

April 17, 1934.

A. C. GILBERT ET AL
AIR CIRCULATING APPARATUS

1,954,872

Filed Nov. 12, 1931

2 Sheets-Sheet 1

Fig. 1.

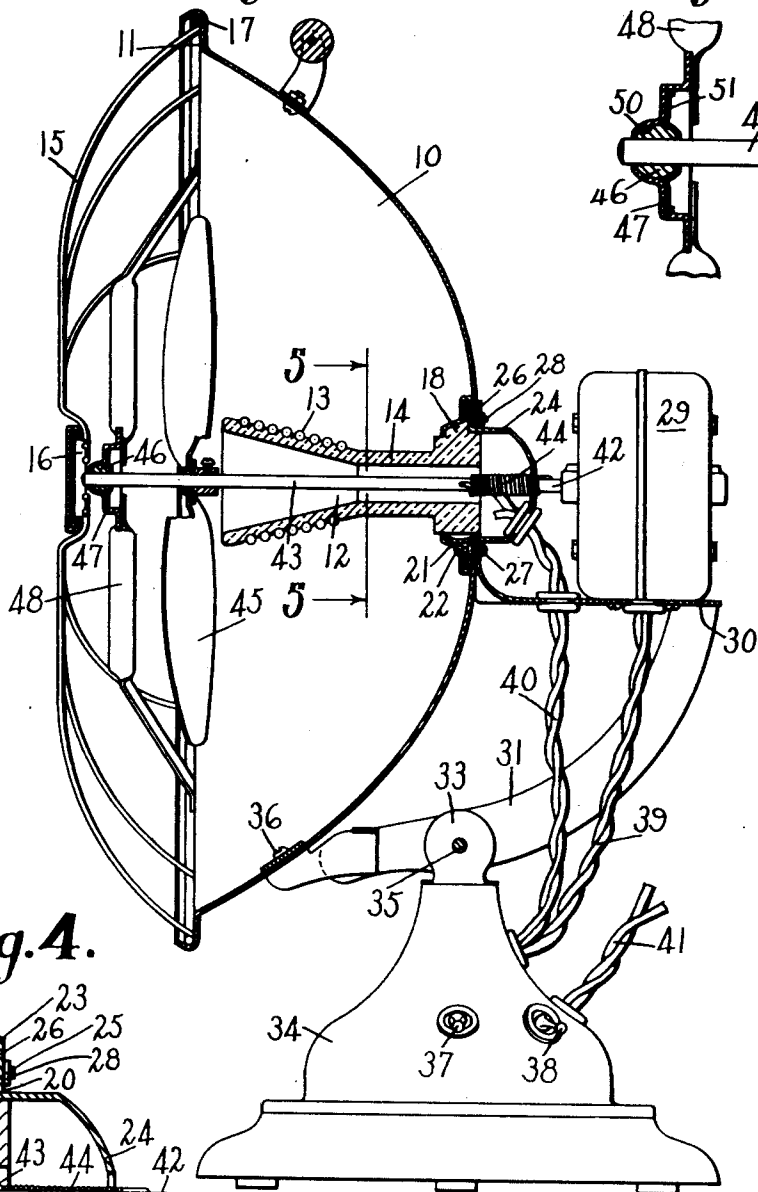


Fig. 3.

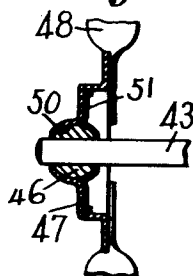
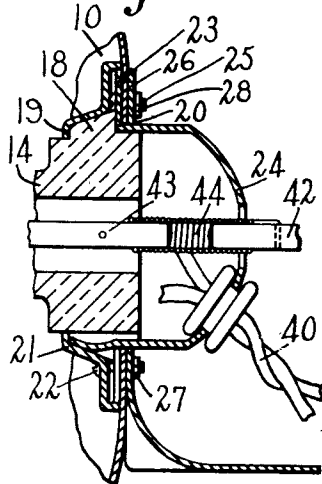


Fig. 4.



