March 24, 1942. C. SCHOONMAKER 2,277,151

HOT AIR CIRCULATING HEATER

Filed April 5, 1939 2 Sheets-Sheet 1

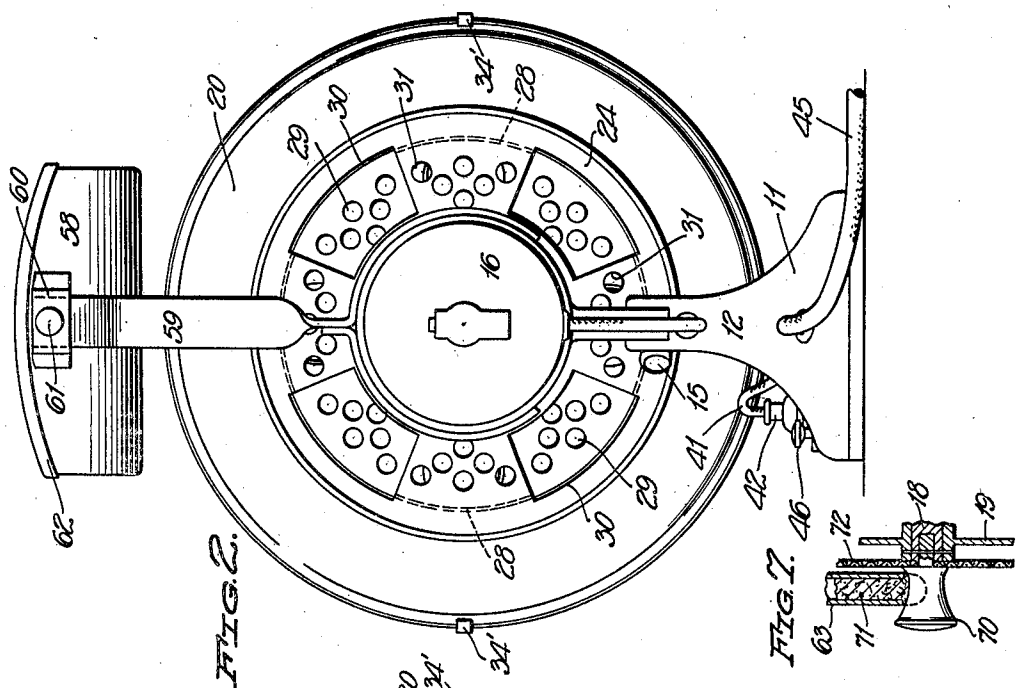


FIG. 2.

FIG. 7.

