Oct. 9, 1934. A. BRANTINGHAM 1,976,651

ELECTRIC HEATER

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Fig. 1.

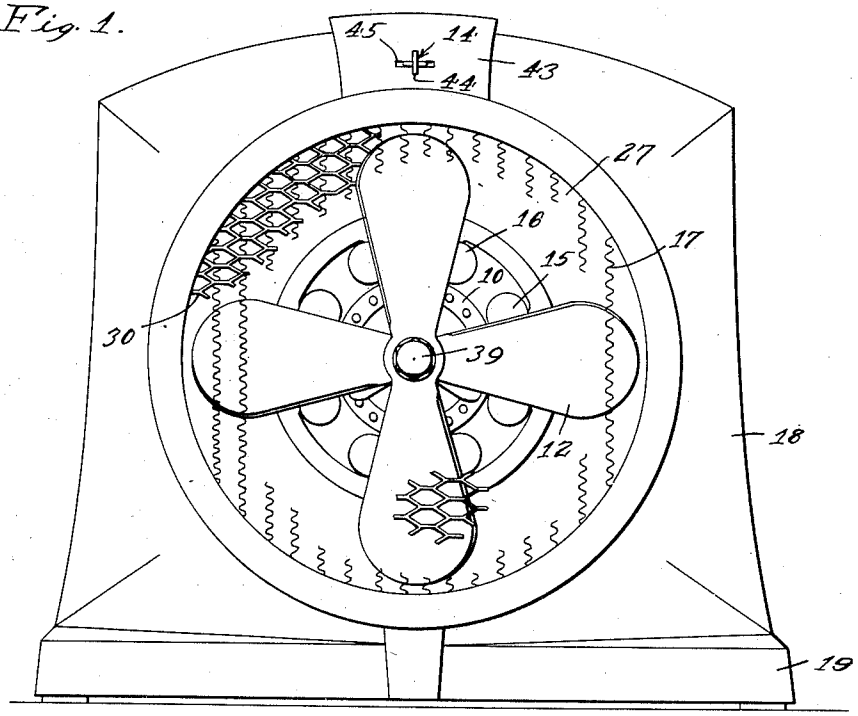


Fig. 2.

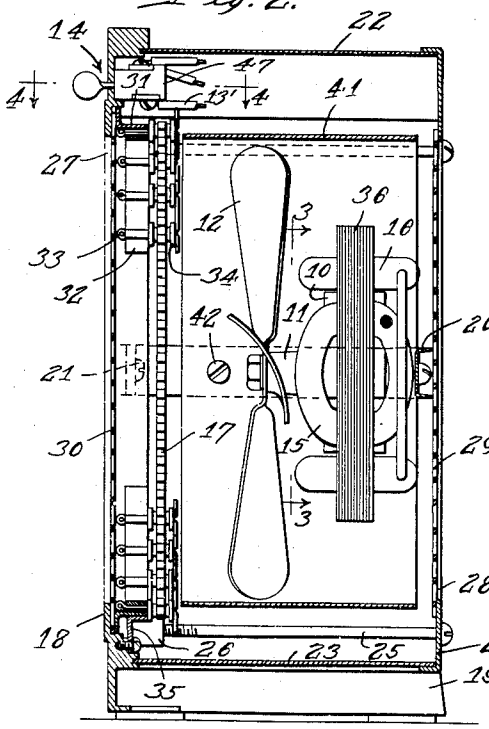


Fig. 3.

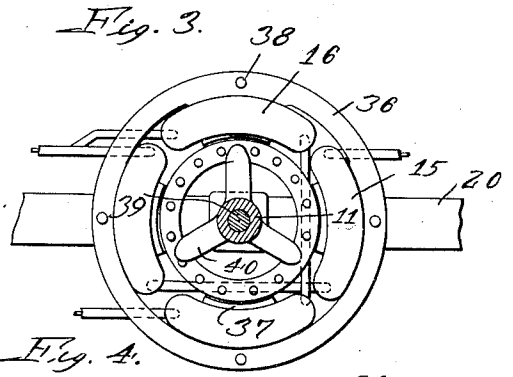
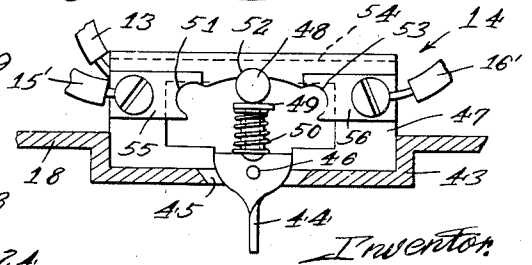


Fig. 4.



