

Sept. 24, 1946.

J. M. AUFIERO

2,408,286

COMBINED ELECTRIC HEATER AND AIR CIRCULATOR

Filed Dec. 14, 1945

2 Sheets-Sheet 1

Fig. 2

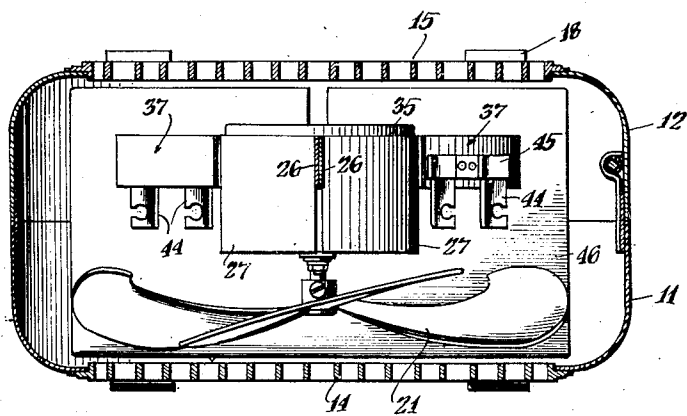


Fig. 4

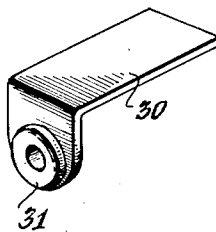


Fig. 1

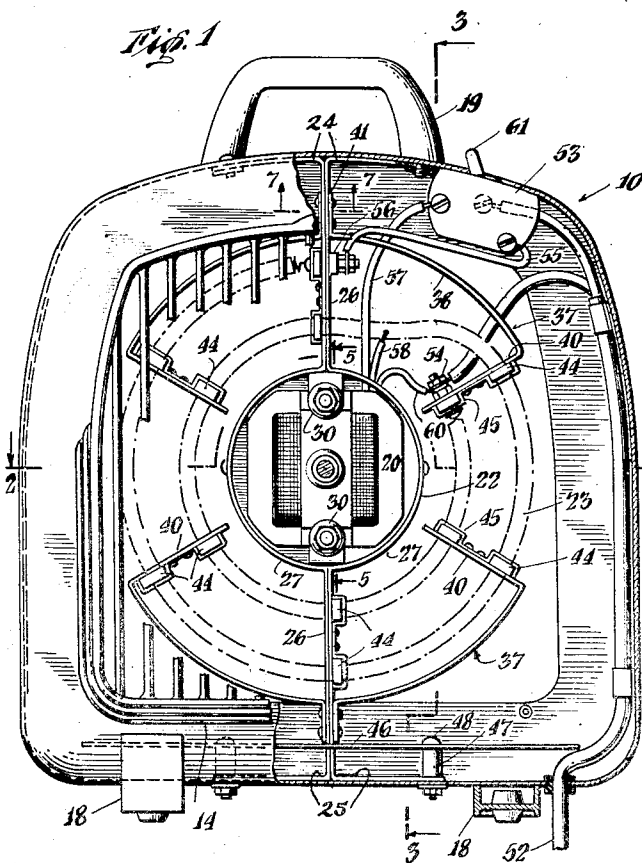
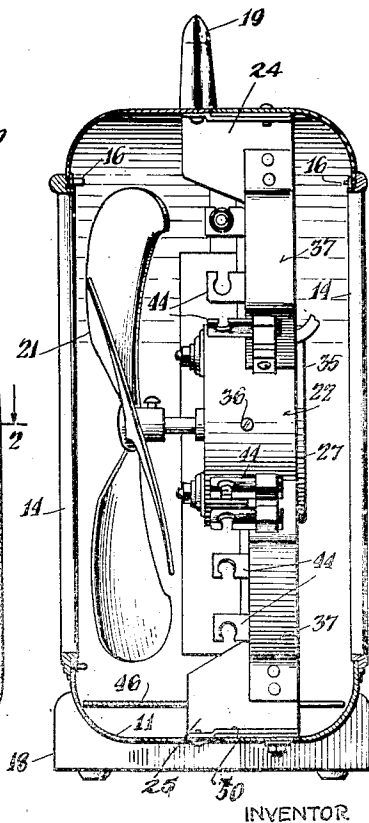