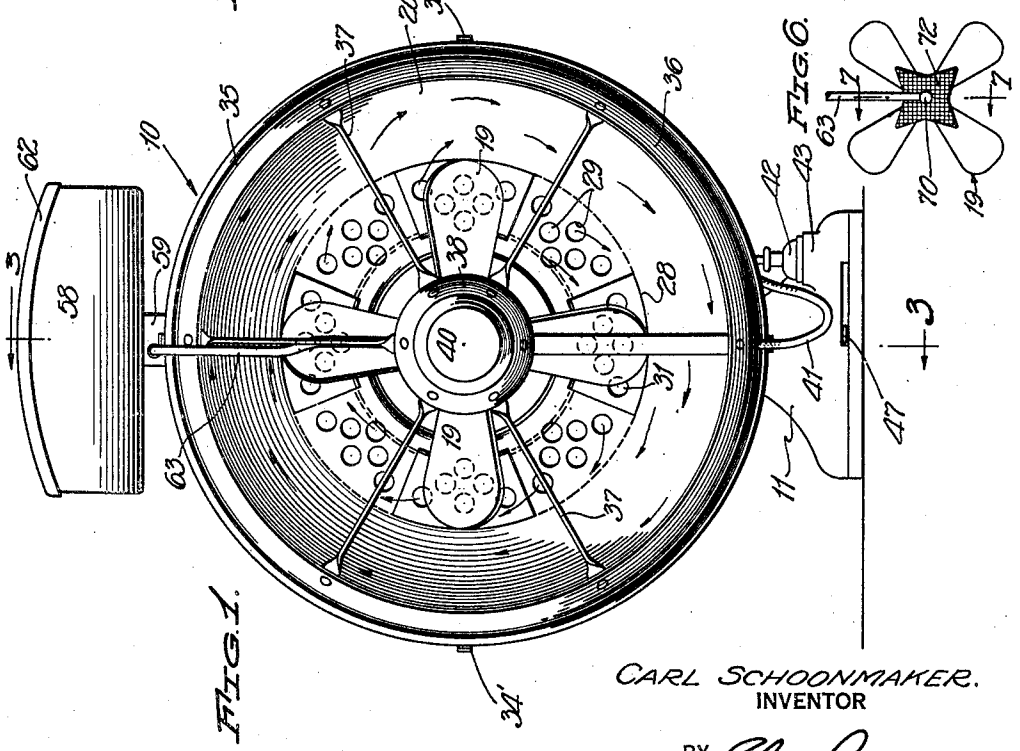


FIG. 1.

FIG. 6.

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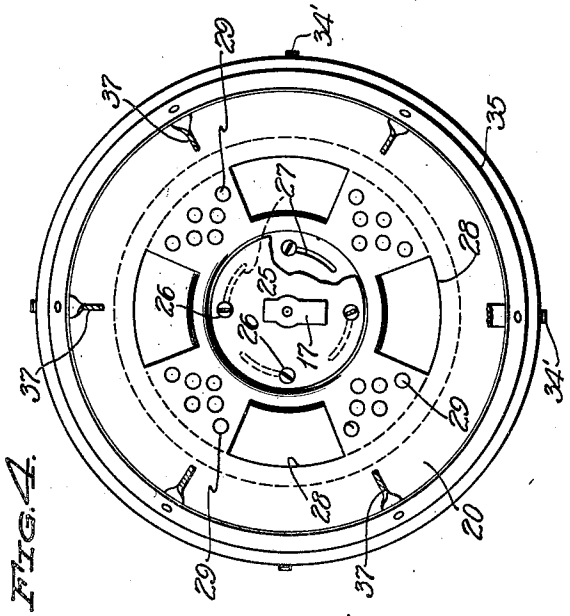


Fig. 4.

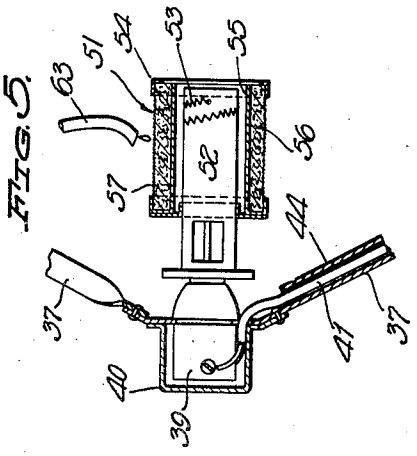


Fig. 5.