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Fig. 5.

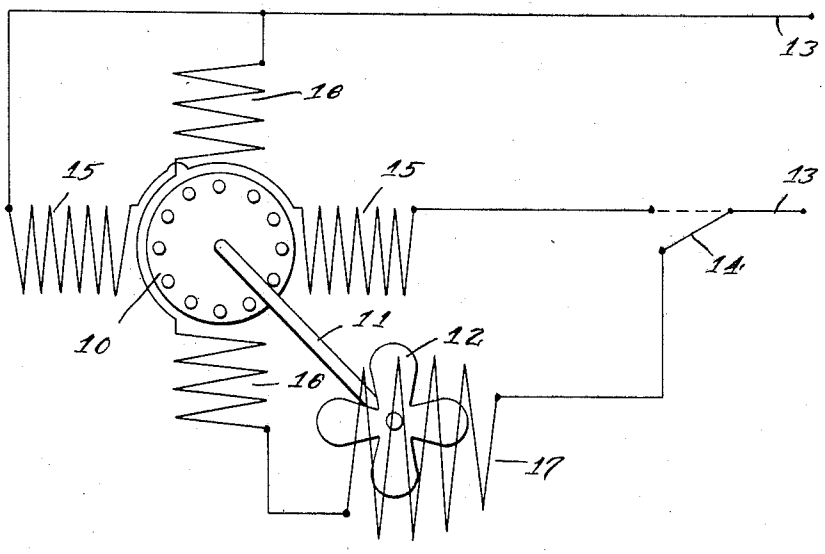
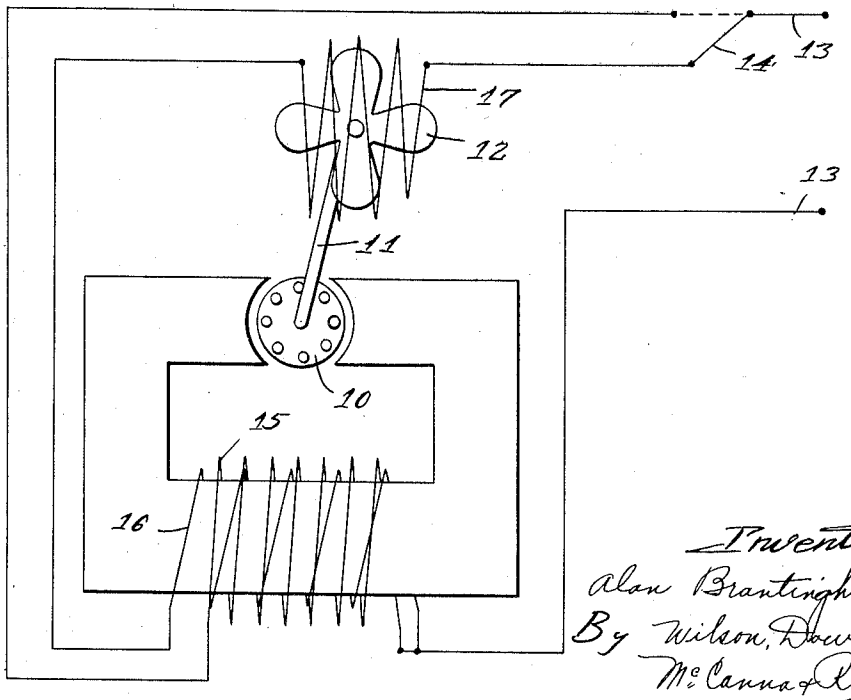


Fig. 6.



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UNITED STATES PATENT OFFICE

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ELECTRIC HEATER

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Application May 11, 1931, Serial No. 536,334

3 Claims. (Cl. 219—39)

This invention relates to electric heaters and more particularly those having a fan in connection therewith to distribute the heat by means of forced circulation of air.

The principal object of my invention is to provide a heater of this kind convertible from operation as a heater to operation simply as a fan, the device being convertible in that way by virtue of the provision of two separate and independent sets of windings, one of which, a low voltage winding, is in series with a heating coil, and the other of which is a high voltage winding and has no connection with the heating coil. With this arrangement when the device is used as a heater the fan operates at low speed just fast enough to distribute the heat efficiently, and when the device is operated as a fan the fan is operated at the desired high speed.

