a fragmentary view similar to FIG. 4, of a slightly modified embodiment of the device wherein a pair of air outlet openings are present in the cabinet.

FIG. 9*a* is an elevational view of a Calrod heating element which is used to advantage in carrying out the present invention.

FIG. 10 is a wiring diagram.

FIG. 11 is a view of a further modified form of the invention wherein the air is exhausted from the interior of the substantially closed cabinet structure.

FIG. 12 is an exploded view of the motor and impeller assembly illustrated in FIG. 11.

Referring to the drawings, the air conditioning device or unit is illustrated as comprising a rectangular substantially closed cabinet **10** having an integral or separate front wall **11**, rear wall **12**, bottom wall **13** and top wall **14**, said cabinet being formed of any appropriate material such as metal or plastic, and having the described walls thereof assembled in substantial integral or fluid tight relation. In the illustrated embodiment the rear wall **10** includes an inwardly offset peripheral flange **15**

defining a circular opening **16** in said wall (FIG. 2). An annular housing **17** surrounds the aperture **16** on the outer side of the cabinet and a bracket member **18** (see also FIG. 6) bridges said aperture. A gasket **19**, having a central aperture **19***a*, is interposed between a laterally projecting peripheral flange **17***a* of the housing **17** and the diametrically opposed radial flanges **18***a* of the bracket member **18**, said housing and bracket members being secured together and to the rear wall **12** of the cabinet in fluid tight relation by means of bolts or screws **20** or other appropriate fastening devices. Said bracket flanges **18***a* are seated within diametrically opposed non-circular recess portions **16***a* (FIG. 6) communicating with the aforesaid aperture **16** in the rear cabinet wall **12**. This serves to anchor the bracket **18** against rotation relative to the enclosing cabinet **10**.

As best seen in FIGS. 1 and 2, the outer or air inlet end of the housing **17** is provided with an annular flange **21** to provide a seat for a disc-like air filter element **22** formed for example of fibre glass, and the filter element is removably clamped to seat **21** of housing **17** by means of a removable clamping and enclosing member **23** having a central air entrance opening **24** therein.

The bracket member **18** further includes a diametrically extending web **18***b* (FIG. 6) having a central aperture **25** therein for rotatably receiving therethrough the armature shaft **26** of an electric motor **27**. A pair of spaced apertures **28** in the bracket web **18***b* respectively receive diametrically spaced bosses **29** on the end of the motor housing for rigidly mounting the motor on the bracket member **18** as by screws or clamping bolts (not shown) engaging the motor bosses and the bracket member web **18***b*.

A rotor impeller or exhaust fan blower is indicated generally at **30** and may be integrally constructed as illustrated, of metal such as steel or aluminum or of plastic of desired, as illustrated in FIGS. 5 and 6. Said rotor is provided at one side thereof with a hub **31** secured thereto said hub being centrally apertured at **32** for the reception of the outer end of the motor armature shaft **26**. A set screw indicated at **33** is provided for securing the rotor hub **31** to the motor shaft **26** for rotation of the hub and fan rotor element with the shaft. Obviously the rotor hub **31** may be keyed to the motor shaft or otherwise secured thereto for unitary rotation therewith.

The rotatable exhaust and propulsion fan element **30** includes a series of circumferentially and uniformly spaced impeller blade or vane members **34** preferably formed integrally with the disc-like body portion **35** of the rotor. Each impeller blade includes an axially extending flange portion **36** extending perpendicularly from the disc **35**, and an integral right angularly extending radial flange **37** of arcuate configuration parallel to disc **35**. Said blades are formed from the rotor disc by bending the rotor material along spaced straight-line parallel folds **38**, **39** (FIG. 5). As thus formed the axially extending flange **36** of each rotor blade or vane **34** is flat and of rectangular configuration, while the integral angularly extending radial flange **37** thereof is also flat, but is of arcuate or curved configuration at its outer periphery. Also, as seen in FIG. 5, the lines of juncture **38**, **39** between disc **35** and axial flange **36**, and between axial flange **36** and radial flange **37**, respectively, are disposed normal to the leading edge **65** of vane **34**. Air inlet and discharge pockets are thus formed in each rotor blade or vane, and the leading axially and radially extending edge **65** of each blade is disposed in the direction of forward rotation of the rotor unit. Also the arcuate flanges **37** of the impeller blades are radially coextensive with the periphery of the disc shaped body portion **35** of the rotor to permit the latter to be snugly and rotatively nested between the axially extending flanges **18***c* of the bracket member with only slight peripheral clearance therebetween.