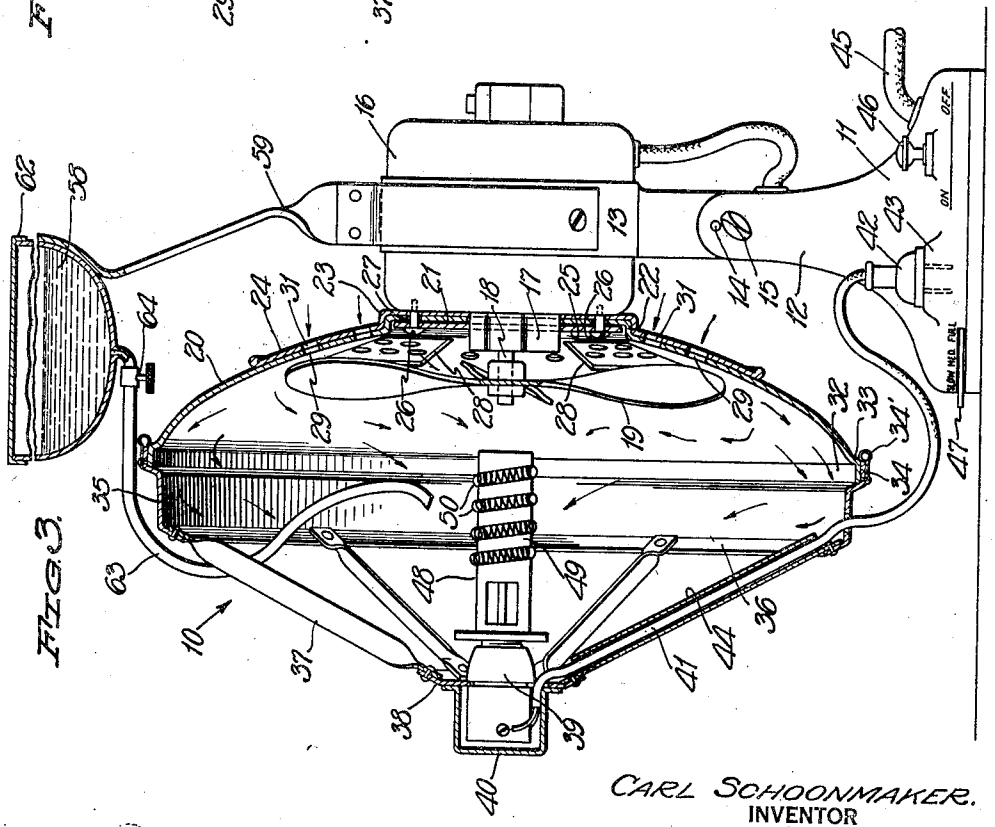


Fig. 3.

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Patented Mar. 24, 1942 2,277,151

UNITED STATES PATENT OFFICE

2,277,151

HOT AIR CIRCULATING HEATER

Carl Schoonmaker, New York, N. Y.

Application April 5, 1939, Serial No. 266,079

1 Claim. (Cl. 219—39)

This invention relates to a controlled hot air circulating heater, and this application is a continuation in part application to my patent application Serial No. 79,544, filed May 13, 1936.

One of the main features of the invention resides in an electric heating appliance for household and other uses by which the temperature of a room may be rapidly raised to suit the comfort of the occupants thereof.

Another feature of the invention is to provide a hot air circulating heater which subjects a controlled amount of cool air to a heat zone and which projects the heated air therefrom in the form of a continuous stream of hot air to stir up the cooler air of a room for mixture therewith and effect a gradual heating of the air throughout a room.

Another important feature of the invention is the provision of a hot air circulating heater in which a stream of thoroughly heated air is blown, thus eliminating the objection of cool or insufficiently heated air from being blown upon a person who might be in the direct path of the air stream.

Another feature of the invention resides in an air circulating fan device which includes a parabolic reflector or casing having air openings therein which may be enlarged in size to provide a direct air flow through the casing to enable the device to be used as an ordinary electric fan for cooling purposes, or which openings may be reduced in size to produce two straight streams of air connected by a stream of centrifugal air to produce a continuous uninterrupted flow, the stream of centrifugal air adapted to be subjected to heat to effect heating of the same, or to a vaporizer to humidify or deodorize the air flow.

A further feature of the invention resides in the novel manner in which the controlled air stream to be heated is centrifugally whirled within a heat zone before being projected from the heater, thus assuring a thorough heating of the air during its passage through the heater.

A still further feature of the invention is the provision of an electric fan heater in which the fan may be run at relatively high speed and deliver only heated air with a relatively great force to drive cooler air away from the lower part of a room and create a more comfortable atmosphere in less time than is possible by radiant and other types of fan heater heretofore commercialized.

A still further feature of the invention resides in an electrical fan appliance which may be operated as a circulating hot air heater; as an ordinary electric fan, or as an air moistener or deodorizer.

With the above and other objects in view, the invention resides in the certain novel construction, combination and arrangement of parts, the essential features of which are hereinafter fully described in the following specification, are particularly pointed out in the appended claim, and are illustrated in the accompanying drawings, in which:

Figure 1 is a front elevational view of my electrical appliance as used for heating air.