Other objects and advantages of the invention which, in the main, have reference to novel details of construction and arrangement will be brought out in the course of the following detailed description, in which reference is made to the accompanying drawings, wherein—

Figure 1 is a front view of a heater embodying my invention, certain parts being broken away for purposes of better illustration;

Fig. 2 is a central, vertical section through the heater;

Fig. 3 is a sectional detail on the line 3—3 of Fig. 2 showing the arrangement of the two sets of windings;

Fig. 4 is an enlarged horizontal sectional detail of the two-way switch, and

Figs. 5 and 6 are wiring diagrams, Fig. 5 being the wiring diagram for the heater illustrated in Figs. 1–4, and Fig. 6 showing a modified or alternative form.

Similar reference numerals are applied to corresponding parts throughout the views.

Referring first to Fig. 5, 10 indicates the rotor of a squirrel cage induction motor, on the shaft 11 of which is carried a suitable fan 12. 13 are the line conductors arranged to be connected in circuit interchangeably through a two-way switch 14 either with the high voltage field windings 15—15 or the low voltage field windings 16—16. 17 is a heating coil connected in series with the low voltage field windings and disposed in proper relation to the fan 12 to have the heat thereof absorbed by the air circulated past the same in the operation of the fan. With this combination the following operation is secured: The device is usable as a heater by throwing the switch 14 to the full line position so as to connect the field windings 16—16 and heating coil 17 in series with the usual 110 volt line, and the rotor 10 of the motor is thereby turned at a low speed of, say, 900 R. P. M., which is just fast enough for the fan 12 to distribute the heat efficiently. The device is usable simply as a fan by throwing the switch 14 to the dotted line position so as to connect the high voltage field windings 15—15 in series with the line and, of course, leave the heating coil and its associated low voltage field windings open circuited. The rotor 10 under such conditions turns at a high speed of, say, 2300 R. P. M., which is fast enough for cooling purposes. The figures given should not, of course, be taken as implying any definite limitation on the invention inasmuch as changes may be made to secure any other desired operating characteristics. Then, too, while I have indicated in Fig. 5 a four-pole motor, two poles for each purpose, it should be understood that substantially the same results would be obtained by having the winding 15 wound about the winding 16, or vice versa, in a two-pole motor, as shown in Fig. 6. In any event, the voltages of the two windings may be widely different, for operation of the motor at different slippage, the load being constant, whereby to secure the desired speed variation in the use of the two independent sets of windings. Furthermore, the fact that the heating coil is connected in series with the low voltage field winding means long life for the unit because the fan is always operated when the heating coil is thrown into circuit, thereby preventing the heating coil from attaining destructive temperatures and, on the other hand, if the heating coil burns out the motor circuit is automatically broken and there is, therefore, no danger of the motor burning out.

In Figs. 1–4 I have illustrated one practical construction for a heater embodying the arrangement illustrated in the wiring diagram of Fig. 5. In this heater the front 18 is suitably cast integral with the base 19 and a U-shaped frame 20 of channel cross-section supports the motor by attachment of the ends thereof to the front 18, as indicated at 21. Top and side walls are provided by a piece of sheet metal 22 set in recesses provided therefor in the front 18 and base 19. A bottom plate 23 fits between the front 18 and a back 24 which, as shown, is suitably flanged to fit over the outside of the top and side walls 22 and under the bottom 23. Bolts 25 are passed through holes in the back 24 and thread into bosses 26 formed on the front 18 to hold the parts together in the relationship stated. An opening 27 is pro-