Fig. 3



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2 Sheets-Sheet 2

Fig. 5

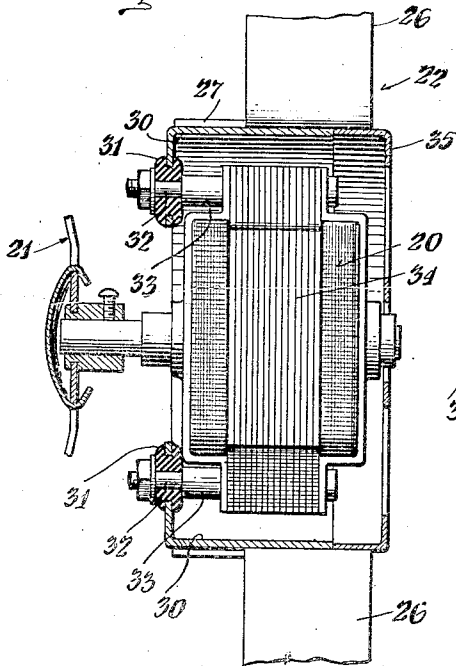


Fig. 6

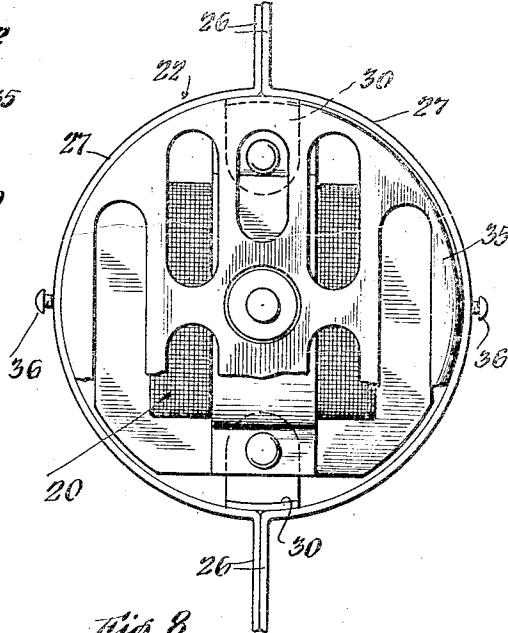


Fig. 7

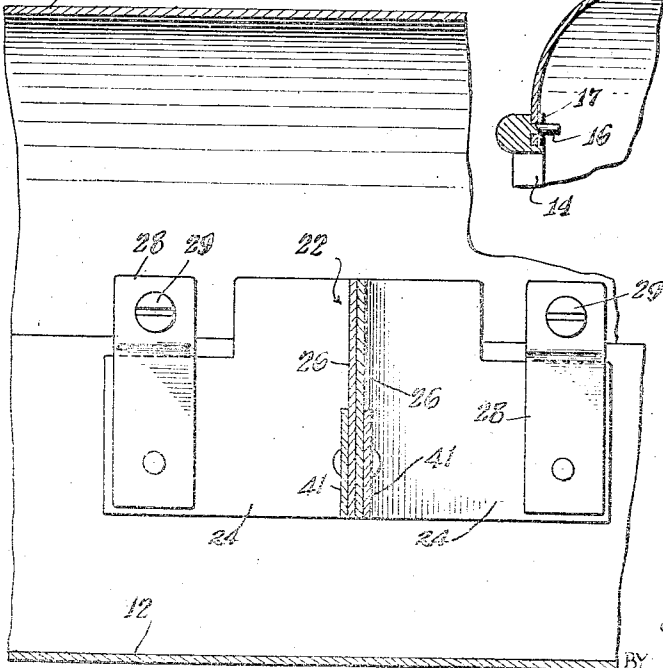


Fig. 8

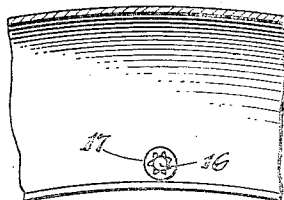
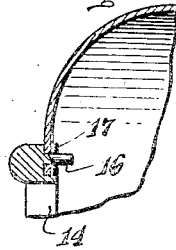