Figure 2 is a rear elevational view thereof.

Figure 3 is an enlarged vertical transverse sectional view on the line 3—3 of Figure 1.

Figure 4 is a front elevational view of the casing with the guard broken away and fan removed and showing the air regulating shutter adjusted to a position to enable use of the appliance as an ordinary electric fan.

Figure 5 is a detail vertical sectional view illustrating an electric vaporizer device which may be substituted for the electric heating element when the appliance is to be used as a vaporizer.

Figure 6 is a front elevational view of a modified form of vaporizer.

Figure 7 is an enlarged detail vertical sectional view on the line 7—7 of Figure 6.

Referring to the drawings by reference characters, the numeral 10 designates my electrical appliance in its entirety which includes a base 11 having a standard 12 to which an electric motor support 13 is pivoted as at 14 for adjustment to various angular positions. A set screw 15 is threaded in the standard and clamps against support 13 to secure the same in a fixed adjusted position. The motor support 13 carries an electric motor 16, the front of which is formed with an elongated boss 17 through which the front end of an armature shaft 18 projects and to which a four bladed fan 19 is fixed. The blades of the fan are pitched but their longitudinal centers are straight from axis of the fan 19 to the tip ends of the blades. Supported by the motor 16 and fitted on the boss 17 is a relatively shallow bowl shaped metal or parabolic casing 20. The central portion of the casing is flattened and rearwardly offset as at 21 and which provides an annular shoulder 22 which acts as a bearing for engagement with the shouldered offset portion 23 of an air regulating shutter 24. The shutter 24 snugly fits the rear side of the casing 20 and against the front of the motor 16. A clamping plate 25 fits over the boss 17 and against the inner flat central portion of the casing and fasten-

ing screws 26 pass through alined holes in the plate and shutter and through arcuate slots 27 in the casing 20, the threaded ends of the screws threading into the casing of the motor 16. By this construction, the casing 20 and shutter 24 are attached to the motor, with the casing 20 having a limited circumferential movement with respect to the shutter which remains stationary. The casing 20 is provided with four relatively large equidistantly spaced segmental shaped air openings 28 between which are arranged groups of smaller air openings 29. The shutter 24 is likewise provided with four equidistantly spaced relatively large air openings 30 which are adapted to register with the openings 28 when the casing 20 is turned to the limit of its circumferential movement in one direction, and groups of smaller openings 31 which register with the openings 29 when the large openings 28 and 30 are in register, but which groups of openings 31 communicate with the larger openings 30 when the casing 20 is turned to the limit of its circumferential movement in an opposite direction. Thus when an unlimited amount of air is desired, such as when the appliance is operating as an ordinary electric fan, the large openings 28 and 30 may be brought into register, and when a restricted control flow of air is desired such as when the appliance operates as a hot air heater or vaporizer, the groups of openings 29 open through the larger openings 30 and coact with the group of openings 31 to provide circular rows of restricted air openings. The ends of the arcuate slots 27 strike the screws 26 to limit the turning movement of the casing 20 in opposite circumferential directions.

The outer periphery of the casing 20 is formed with an annular forwardly extending flange 32 which provides an annular shoulder 33 for a purpose to be hereinafter explained. Fitted to the flange 32 is the offset rearwardly extending rim 34 of an air confining ring member 35 which has a forwardly and inwardly extending flange 36. Carried by the rim 34 are four equidistantly spaced spring clips 34' which engage behind the shoulder 33 to secure the ring member 35 to the open side of the casing. Fastened to the inner side of the flange 36 are the outer ends of spaced radially arranged guard bars 37. The guard bars 37 extend forwardly and the inner ends are fixed to a ring member 38 disposed in axial alinement with the axis of the fan shaft 18. Mounted in the ring member 38 is an electric socket 39 with its open socket facing inwardly. Fixed to the outer side of the ring member and enclosing the base end of the socket 39 is a cap 40. An electric cord connection 41 has one of its wire ends connected to the terminals of the socket 39 while the other end of the cord carries an electric plug 42 which is insertible into an electric socket 43 in the base 11 when it is desired to supply the socket 39 with electric current. When no current is desired at the socket 39, the plug 42 is pulled from the current supply socket 43. The cord 41 is led through a tube 44 which is formed on the rear of the lower vertical guide bar and sufficient slack is provided in the length of the electric cord to facilitate insertion and removal of the plug 42 into the socket 43.