vided in the front 18 concentric with the opening 28 provided in the back 24. A suitable grating 29 is provided on the back 24 covering the opening 28. Another grating 30 is provided in the opening 27. A ring 31 of angular cross-section has the outwardly projecting annular flange thereof disposed in abutment with the back of the grating 30 and strips 32 are fastened on the inside of the rearwardly projecting annular flange at diametrically opposite sides of the ring carrying cotter pins 33 at spaced intervals on which small spools 34 of insulation material are carried to serve as a mounting for the ribbon type heating coil 17. The coil 17 is strung back and forth over the spools 34, as appears in Fig. 1. A suitable number of small clips 35, fastened by means of screws to the back of the front 18, serve to hold the ring 31 in place, clamping the grating 30 between the ring and the front, as shown. The frame 20 for supporting the motor extends diametrically relative to the openings 27 and 28. The frame 36 of the motor, suitably made up of laminations stamped so as to provide the poles 37 and riveted together, as indicated at 38, is suitably fastened to the frame 20 and, of course, supports the field windings 15 and 16 on the poles thereof. A stud 39 is supported on the frame 20 centrally of the frame 36 and serves as a bearing for the hollow armature shaft 11 to which the rotor 10 is fixed, as by means of the spiders 40. A circular sheet metal shroud 41 is disposed in concentric relation to the openings 27 and 28 and fastened at diametrically opposite sides to the frame 20, as appears at 42, and serves to establish direct communication between the aforesaid openings so that air drawn in through the opening 28 in the operation of the fan 12 passes through the heating coil 17 and is discharged through the opening 27.

Any suitable or preferred form of two-way switch may be provided. I prefer one constructed along the lines shown in Fig. 4 and also prefer to have the same set in a recess provided in the front 18 of the heater in the projecting portion 43. With that arrangement the only part of the switch that is left exposed is the lever 44, the same projecting through a slot 45 in the front 18. The lever 44 is pivoted at 46 in a block 47 of insulation material suitably secured to the front 18 and has a cross-head 48 carried on the end of a plunger 49 slidably mounted in the inner end of the lever and normally urged outwardly under the action of a coiled compression spring 50, so that the cross-head 48 snaps into recesses 51, 52 and 53 as the lever is moved to the different positions represented by those recesses. A plate 54 has the line conductor 13' connected therewith and is mounted on one side of the block 47. Plates 55 and 56 provide terminals for the conductors 15' and 16' leading to the field coil windings 15 and 16, respectively. Thus, when the lever 44 is in mid position there is no connection between the plate 54 and either of the plates 55 and 56. However, if the lever 44 is moved to the right the cross-head 48 drops into the recess 51, thereby closing the circuit through conductors 13' and 15' for operation of the device simply as a fan, and when the lever 44 is swung to the left so that the cross-head 48 drops into recess 53 the circuit is completed between conductors 13' and 16' for operation of the device as a heater.

It is believed the foregoing description conveys a good understanding of all of the objects and advantages of my invention. The appended claims have been drawn with a view to covering all legitimate modifications and adaptations.

I claim:

1. In a combination electric heater and fan, the combination of an electric heating element, a motor armature for operating the fan in juxtaposition to the heating element to distribute the heat therefrom by air circulation or produce sufficient air circulation for cooling, two separate and independent sets of field windings for the motor armature, one being a low voltage winding connected in series with the heating element to produce relatively slow rotation of the fan for the circulation of air past the heating element in proper relation to its heat exchange characteristics to give a heating effect, and the other being a high voltage winding independent of the heating element to produce relatively fast rotation of the fan for the circulation of air in sufficient volume to give a cooling effect, and means for selectively connecting either of the windings in circuit with a source of electric current.

2. In a combination electric heater and fan, the combination of an electric heating element, a four-pole squirrel cage induction motor having the armature thereof operating the fan in juxtaposition to the heating element to distribute the heat therefrom by air circulation or produce sufficient air circulation for cooling, a pair of series connected low voltage field windings provided on diametrically opposed poles of said motor and connected in series with the heating element to produce relatively slow rotation of the fan for the circulation of air past the heating element in proper relation to its heat exchange characteristics to give a heating effect, a pair of series connected high voltage field windings on the remaining diametrically opposed poles of said motor independent of the heating element to produce relatively fast rotation of the fan for the circulation of air in sufficient volume to give a cooling effect and means for selectively connecting either set of windings with a source of electric current.

3. In a combination electric heater and fan, the combination of an electric heating element, a squirrel cage induction motor having a rotor for driving the fan in juxtaposition to the heating element for distribution of the heat therefrom by air circulation or produce sufficient air circulation, a pair of separate and independent field windings for said motor, the one being a low voltage field winding connected in series with the heating element to produce relatively slow rotation of the fan for the circulation of air past the heating element in proper relation to its heat exchange characteristics to give a heating effect and the other a high voltage winding independent of the heating element to produce relatively fast rotation of the fan for the circulation of air in sufficient volume to give a cooling effect, and means for selectively connecting either of said windings in circuit with a source of electric current.

ALAN BRANTINGHAM.