Fig. 9

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# UNITED STATES PATENT OFFICE

2,408,286

## COMBINED ELECTRIC HEATER AND AIR CIRCULATOR

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7 Claims. (Cl. 219—39)

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This invention relates to a compact, easily portable, combination electric fan and electric heating unit to provide a directed circulation of cool or warmed air.

As will hereinafter appear, the invention may be used as an electric fan, or as heating means for supplementing the normal heating of rooms in the household, or in providing temporary heat in rooms which may be temporarily unheated.

In homes or buildings having automatically controlled heating equipment, it is usual to set the thermostat during the night hours at such a low control point that the temperature of the rooms of the building may drop to 55 or 60 degrees. Open windows in a bedroom or nursery will additionally lower the room temperature. Low temperature sleeping rooms are a health hazard when it is necessary to arise during the night, as when a parent must go into a nursery to attend to an infant. A portable heating device, such as disclosed herein, may be brought into the room or nursery to provide a localized heat source which will raise the temperature to a safe and comfortable level. The heater embodying the present invention may be placed in close proximity to draperies, bed clothes or the like with perfect safety and freedom from danger of fire.

It is therefore a principal object of the invention to provide an electric heater and air circulator which combines high heat output with complete safety in operation, so that when used as a heater, the same may be placed on furniture, or in proximity to draperies or other inflammable material, without fire hazard.

It is another object of the invention to provide a portable heater having high thermal output but in which no external or exposed structure or element can rise to a temperature which will be dangerous to persons or objects which may come into contact therewith.

It is an object of the invention to provide a combined heating and ventilating unit having motor driven fan means and a heating element, and in which the fan may operate with the heating element deenergized, but in which the heating element may not be energized without having the fan in operation.

It is another object of the invention to provide a unit capable of being used as an air circulating fan or as a heating means, in which the fan speed automatically drops upon energization of the heating means to provide the velocity of air flow over the heating unit most favorable for the abstraction of heat therefrom.

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It is yet another object of the invention to provide an improved means for mounting a motor and a heating coil, said mounting means being assembled from a plurality of identical sheet metal stampings.

Other features and advantages will hereinafter appear.

In the accompanying drawings:

Fig. 1 is a front elevation of a combined heater and air circulator embodying the present invention, a portion of the front panel, and the fan, having been removed to reveal underlying structure;

Fig. 2 is a plan section taken on lines 2—2 of Fig. 1, and showing the fan in operative position;

Fig. 3 is an end elevation, in section on lines 3—3 of Fig. 1;

Fig. 4 is a perspective of one of the motor suspension brackets;

Fig. 5 is a side elevation, partly in section, showing the means of supporting the fan motor in a "floating" mount;

Fig. 6 is a rear elevation of the motor and mounting, the rear cover plate of the motor being partially broken away;

Fig. 7 is a bottom plan detail of the motor support at its point of connection with the upper wall of the heater casing; and

Figs. 8 and 9 are details showing a preferred means of securing the front and rear grilles to the casing.

Referring to the drawings, the combined heater and air circulator 10 includes a housing having front and rear sections 11 and 12, which may be identical in shape and size. The housings have grilles 14 and 15, also identical, suitably secured to the housing as by the integral studs 16 projecting from the inner walls of the grilles through the wall of the housing and secured by friction nuts 17 as shown in Figs. 8 and 9. The grilles permit the free flow of air into and through the housing although the bars of the grilles are relatively close together (see Fig. 2) to prevent draperies, for example, from being blown against the fan blades or heat coil. Suitable ornamental feet 18 which space the bottom of the casing above any supporting surface, and a suitable carrying handle 19, complete the casing.