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2 Sheets-Sheet 2

Fig. 2.

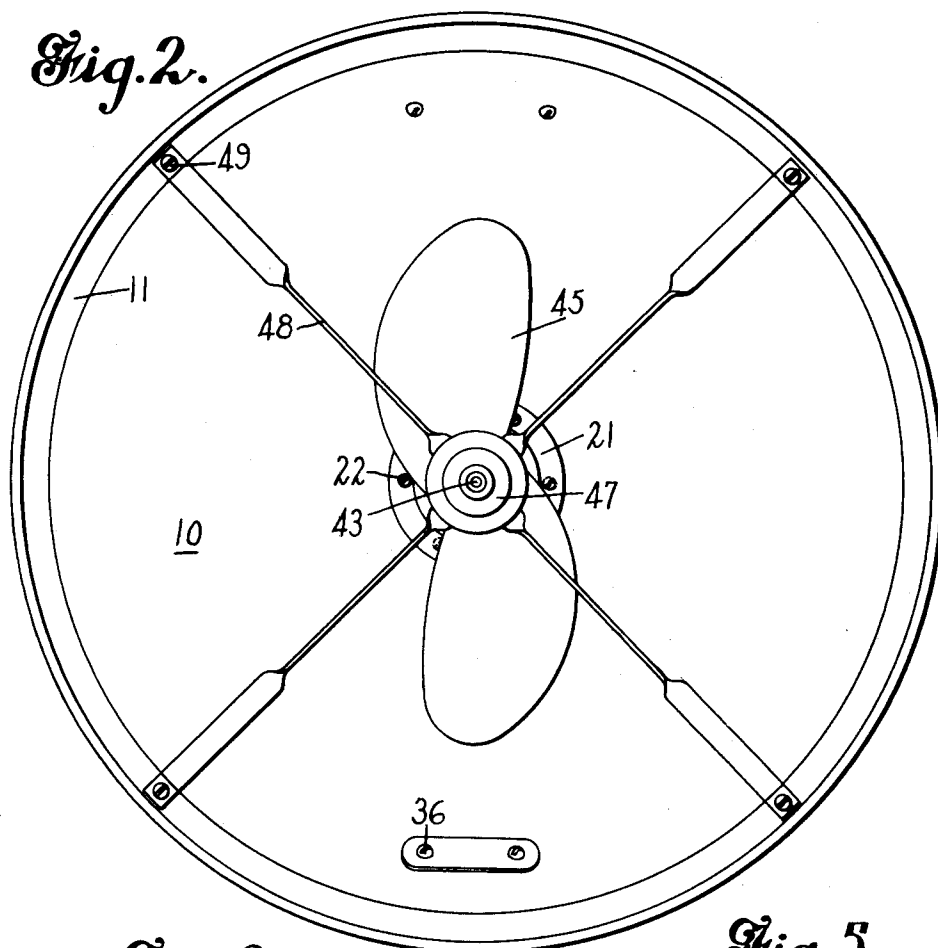


Fig. 6.

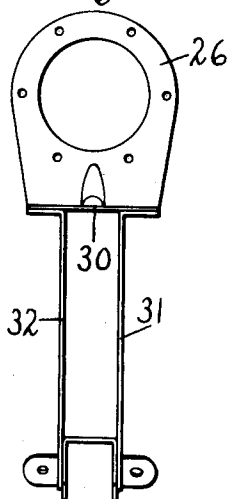
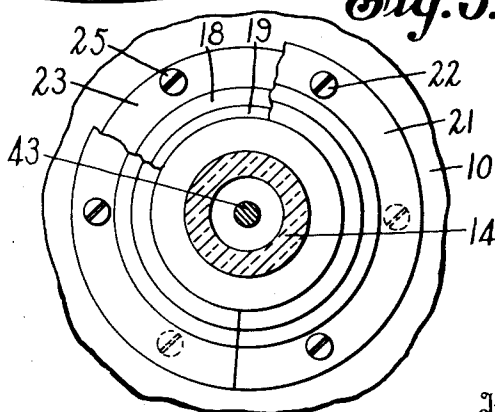


Fig. 5.



