

Nov. 21, 1944.

J. W. MILLER

2,363,191

AIR CIRCULATOR

Filed Feb. 23, 1942

3 Sheets-Sheet 1

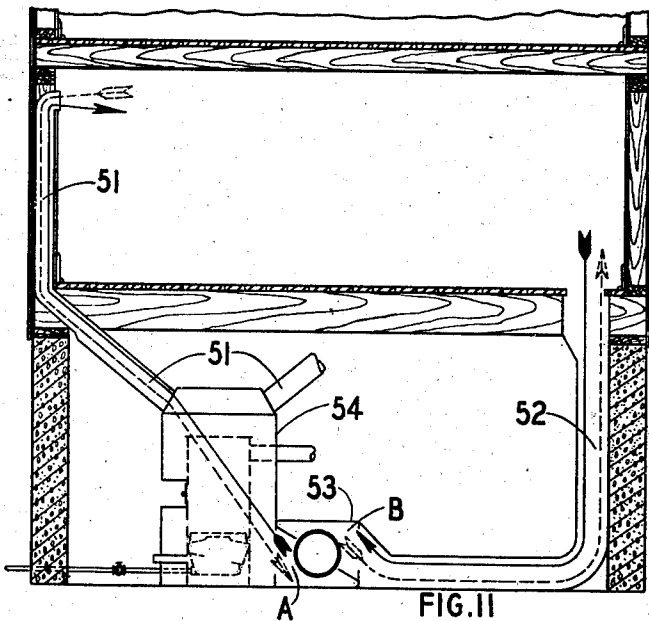
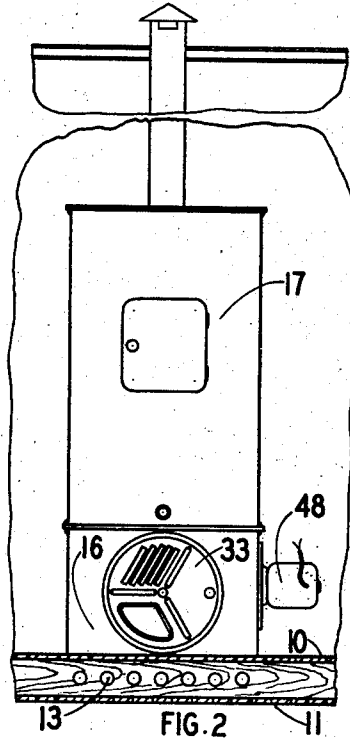
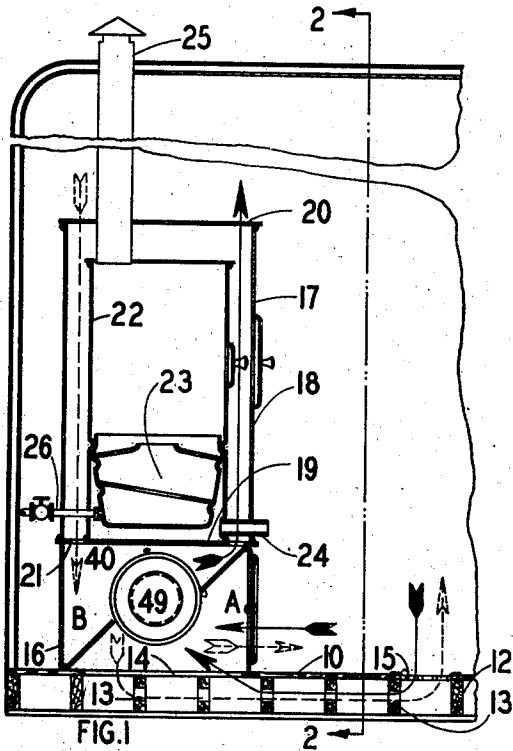