Disposed centrally within the housing is a motor 20 having a fan 21 secured to a forwardly projecting motor shaft. A motor and heat coil support structure 22 supports the motor and a heating coil 23, as later explained. It will be noted from Fig. 2 that the heat coil is practically

in the center vertical plane of the casing. The center of gravity of the fan, motor, and heat coil assembly is likewise substantially in the center plane of the casing, thus affording a very stable and practically tip-proof, structure.

The support structure 22 comprises two identical brackets, preferably of cold rolled steel of suitable thickness, and formed, see Fig. 3, with angular extensions 24, 25 of substantial width respectively at the top and bottom. The relatively narrow upper and lower center post members 26 are interconnected by an integral semicircular element 27 of substantially greater width than the post members. Two brackets are placed back to back, whereupon the upper extensions and lower extensions provide a supporting head and foot for securement to the casing, and the semicircular structures 27 form a circular pocket within which the motor 20 may be positioned. As shown in Fig. 7, the said extensions 24 are L-shaped, with the vertical bar of the L extending across the meeting line of the two casing halves. Brackets 26, 28 closely overlie the respective leg portions of the L, and through said brackets pass screws 29 which provide for the securement of the handle 19. The respective upper extensions are screwed or bolted to the casing.

Preferably welded to the interior wall of the circular motor pocket are angle brackets 30, the radially extending ends of which have enlarged openings within which are received and held rubber bushings 31. Axial openings in the said bushings receive the reduced diameter extensions 32 of studs 33 which pass through and are secured to the frame structure 34 of the motor 20. The ends of said extensions 32 are threaded to receive a nut, as illustrated, in Fig. 5, and hence the motor 20 is floatingly suspended within the ring formed by the mating portions 27 of the motor suspension. The maximum diameter of the motor is less, see Fig. 1, than the inside diameter of the motor support pocket. As shown in Fig. 5, the angle brackets 30 terminate short of the rear wall of the members 27 and serve as stops to limit the extent of insertion of the rear motor cover plate 35, which is held in position by screws 36 or equivalent. As appears in Fig. 6, the rear plate 35 is foraminated to provide air flow passages for cooling the motor.

Desirably, the fan blades provide a fan disc area as large as the maximum opening afforded by the grilles and therefore induce air flow through the casing over substantially the full grille area. The front of the motor is not enclosed, and the foraminated rear plate 35 permits free flow of cool air through and about the motor during the operation thereof.

The structure 22 also provides means for securing and supporting the plurality of identical heater coil carriers 37, said carriers being formed from cold rolled steel to have an arcuate wall 38 terminating at one end in a branch 40 extending radially toward the center of the motor support ring and at the opposite end in a shorter branch 41 extending radially away from said motor support. The two upper carriers are placed back to back with their shorter branches against the vertical post sections of the structure 22, whereupon rivets or the like passing through the complete assembly secure the two heater coil carriers and the two upper posts of the structure into a rigid unit. In similar fashion the two lower heater coil carriers are secured to the

lower post portions of the structure by rivets passing through the assembly.

The heating coil 23 is supported on the carriers at the rear of the fan, by means of rigid blocks 44 of insulation material, each of said blocks having an opening or pocket within which the heater coil may be fitted. Desirably the insulation blocks are securely fastened to the radial branches 40, and to the post portions of the motor support, by means of metal straps 45 riveted to the said structure. The heater coil 23, positioned within the insulation blocks as aforesaid, follows a sinuous path, as shown in Fig. 1. Obviously the number and disposition of the insulating blocks depends upon the number of coils to be included in the heating unit. When the unit is to draw current from conventional house lighting circuits, the heating coil is sized to draw about 1300 watts; heavier duty coils may be used according to the capabilities of heavier-duty wiring circuits.