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UNITED STATES PATENT OFFICE

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AIR CIRCULATING APPARATUS

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Application November 12, 1931, Serial No. 574,516

25 Claims. (Cl. 219—39)

This invention relates to improvements in air circulating devices and more particularly to such a device comprising a combination of an air heating medium and an air disturbing medium.

Preferably, the air heating and air circulating mediums of the device of this invention are electrically operated, the heating medium embodying the general principles of electric heaters of the radiant or reflector type, and the air disturbing medium embodying the general principles of motor driven electric fans.

The principal object of this invention is to provide an efficient and inexpensive air circulating device.

Another object is to provide in an air circulating device a novel combination of air heating and air disturbing means operable in unison or separately, as desired.

A further object is to provide means for combining the elements of such an air circulating device to efficiently permit the operation of one without interference by the other and their efficient operation in unison.

To these and other ends, the invention consists in the novel features and combinations of parts to be hereinafter described and claimed.

In the accompanying drawings:

Fig. 1 is a vertical section through the parts constituting an air circulating device embodying the features of this invention, certain parts not being sectioned for the sake of clearness;

Fig. 2 is a front view of the device, the supporting base and heating element guard being omitted for the sake of clearness;

Fig. 3 is an enlarged section through the front bearing for the fan shaft;

Fig. 4 is an enlarged section through the heating element connecting means and the fan shaft coupling;

Fig. 5 is a section on line 5—5 of Fig. 1, and

Fig. 6 is a rear view of the combined motor and reflector supporting bracket of this device.

The heating means of the device illustrated comprises a concave reflector 10, formed of sheet metal and provided with an outwardly directed shoulder 11 extending about its peripheral edge and disposed substantially perpendicular to the axis of the reflector, and a heating element 12 formed by winding a coil or length of resistance wire 13 about a generally tubular member 14 of insulating material. The tubular member 14 is secured to the back of the reflector 10, within its concave portion and extends outwardly along the axis thereof. A heating element guard 55 formed of a plurality of radially converging wires

15, secured at their inner ends to a ring 16 and at their outer ends to a ring 17, is provided and disposed in front of the reflector with the ring 17 seated upon the shoulder 11. The material of the reflector at the periphery of the shoulder 11 is bent forwardly and downwardly over the ring 17 to retain it in place.

The tubular member 14 at its end adjacent the reflector 10 is provided with an annular rib 18 of larger diameter than the body portion thereof, whereby oppositely directed shoulders 19 and 20 are formed on each side of rib 18. A disk-like plate 21 is provided and is formed to fit over rib 18, engage shoulder 19 and rest upon the back of the reflector 10 to which it is secured by bolts 22. The shoulder 20 of the rib 18 seats against a flange 23, formed upon the peripheral edge of a generally cup-shaped member 24, and bolts 25 passing through the flange 23 and reflector 10 secure the member 24 in place. A suitable opening is provided in the back of the reflector 10, to permit member 24 to protrude rearwardly therefrom.

The bolts 22 and 25 extend through and beyond the back of reflector 10 and through a plate portion 26 of a supporting bracket. Suitable nuts 27, acting in cooperation with bolts 22, when tightened, draw the plate 21 into clamping relation with rib 18 and force it against flange 23 of member 24, and the latter against the back of reflector 10, securing the reflector to plate portion 26. Suitable nuts 28, acting in cooperation with bolts 25, when tightened, draw the flange 23 against the back of reflector 10, and secure the reflector to plate portion 26.