The forward end **11** of the cabinet **10** is provided with

a single central air outlet opening or aperture **38**. Additional air filter means similar to filter member **22** may be provided if desired to cover the said air exit opening **38** in the front wall **11** of the cabinet **10**.

An imperforate horizontal baffle plate is indicated at **40** and is preferably disposed in closely spaced relation to the upper surface of the motor **27**. Said baffle plate is substantially coextensive with the width of the cabinet **10** and is rigidly secured to the interior surface of the front wall **11** thereof by bolt or screw means **41**, and to the upper wall **14** of the cabinet by bolt or screw means **42**, said screws respectively engaging apertures in integral flange portions **43** and **44** of the baffle member **40**. The inner end of the baffle **40** includes an integral medial upstanding flange **45** of less width than the baffle **40** so as to provide a pair of spaced substantially rectangular air exit openings **46** respectively in horizontal registry with and spaced horizontally inwardly of the cabinet from the air outlet openings **38** in the cabinet front wall. The upper end of the upstanding medial flange **45** of the baffle plate terminates in the aforesaid angular horizontal flange **44** by means of which the baffle plate is rigidly secured to the top wall **14** of the cabinet **10**.

The baffle **40** is not necessary where two air exit openings are used, as shown at **38***a* in the slightly modified form illustrated in FIG. 9. This is because the pressurized air inherently collects in the interior corners of the cabinet and thereafter is discharged readily by the rotor impeller. However where the one opening **38** is used at the center of the front wall (FIG. 4), the baffle **40** materially aids in passing the air collected at the cabinet corners to such center opening where it is discharged under pressure by the rotor.

The imperforate fluid tight interior of the cabinet **10** is designed to contain a body of water **47** which may be admitted through the substantially central inlet aperture **48** in the front wall of the cabinet. A cover plate **49** is preferably removably secured to the opening **48** by means of a threaded screw bolt **50** having a wing nut **51** thereon, a curved clamping plate **52** being interposed between the inner bolt head and the portion of the cabinet front wall surrounding and defining the opening **48**.

In the modification illustrated in FIGS. 7 and 8 the fan or blower rotor unit **39***a* is of composite construction, for example when utilized in an exhaust fan or air impelling device of greater size. The disc like body portion **35***a* of the rotor **30***a* is die cut from metal or plastic along angular intersecting shear lines **53** and **54** to provide a series of spaced notches of angular configuration in the periphery of the disc. Alternatively the rotor **30***a* may comprise a circular disc when the blades are riveted thereto as shown in FIG. 7. Each impeller blade or vane **34***a* is of separate angular construction so as to include a central axially extending rectangular air propelling wall or flange **36***a* terminating in an angular radially extending wall **37***a* bent along line **39***a*. An inner angularly extending terminal flange **55** of each impeller blade **36***a* is bent along line **38***a*, and the flange **55** is apertured at **56** for the reception therethrough of rivet elements **57** for securing each blade unit to a flat disc-like body portion **35***a* of the fan rotor element. The same right-angle relationship between juncture lines **38***a* **39***a*, and leading edge **65** is present in the modified rotor of FIG. 7, as in the preferred construction of FIG. 5.

In use the cabinet **10** is transported as by the carrying handle H (FIG. 1) to any interior location where it is desired to create a comfort zone for example in a ventilated room or bedroom. The motor **27** of the unit is connected by means of the usual flexible cord (not shown) to a source of electrical current, and a switch (not shown) may be closed to energize the motor **27** to rotate the fan blower unit **30**. Unconditioned or untreated air is thus drawn into the cabinet through the filter screen **22** and housing **17** to impinge against the flat disc-like portion **35** of the rotor. This entrained

air on the inlet or low pressure side of the fan is forcibly directed centrifugally outwardly therefrom by the axially extending flange walls 36 of the impeller blades 34, as the blower is rotated by the motor in a clockwise direction as viewed in FIG. 6. Incoming air striking the radially extending blade portions or flanges 37 is arrested thereby so as to be forcibly propelled by the blade portions 36 into the lower interior of the cabinet 10. Since the fan and motor unit are mounted in the upper portion of the cabinet, the centrifugally propelled air under pressure will be forcibly directed laterally and downwardly along the cabinet walls and against the surface of the body of water 47, preferably with sufficient force to break the surface tension of and agitate the liquid. This tends to induce evaporation with attendant slight cooling of the water. The filtered and centrifugally propelled air under relatively high blower pressure from the discharge side of the rotor 30 contacts and is swept across the surface of the water so as to be slightly humidified and cooled thereby prior to being conducted upwardly through the cabinet for forcible exit from the discharge aperture 38 or apertures 38*a*.