FIG. 11

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3 Sheets-Sheet 2

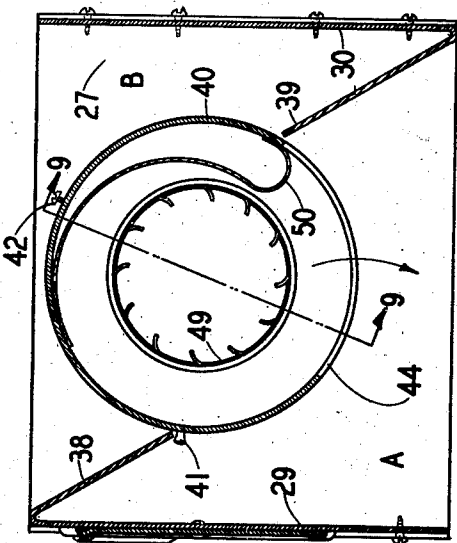


FIG. 5

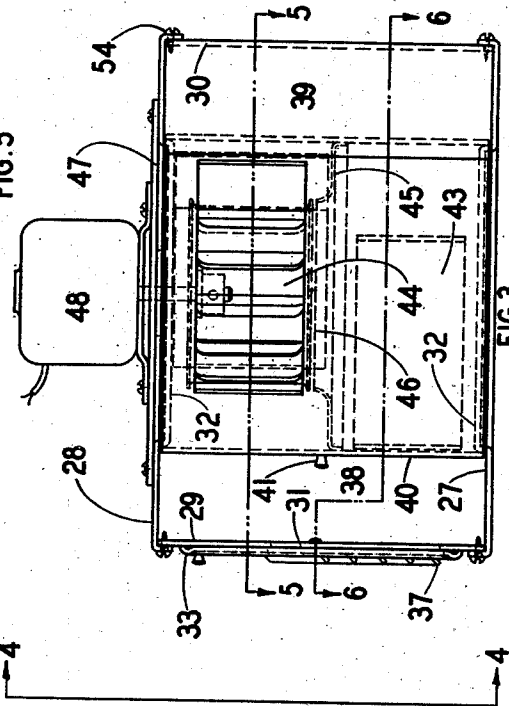


FIG. 3

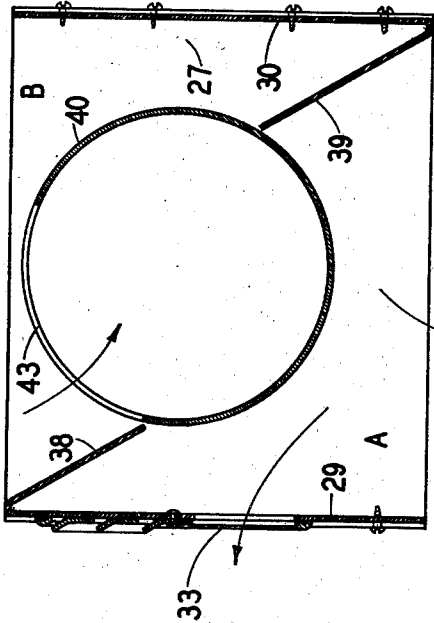


FIG. 6

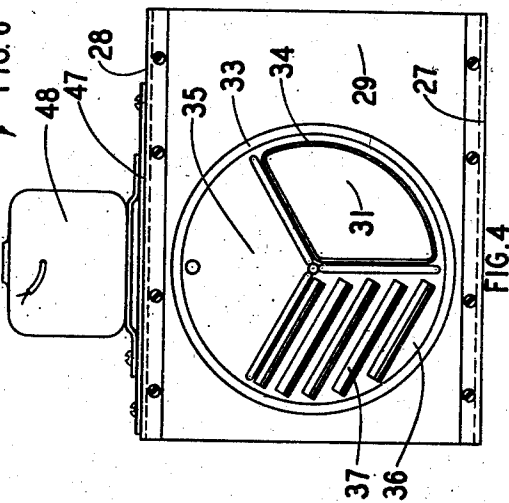


FIG. 4

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3 Sheets-Sheet 3

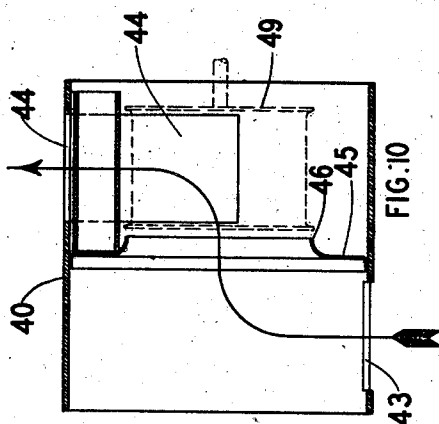


FIG. 10

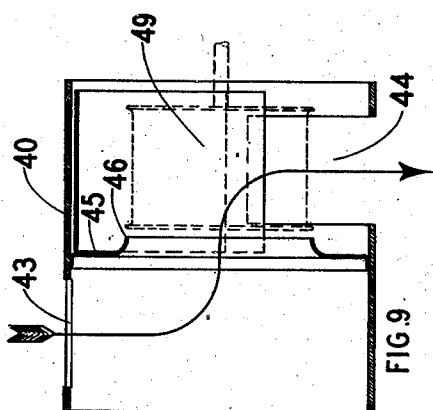


FIG. 9

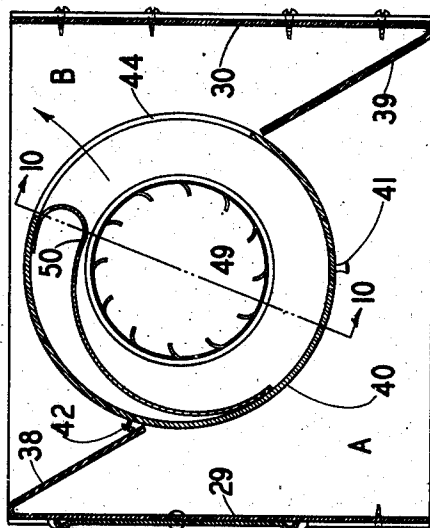


FIG. 7

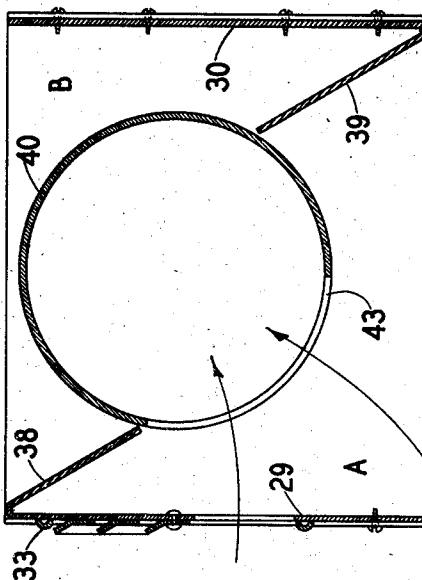


FIG. 8

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UNITED STATES PATENT OFFICE

2,363,191

AIR CIRCULATOR

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Application February 23, 1942, Serial No. 431,991

4 Claims. (Cl. 230—42)

This invention relates to forced air circulators, particularly those suitable for use with heating systems.

It is common practice to equip heating systems with some means, such as a fan, for positively circulating air through the system. Frequently it is desirable to be able to reverse the direction of flow of the air through the system. It is not practical to provide a reversible motor and fan, because reversible motors are relatively expensive and reversible fans are relatively inefficient.

Accordingly, the principal object of this invention is to provide an air circulating unit having a rotary fan therein which operates in but one direction, and in which provision is made for reversing the direction of flow of the air through the unit.

Another object is to provide an air circulating unit including a fan and a rotatable fan casing so constructed and arranged that by rotation of the casing through a predetermined angle the direction of flow of air through the unit can be reversed.