At the bottom of the housing it is preferred to provide a reflector plate 46, supported above the lowermost wall by means of tubular spacers 47 through which pass bolts 48 which secure the lower structural extensions 25 to the casing. As shown in Fig. 3, a strap or bracket 50 is riveted or otherwise fastened to the forward casing 11 and extends rearwardly to closely overlie the said extensions 25. In this fashion, the casing halves are securely joined, it being understood that the feet 18, secured to the front and rear casing halves by conventional means (not shown) assist in such securement.

The electric lead 52 may enter the housing at any convenient point, and may be secured to the sidewall of the casing by brackets or other conventional means. Conveniently disposed, as adjacent the handle, is a double-throw switch 53 which in one throw position will energize the heating coil and in the other, the motor alone. It will be understood that the switch has an "off" position disconnecting the power circuit. One conductor of the two conductor lead 52 is electrically connected to the throw arm of the switch; the return lead is connected to a binding post 54 at the end of the heating coil. A conductor 55 leads from one of the throw positions of the double throw switch 53 to a binding post 56 at the opposite end of the coil 23. Thus, when the switch is in this throw position, the heating coil will be energized. A conductor 57 connects the opposite throw position of the switch with one of the motor field coil leads. A conductor 58 of suitable resistance is electrically connected to the heater coil and to the same field coil lead. The opposite end of the field coil winding is connected by conductor 60 to binding post 54.

It will be seen therefore that assuming the switch handle 61 to be in the heat coil energizing position as seen in Fig. 1, current will flow through the conductor 52, switch 53, conductor 55, to heat coil binding post 56, thence through the heat coil to binding post 54, at which it is connected to the return lead of the two conductor system. At the same time, current will be drawn to the motor through lead 53 and thence through lead 60 to post 54. The motor will therefore operate so long as the heater coil is energized, and by tapping the lead 58 into the heater coil at a suitable resistance point, the normal speed of the motor may be reduced due to the relatively small resistance of the heater coil in parallel with the much greater resistance of the

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motor circuit. It is desirable to establish the motor speed at a rate at which the fan will draw air through the casing and over the heater coil in sufficient volume at sufficient velocity to prevent the heater coil from attaining a cherry-red temperature.

When the device is to be used as an electric fan, i. e. without heating effect, the switch 53 may be thrown to its second throw position wherein the heating coil lead 55 is disconnected from the power source, and the motor is energized through conductor 57 and 60. The motor circuit is not influenced by the less resistance of the heater coil, and the speed of rotation of the motor is correspondingly faster, producing greater air displacement.

It has been previously noted that the heater coil is in substantially the vertical center plane of the casing. Hence, the heater coil is remote from either grille; this condition, plus the circumstance that the heater coil cannot be energized without simultaneously causing operation of the fan, protects against the generation of a scorching temperature at either the front or rear grille. Therefore, even if the unit were knocked or placed face down on a piece of furniture or a blanket, many minutes would elapse before the temperature of the surface on which the unit has been lying is raised to a dangerous point.

When the unit rests in normal vertical position, the plate 46 acts as a reflector and is an effective additional insulation means which prevents the lower wall of the casing from attaining even a moderately high temperature.

Although the invention has been described by making a fully detailed reference to the certain presently preferred embodiments, such detail of description is to be understood in an instructive rather than a limiting sense, many changes being possible within the scope of the claims hereto appended.