An electric motor 29 is provided and is mounted upon a flat bracket portion 30 integral with and disposed at right angles to plate portion 26. The motor 29 is secured to portion 30 of the bracket by suitable screws and is disposed thereon with the axis of its armature substantially in alignment with the axis of the reflector 10 and tubular member 14. Bracket arms 31 and 32 laterally spaced apart to straddle a post 33, provided on a base 34, are provided and extend downwardly and forwardly from the rear portion of motor supporting member 30. Extending beyond post 33 the arms 31 and 32 engage the reflector and are secured thereto by screws 36. The arms 31 and 32 are pivotally secured to post 33 by a bolt 35, the axis of which is at right angles to the axis of the reflector 10. The pivotal joint between arms 31 and 32 and post 33 is disposed below the axis of the reflector 10 and interme-

diates the motor 29 and the reflector on a line perpendicular to the axis of the reflector.

Switches are provided for connecting the motor 29 and the heating element 12 to a source of electrical energy. These switches are mounted within base 34 and respective operating fingers 37 and 38 extend outwardly therefrom. Conductor leads 39 and 40 electrically connect the switches with the motor 29 and heating element 12, and a conductor lead 41 electrically connects the switches to a source of electrical energy. Proper manipulation of switch operating finger 37 operates the proper switch to electrically connect the motor 29 to the source of power, and proper manipulation of switch operating finger 38 operates the proper switch to electrically connect the heating element 12 with the source of power.

An opening is provided in the back of member 24 to permit the motor armature shaft 42 to pass therethrough into member 24. A fan shaft 43 extends through the tubular member 14 and into member 24. Shafts 42 and 43 are in alignment and the respective ends thereof that are disposed in member 24 are axially spaced apart. A coil spring 44 is disposed about the spaced apart ends of shafts 42 and 43, one end of spring 44 being secured to shaft 42, and the other to shaft 43.

A two bladed fan 45 is secured to shaft 43 in front of the outer end of tubular member 14. Shaft 43 extends beyond fan 45 and is journaled in a bearing 46, which is secured in a bearing holder 47. The bearing holder 47 is supported by bars 48 which are each secured at one end thereof to shoulder 11 of the reflector 10 by screws 49, and at the other end to the bearing holder 47. The bearing 46 is substantially spherical and seats in a semi-spherical recess 50 in holder 47, being retained therein by a bearing plate 51.

The fan 45 when rotated forces air axially from the concave reflector 10 and being of a diameter less than the diameter of the reflector creates a flow of air into the reflector around the peripheral edge thereof. The air flowing into the reflector at its periphery travels along the heated interior surface thereof and is then urged outwardly over the heating element 12 before being forced outwardly by the fan. It has been found to be preferable to make the diameter of the fan 45 not more than substantially two-thirds the diameter of the reflector at shoulder 11 formed about its periphery.

The air circulating device of this invention may be used as an electric heater, an electric fan, or as a combination heater and fan. When used as an electric heater, the switch operated by finger 38 is closed whereby the coil resistance wire 13 becomes hot and the radiating heat therefrom is reflected outwardly by the reflector 10. By closing the switch operated by finger 37, the motor 29 is energized and rotates fan 45 to create a flow of air outwardly therefrom. When both switches are closed, heated air is drawn out of the reflector 10 by fan 45, and as more air immediately takes its place and is heated by coils 13, a constant flow of warm air at uniform temperature is provided and circulated into the atmosphere about the device.

The provision of the spring connection 44 between the spaced apart opposing ends of shafts 42 and 43, permits axial expansion of shaft 43 due to the heating action of the heating element, and prevents interference thereof with the operation of motor 29. The spring connection 44 also

compensates for any irregularities in the alignment of these shafts being, in effect, a flexible coupling. In combination with the spring connection 44 the substantially spherical bearing 46 that has rotative movement in its seat 50, also compensates for slight misalignment of the shafts 42 and 43 whereby the tendency of the device to vibrate is reduced to a minimum and substantially noiseless operation is insured.

The disposition of the pivotal joint between the arms 31 and 32 and the post 33 intermediate the reflector 10 and motor 29 on a line perpendicular to the axis of the reflector and of the motor shaft 42, provides a condition wherein the parts on one side of the pivotal joint substantially balance those on the other. Such an arrangement steadies the device and obviates any tendency for it to tip over. The arrangement of the bolt wherein its axis is directed transversely of and at right angles to the axis of the reflector or of the motor shaft, permits tilting the device in a vertical plane to the desired angle.