The socket 43 is electrically connected with an electric current supply cord 45 which enters the base and supplies current to the motor 16 and socket 43 when the switch 46 is turned on. A manipulating lever 47 extends from the base 11 and operates a rheostat for operating the fan motor 16 at "slow," "medium," or "full" speed.

In Figure 3 of the drawings, I have illustrated an electric heating element 48 screwed into the socket member 39 and is of the type having a cylindrical porcelain core 49 containing windings of bare coiled resistance wire 50. The heating element 48 extends inwardly toward the fan 19 but short of the path of the rotating blades.

In practice, assume that it is desired to operate the appliance as a hot air circulating heater. The casing 20 is turned to cause the groups of openings 29 to register with the large arcuate shaped openings 30 as illustrated in Figures 1 to 3, inclusive, to provide a restricted air flow through the casing upon rotation of the fan 19. The plug 42 is inserted into the socket 43 and the switch 46 is turned "on," whereupon current will simultaneously flow to the windings of the motor and to the heating element 48. As the fan 19 rotates, cool air is drawn into the casing from the rear thereof through the openings 29—31. The windings 50 of the heating element 48 become red hot and a heat zone is created within the casing. The cool drawn-in air is whirled or vortexed within the casing as illustrated by the arrows in Figure 1, and is momentarily confined therein and subjected to the heat of the heat zone created by the heating element 48. The rim 35 serves to confine the whirled air within the casing for it prevents slippage of air from the casing due to centrifugal forces set up by the high speed of the rotating fan. After the cool air has been whirled about the casing at which time it is thoroughly heated, it is blown forward from the open side of the casing in the form of a stream of hot air for mixture with the cooler air of a room. The continuous blast of hot air projected from the casing sets up a circulation of the room air and by such action it is possible for me to increase the temperature of a room in much shorter time than by the use of the conventional radiant style heater.

Should it be desired to use the appliance as a fan alone, the casing 20 may be turned relative to the shutter 24 so as to bring the large arcuate shaped openings 28 and 30 into alinement as shown in Figure 4, whereupon an unlimited supply of air may be drawn into the casing 20 from the rear thereof. When used as a cooling fan, the plug 42 is pulled from the socket 43 so that no current passes to the heating element 48 or socket 39.

The appliance is also adaptable for use as a room humidifier or deodorizer, and for such use the heating element 48 is removed from the socket 39 and a novel electrically operated vaporizer device 51 is substituted therefor. Such a device 51 is illustrated in Figure 5 of the drawings and the same consists of a porcelain core body 52 having a plug end threaded into the electric socket 39 while a coiled low resistance wire 53 is wound upon the other end thereof. Supported by the core body 52 is a cylindrical absorbent element 54 which includes an inner cylindrical casing 55 arranged in spaced relation to the core body 52, and a cylindrical absorbent wick 56 of asbestos or other fireproof material enclosed in a cylindrical screen 57. Water or a deodorizing liquid is adapted to be fed to the wick 56 from a supply tank 58 supported in an elevated position by a bracket 59 secured to and rising upwardly from the casing of the motor 16. The upper end of the bracket 59 fits into a socket 60 carried by the rear of the tank 58 and a set screw 61

threaded to the socket, clamps the same to the bracket against accidental separation. The tank **58** is provided with a removable cover **62** to facilitate filling of the tank as and when the occasion requires. A drip tube **63** leads from the bottom of the tank and extends forwardly and downwardly into the open side of the casing **20** with the discharge end of the tube directly above the vaporizer device **51** as illustrated in Figure 5. A regulating valve **64** is arranged in tube **63** for controlling the flow of liquid from the tank to the vaporizer device **54**.