It will thus be seen that a localized comfort zone permeated by slightly humidified and cooled air under pressure from the cabinet openings 47 is created in the vicinity of the user of the device. This is of obvious advantage to a person occupying such zone, regardless of whether it is for recreation or for sleeping purposes. Also it is pointed out that the instant invention, particularly the improved rotor 30 or 30*a*, may be utilized for the purpose of pumping fluids such as water or air in conjunction with cooperating conduit means.

FIGS. 11 and 12 illustrate the use of the device as an exhaust fan or impeller, under conditions wherein it is desirable to remove the air from a room or enclosed area. In such instance the rotor 30 is mounted for example on the cabinet 10 in a manner similar to that shown in FIG. 2, but on the exterior of the cabinet rear wall. When the rotor impeller 30 is driven as by the motor 27, the air on the interior of the cabinet will be drawn outwardly through the aperture 16 in the rear cabinet wall 12, and expelled by the rotor impeller blades laterally and centrifugally, as indicated by the arrows A. The side wall apertures 10*a* in the cabinet show the means of entraining the air therewithin prior to exhausting the same by the rotor 30. The cabinet 10 is merely illustrative of any area, such as a room or building, from which it is desired to exhaust the air for the purpose of conditioning the area.

Under certain conditions it may be desirable to heat the air prior to expelling the same through the cabinet aperture 38, as in the instance of an unduly chilled room or area to be conditioned. For this purpose an electrical resistance heating unit 60 of the Calrod type (FIG. 9*a*) is suitably mounted within the annular housing 17 inwardly of the filter element 22, as illustrated in FIG. 2. Said Calrod resistance element includes the usual terminal portions 61 by which it may be connected to a source of electrical current. The air stream is drawn into a heating zone on the interior of the annular housing 17, where the air is heated and expanded by the heated resistance element 60. Thereafter the heated air is circulated against the surface of the body of water 47, which causes the air to contract, after which it is discharged through the central opening 38 (FIG. 2), or plurality of openings 38*a* (FIG. 9), and continuously circulated in the room, area or building to be conditioned.

The heater 60 while contemplated as a permanent part of the device, is only used in a closed room during cold weather.

FIG. 10 illustrates a simple wiring diagram through which the Calrod heater 60 is connected to the motor 27 by means of a pivoted swich arm 62. When it is desired to heat the air, said switch arm is pivotally moved to engage switch contact 63 which places the motor and heater in series with the power circuit P. When it is not desired to heat the air being discharged into the room or area, the switch arm 62 is moved in the opposite direction into contact with the terminal 64, thereby cutting out the heater and energizing the motor only for the purpose of entraining and expelling cool air by the rotor impeller 30. Thus it will be seen that the heater can only be placed in operation in the circuit when the motor 27 is in operation, thus insuring against burning out the motor.

From the foregoing it will be obvious that the instant improved device may be constructed as an air heater or cooler, or a combination of both, which latter is most preferable.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing any of its material advantages, the forms hereinbefore described being merely exemplary embodiments thereof.

I claim:

1. An air exhaust and impeller rotor of one piece construction, comprising a flat disc-shaped body portion having a centrally apertured hub for the reception therethrough of a motor drive shaft secured thereto, and a plurality of impeller blades spaced peripherally of and secured to said disc portion, each of said blades including an axial air impelling flange extending perpendicularly from said disc portion for discharging air centrifugally from said rotor, said flange having a straight forward edge disposed parallel to the axis of rotation of said rotor and with said edge lying on a radial plane through the rotor axis, the line of juncture between said flange and said disc portion comprising a straight line disposed normal to said radial plane, and a radially extending terminal flange extending at right angles from the outer end of said axial flange, the line of juncture between said axial and radially extending flanges being disposed parallel to said first-mentioned line of juncture and the periphery of said radially extending flange being of arcuate configuration radially coextensive with and generated by a radius equal to and spaced axially from the radius of said disc portion.

2. An air exhaust and impeller rotor as defined in claim 1, wherein said rotor disc portion is of circular configuration and said impeller blades are of separate construction and are rigidly secured in circumferentially spaced relation to said disc portion adjacent the periphery thereof.

3. An air exhaust and impeller rotor as defined in claim 1, wherein said impeller blades are formed integrally from said disc portion.

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