While we have shown and described a preferred embodiment of our invention, it will be understood that it is not to be limited to the details shown but is capable of modification and variation within the spirit of the invention and the scope of the appended claims.

What we claim is:

1. In an air circulating device, a base, a bracket pivoted to said base, a concave reflector supported by said bracket, a motor, said motor being supported on said bracket in back of said reflector, a rotatable shaft in said motor structure, said rotatable shaft being in alignment with the axis of said reflector, a tubular heating element mounted within said reflector with its axis in alignment with the axis of said reflector, a shaft bearing supported by said reflector in front of said heating element, a shaft journaled in said bearing and extending rearwardly toward said motor through said tubular element and said reflector, said shaft being substantially in alignment with the axis of said reflector, a fan on said last named shaft between said bearing and said heating element, and means to flexibly connect said shafts.

2. In a device such as described, a concave reflector, a hollow heating element supported within said reflector and extending outwardly from the back thereof in alignment with the axis of said reflector, a shaft bearing supported by the front of said reflector, a shaft journaled in said bearing and extending rearwardly therefrom through said hollow heating element toward and through the back of said reflector, said shaft being substantially in alignment with the axis of said reflector, an air disturbing element on said shaft between said heating element and said bearing, and means to rotate said shaft.

3. In a device such as described, a concave reflector, a hollow heating element supported within said reflector and extending outwardly from the back thereof in alignment with the axis of said reflector, a shaft bearing supported by the front of said reflector, a shaft journaled in said bearing and extending rearwardly therefrom through said hollow heating element toward and through the back of said reflector, said shaft being substantially in alignment with the axis of said reflector, an air disturbing element on said shaft, and means to rotate said shaft disposed back of said reflector, and including a rotatable shaft in alignment with the axis of said reflector.

4. In a device such as described, a concave re-

reflector, a hollow heating element supported within said reflector and extending outwardly from the back thereof in alignment with the axis of said reflector, a shaft bearing supported by the front of said reflector, a shaft journaled in said bearing and extending rearwardly therefrom through said hollow heating element toward and through the back of said reflector, said shaft being substantially in alignment with the axis of said reflector, an air disturbing element on said shaft, and a motor having a rotatable shaft, said motor being mounted in back of said reflector with the shaft thereof extending toward and in alignment with said first mentioned shaft and drivingly connected thereto.

5. In a device such as described, a concave reflector, a hollow heating element supported within said reflector and extending outwardly from the back thereof in alignment with the axis of said reflector, a shaft bearing supported by the front of said reflector, a shaft journaled in said bearing and extending rearwardly therefrom through said hollow heating element toward and through the back of said reflector, said shaft being substantially in alignment with the axis of said reflector, an air disturbing element on said shaft between said heating element and said bearing, and a motor having a rotatable shaft, said motor being mounted in back of said reflector with the shaft thereof extending toward and in alignment with said first mentioned shaft, and means to drivingly connect said shafts together comprising a resilient member connected to and extending between said shafts.

6. In a device such as described, a concave reflector, a hollow heating element supported within said reflector and extending outwardly from the back thereof in alignment with the axis of said reflector, a shaft bearing supported by the front of said reflector, a shaft journaled in said bearing and extending rearwardly therefrom through said hollow heating element toward and through the back of said reflector, said shaft being substantially in alignment with the axis of said reflector, an air disturbing element on said shaft between said heating element and said bearing, a motor having a rotatable shaft, said motor being mounted in back of said reflector with the shaft thereof extending toward and in alignment with said first mentioned shaft, the opposing ends of said shafts being spaced apart, and an axially expansible member secured to each shaft to drivingly connect the same.