In use of the vaporizer device, the appliance is set as explained for its use as a hot air circulating heater with the exception that the vaporizer device **51** is substituted for the heating element **48** and the valve **64** is adjusted to an open position to allow the liquid from the tank to drip upon the absorbent wick **56**. The socket **39** supplies the current for the heating coil **53** and the heat from the coil vaporizes the moisture which is absorbed by the wick **56**. The liquid supplied to the wick may be plain water for humidifying purposes, or may be of a perfumed nature for deodorant purposes. The vaporized liquid is picked up by the air whirled about the casing during rotation of the fan **19**, and is subsequently projected forwardly into the room for mixture with the circulating room air.

The tube **63** extends between two adjacent spaced guard bars **37** but does not interfere with the limited circumferential movement of the casing **20** relative to the shutter **24**. For cleaning the inner side of the casing and for facilitating interchanging of the heating element **48** and vaporizing device **51**, the guard cage formed by the ring member **35**, guard bars **37** and cap **40**, may be separated from the casing by releasing the spring clips **34'** which engage behind the shoulder **33**.

From the foregoing description when read in conjunction with the accompanying drawings, it will be understood that I have devised a new method and apparatus for changing a flow of air (originating from an electrically propelled propeller blade) from a direct flow to a centrifugal flow and back to a direct flow without change of the shape of the fan blades **19**, by means of the simple expedient of reducing the normal supply of air through the placing of a parabolic reflector or casing **20** behind the fan blades, and in which apertures of a predetermined size and number are provided which are sufficient to prohibit the blades from producing the normal supply of air flow to such an extent that the fan is unable to drive all the air directly forward, thereby occasioning a side slip of a sufficient amount of the air flow to be driven to the outer periphery of the parabolic casing where a confining ring member **35** disposed in axial alinement with the axis of the fan shaft **18** confines the slipped air flow within the confining casing to such an extent that the air flow is first revolved around the heating element **48** within the parabolic casing to heat the body of air before being delivered to the open spaces.

In Figures 6 and 7 of the drawings I have illustrated a modified form of vaporizer in which a hub member **70** is fixedly carried by the front end of the fan shaft **18**. The hub member is provided with an annular concavity and disposed in close spaced relation to the walls thereof is the discharge end of the drip tube **63**. A wick **71** extends into the tube **63** and feeds water or deodorizing liquid to the hub member. Fixedly connected to the shaft **18** and interposed between the fan **19** and the hub member **70** is a star shaped mesh screen **72**. By this construction it will be understood that as the hub member **70** and screen **72** rotates, moisture will be picked up by the hub member from the wick **71** and transferred onto the central portion of the star shaped screen **72**. Centrifugal force tends to cause the moisture to work its way outwardly to the points of the star shaped screen, during which time, air from the fan **19** is being blown through the screen, and which blown air picks up moisture therefrom. Any excess moisture thrown from the screen by centrifugal force is caught by the ring member **35**. In view of the fact that this vaporizer is carried by the fan shaft, the same may be used with the heating element **48** in operation.

While I have shown and described what I consider to be the preferred embodiments of my invention, I wish it to be understood that various modifications as come within the scope of the appended claim may be resorted to if desired.

Having thus described the invention, what I claim as new and desire to secure by Letters Patent of the United States, is:

A hot air circulating heater comprising an electric fan including an electric motor having a driven rotatable shaft and a blade fan element fixed thereto, an annular bowl shaped casing fixed to said motor and within which said fan element is disposed in close spaced proximity to the concave side thereof, said casing having air inlet openings therein, a straight annular flange formed integral with the periphery of said bowl shaped casing and being concentric to the axis of said casing, an annular air confining band having its inner portion frictionally telescoping said flange and having its outer portion extending forwardly thereof, a hub member in axial alinement with the axis of rotation of said fan element and disposed forward of the plane of the outer edge of said band, radially arranged bars rigidly connecting said hub member and said band together, an electric socket mounted in said hub member and having its open end facing inwardly, and an electric heating element mounted in said socket and extending inwardly therefrom, substantially as and for the purpose specified.

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