I claim:

1. A combination electric fan and heater, comprising a casing having mating front and rear sections disposed in edge to edge relationship substantially centrally of the casing, each of said casing sections having an enlarged wall opening: grille means including relatively closely spaced elements secured to said casing sections over said openings to permit air flow through the casing while guarding against the introduction of foreign objects thereinto; a motor and heat coil support structure extending transversely within said casing and having end members extending from one to the other of said mating casing sections and secured thereto to unite said sections; a motor and therewith associated fan supported by said structure; a plurality of rigid arcuate elements fixed to said support structure and defining an interrupted circle substantially concentric with the motor, said arcuate elements having branches extending radially; a plurality of axially extending blocks of insulation material fixed to said branches; and a heat coil supported in said blocks and arranged in a substantially helical course intermediate said support structure and said fan; said support structure being so disposed within said casing as to locate the center of gravity of the motor and heat coil assembly in substantially the vertical center plane of the casing.

2. A combination electric fan and heater comprising a casing formed from mating sections disposed in edge to edge relationship, said casing having front and rear wall openings; motor sup-

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port means within said casing and having end members bridging said casing sections to secure the same together, said support means including a ring-like section intermediate the ends thereof; angle brackets fixed to and extending forwardly of said section and having free end portions extending radially thereof; resilient bushings in said end portions; and a motor disposed within said ring-like section and supported out of contact with the walls thereof solely by attachment to said resilient bushings.

3. A combination electric fan and heater, comprising a casing; motor support means secured therein, said motor support means including identical structures placed back to back and providing head and foot sections for securement to said casing and a centrally disposed substantially cylindrical motor-support section; angle brackets fixed to said motor-support section and having end portions extending inwardly radially thereof; resilient bushings affixed to said end portions; a motor within said motor support section; and means for supporting said motor out of contact with the walls of said section, comprising stud means fixed to and extending axially of said motor frame and secured to said bushings.

4. In an air displacement apparatus, a combined motor mount and heat coil support means, comprising a substantially circular section to accommodate a motor; means for supporting said motor within said section but out of physical contact therewith; support post means secured to and extending from diametrically opposite sides of said section; arcuate supporting members fixed to said post means and collectively defining an interrupted circle concentric with said center section; insulators secured to said support post means and to said arcuate members; and heat coil means secured to said insulators and defining a substantially helical course about said motor section.

5. In an air displacement apparatus, a combined motor mount and heat coil support means, comprising a pair of identical rigid elements placed back to back to define a central substantially circular motor-receiving section and support-post means extending from diametrically opposite sides thereof; a plurality of identical, substantially arcuate members affixed to said support post means at each side thereof and collectively defining an interrupted circle concentric with said center section; insulators secured to said support post means and to said arcuate members; and heat coil means supported by said insulators in a course surrounding said motor receiving section.

6. In an air displacement apparatus, a casing formed of two half portions placed back to back; a combined motor mount and heat coil support means disposed within said casing and having head and foot members extending from one to the other of said casing portions and secured to each said casing portions to provide a main means of securement therefor; said support means further including a substantially circular motor-receiving section supported intermediate said head and foot members by rigid support-post means extending therebetween; a plurality of arcuate members fixed to said support-post means and collectively defining an interrupted circle disposed about said motor-receiving section; insulators affixed to said support-post means and said arcuate members and extending axially forwardly thereof; a heat coil carried by said insulators in a course disposed about said motor-receiving sec-

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tion; a motor disposed within said section; and means for resiliently supporting said motor therein out of physical contact with the walls of said section.

7. A combination electric fan and heater, comprising a casing formed of mating substantially identical front and rear sections disposed in edge to edge relationship, said sections having relatively large wall opening; grille means including relatively closely spaced elements secured to said sections over said openings to permit air flow therethrough while guarding against the entry of foreign bodies into said casing; a motor and heat coil support structure extending transversely within said casing and having enlarged end mem-

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bers in contact with and extending from one to the other of said casing sections, said end members being secured to said casing sections to form means of mutually securing the same; a substantially cylindrical motor section integral with said support structure and disposed intermediate the ends thereof; a motor and therewith associated fan resiliently supported within said cylindrical section; an electric heat coil insulatedly carried by said support structure and extending about said motor section; and a reflector plate disposed above the bottom wall of said casing and intermediate said wall and said heater coil to insulate said wall from the radiant heat of said coil.

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