7. In an air circulating device, a concave reflector, a hollow heating element mounted within said reflector with its axis in alignment with the axis thereof, a shaft extending axially through said hollow heating element and said reflector and beyond the back of the latter, a shaft rotating means having a shaft extending toward and substantially in alignment with said first mentioned shaft, axially expansible means connecting the opposing ends of said shafts, and an air disturbing element mounted on said first mentioned shaft in front of said heating element.

8. In a device such as described, a concave reflector, an electric motor mounted in back of said reflector and having an armature shaft extending therefrom toward said reflector and substantially in alignment with the axis thereof, an air disturbing element disposed adjacent the front of said reflector, said element having a shaft extending toward and through the back of said reflector and being substantially in alignment with said armature shaft, and resilient means

between and connected to each shaft to drivingly connect them together.

9. In a device such as described, a concave reflector, an electric motor mounted in back of said reflector and having an armature shaft extending therefrom toward said reflector and substantially in alignment with the axis thereof, a heating element including a tubular member secured to the back of said reflector and extending outwardly toward the front thereof with its axis substantially in alignment with the axis of said reflector, an air disturbing element disposed adjacent the front of said reflector, said element having a shaft extending axially through said tubular member toward and through the back of said reflector substantially in alignment with said armature shaft, and resilient means between and connected to each shaft to drivingly connect them together.

10. In a device such as described, a concave reflector, an electric motor mounted in back of said reflector and having an armature shaft extending therefrom toward said reflector and substantially in alignment with the axis thereof, a heating element including a tubular member secured to the back of said reflector and extending outwardly toward the front thereof with its axis substantially in alignment with the axis of said reflector, an air disturbing element disposed adjacent the front of said reflector, said element having a shaft extending axially through said tubular member toward and through the back of said reflector substantially in alignment with said armature shaft, the opposing ends of said shafts being axially spaced apart, and means to drivingly connect said shafts while permitting relative axial movement therebetween.

11. In a device such as described, a concave reflector, an electric motor mounted in back of said reflector and having an armature shaft extending therefrom toward said reflector and substantially in alignment with the axis thereof, a heating element including a tubular member secured to the back of said reflector and extending outwardly toward the front thereof with its axis substantially in alignment with the axis of said reflector, an air disturbing element disposed adjacent the front of said reflector, said element having a shaft extending axially through said tubular member toward and through the back of said reflector substantially in alignment with said armature shaft, the opposing ends of said shafts being axially spaced apart, a coiled spring embracing the opposed ends of said shafts and extending between the same, one end of said spring being secured to one shaft and the other end thereof to the other shaft.

12. In a device such as described, a concave reflector, an electric motor mounted in back of said reflector and having an armature shaft extending therefrom toward said reflector and substantially in alignment with the axis thereof, a heating element including a tubular member secured to the back of said reflector and extending outwardly toward the front thereof with its axis substantially in alignment with the axis of said reflector, an air disturbing element disposed adjacent the front of said reflector, said element having a shaft extending axially through said tubular member toward and through the back of said reflector substantially in alignment with said armature shaft, said element shaft extending forwardly beyond said element, a bearing for supporting the outer end of said element shaft and through which said shaft is axially slidable,

the opposing ends of said shafts being axially spaced apart, and means to drivingly connect said shafts while permitting relatively axial movement therebetween.

13. In a device such as described, a base, a motor having a shaft, a stationary concave reflector, a heating element within and secured to said reflector, the axes of said motor shaft and said reflector being substantially in alignment, and a bracket upon which said reflector and motor are mounted, a pivotal joint between said bracket and said base, the axis of said pivotal joint extending transversely of and substantially at right angles to the axis of said reflector, and being disposed substantially intermediate said motor and said reflector adjacent the lower extremity of the latter.

14. In a device such as described, a base, a motor having a shaft, a stationary concave reflector, a heating element within and secured to said reflector, the axes of said motor shaft and said reflector being substantially in alignment, and a bracket secured to said reflector and upon which said motor is mounted, a pivotal joint between said bracket and said base, said pivotal joint being disposed below the axis of said reflector on a line drawn perpendicularly to the axis of said motor shaft and substantially in alignment with the rear surface of said reflector.

15. In an air circulating device, a stationary concave reflector, a heating element mounted upon the concave side of the reflector, a fan mounted for rotation in front of the concave side of the reflector forwardly beyond the heating element, said fan being of a diameter substantially two-thirds the diameter of said reflector, a motor secured to the convex side of the reflector, and a driving connection between the motor armature and the fan.

16. In an air circulating device, a stationary concave reflector, a heating element mounted upon the concave side of the reflector, a fan mounted for rotation in front of the concave side of the reflector forwardly beyond the heating element, said fan being of a diameter substantially two-thirds the diameter of said reflector, a motor secured to the convex side of the reflector, and a driving connection between the motor armature and the fan, said driving connection extending axially through the concave reflector and the heating element mounted thereon.

17. In a device such as described, a base, a motor having a shaft, a stationary concave reflector, a heating element secured to said reflector, the axes of said motor shaft and said reflector being substantially in alignment, and a bracket secured upon the rear surface of said reflector and extending rearwardly therefrom to support said motor and then extending forwardly and downwardly into engagement with said base, said bracket being pivoted to said base at its point of engagement therewith.

18. In an air circulating device, a stationary substantially concave reflector, a cylindrical heating element disposed within said reflector and extending forwardly from the concave face thereof with its axis substantially in alignment with the axis of said reflector, a rotary air disturbing element disposed in front of said heating element with its axis in alignment with the axis of said reflector, said rotary air disturbing element being of a diameter not more than substantially two-thirds the diameter of said reflector, and means to rotate said air disturbing element.

19. In an air circulating device, a stationary substantially concave reflector, a heating element secured to said reflector, a rotatable shaft, an air disturbing element on said shaft, and means to support said shaft with said air disturbing element in front of said heating element, said means being secured to and adjacent the forward edge of said reflector, and means to rotate said shaft.

20. In an air circulating device, a substantially concave reflector, a heating unit disposed within the concave face of said reflector, a rotary air disturbing element in front of said heating unit, and means to rotate said air disturbing element including aligned shafts connected by axially expandible means.

21. In an air circulating device, a substantially concave reflector, a heating unit disposed within the concave face of said reflector, a rotary air disturbing element in front of said heating unit, and means to rotate said air disturbing element including a shaft and bearings for said shaft, one of said bearings being disposed in front of said air disturbing element and the other in back of the convex face of said reflector.

22. In an air circulating device, a substantially concave reflector, a heating unit disposed within the concave face of said reflector, a rotary air disturbing element in front of said heating unit, and means to rotate said air disturbing element including aligned shafts connected by axially expandible means, bearings for said shafts, one of said bearings being disposed in front of said air disturbing element, and the other in back of the convex face of said reflector, said axially expandible means being disposed between said bearings.

23. In an air circulating device, a substantially concave reflector having an opening therein substantially in alignment with the axis thereof, a heating element disposed in the aforesaid opening and extending forwardly from the concave face of said reflector, a shaft extending through said parts, a motor drivingly connected to said shaft, a motor supporting bracket having a part surrounding the aforesaid opening in said reflector, and common means to secure said bracket and said heating element to said reflector.

24. In an air circulating device, a substantially concave reflector having an opening therein substantially in alignment with the axis thereof, a heating element disposed in the aforesaid opening and extending forwardly from the concave face of said reflector, a cap-like member extending rearwardly from said reflector and disposed over the end of said heating element exposed through the aforesaid opening in said reflector, a shaft extending through said parts, a motor drivingly connected to said shaft, a motor supporting bracket having a part surrounding the aforesaid opening in said reflector, and common means to secure said bracket, said cap and said heating element to said reflector.

25. In an air circulating device, a substantially concave reflector, a heating unit disposed within the concave face of said reflector, a fan disposed in front of said heating unit, the diameter of said fan being not more than substantially two-thirds the diameter of said reflector, and means to rotate said fan to draw air into said reflector about its periphery and to force air out of said reflector.

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