A still further object of the invention is to provide a novel form of housing for a rotatable fan casing which together comprise a reversible air circulating unit.

For a more complete disclosure of the invention reference is made to the following description and the accompanying drawings, wherein—

Figure 1 is a fragmentary cross-sectional view of a house trailer having a heating system embodying the invention;

Figure 2 is a fragmentary cross-sectional view taken on substantially the line 2—2 of Figure 1;

Figure 3 is a bottom plan view of the air circulating unit itself;

Figure 4 is a left elevational view of the unit taken on the line 4—4 of Figure 3;

Figure 5 is a cross-sectional view of the unit taken on substantially the line 5—5 of Figure 3 showing the fan casing in one position;

Figure 6 is a cross-sectional view taken on substantially the line 6—6 of Figure 3;

Figure 7 is a cross-sectional view taken on the line 5—5 of Figure 3 and showing the fan casing in another of its two positions;

Figure 8 is a cross-sectional view taken on substantially the line 6—6 of Figure 3 and showing the casing in the same position as that shown in Figure 7;

Figure 9 is a cross-sectional view of the fan casing taken on substantially the line 9—9 of Figure 5;

Figure 10 is a cross-sectional view of the fan

casing taken on substantially the line 10—10 of Figure 7; and

Figure 11 is a diagrammatic sectional view of a portion of a house showing the invention employed in connection with a heating system for the house.

Referring now more specifically to the drawings, and particularly to Figures 1 and 2 thereof, the invention is shown as employed in connection with an oil burning heater for heating a house trailer. The trailer is of conventional construction and comprises a floor, side walls and a roof. The floor includes upper and lower flooring 10 and 11, respectively, spaced apart and supported by joists 12. Certain of the joists are provided with openings 13 for the passage of air therethrough. Spaced apart openings 14 and 15 are formed in the upper flooring 10. Preferably the opening 15 is furnished with a register which can be opened or closed.

Mounted over the opening 14 in the floor is an air circulating unit 16 on top of which the heater 17 is placed. The air circulating unit in general comprises a housing having a circulating fan 49 therein, and in which provision is made for reversing the direction of flow of the air. The air circulating unit constitutes the present invention and will be more fully described presently.

The heater 17 is of conventional construction and embodies an outer casing having a side wall 18, a bottom wall 19 and a top wall 20. The central part of the bottom wall is imperforate, but adjacent the perimeter of the bottom wall a plurality of openings 21 are provided. The top wall 20 is perforated to permit the passage of air therethrough.

Mounted within the casing 18 is an inner shell 22 in the lower part of which is an oil burner 23 of the vaporizing pot type. Air is admitted to the burner through a duct 24 and exhaust gases escape through a chimney 25. Fuel oil is fed from a suitable source of supply to the burner through the pipe 26.

The air circulating unit which constitutes the base for the heater is shown more in detail in Figures 3 to 10. In general, the unit comprises a housing of box shape, partition or baffle means including two plates 38 and 39 and a fan casing 40 dividing the housing into two compartments, and a fan 49 in the casing for drawing air from one compartment and discharging it into the other compartment.

The housing is made up of imperforate upright side walls 27 and 28, a front wall 29 having an opening 31 therein, and an imperforate rear wall

30. These walls are all made of sheet metal. The top and bottom ends of the housing are open. The side walls 27 and 28 are flanged at their upright edges to overlap the front and rear walls and are secured to the latter by screws 54. The side walls 27 and 28 are indented at 32 to provide cylindrical shoulders or bearings for a purpose which will appear presently.

Partitions 38 and 39 together with casing 40 divide the housing into upper and lower compartments, A and B respectively. Preferably the partitions 38 and 39 are formed integrally with the front and rear walls 29 and 30 respectively, and extend from one side wall 27 to the other side wall 28. The two partitions extend generally diagonally of the housing. The fan casing 40 completely fills the space between the two partitions 38 and 39. The open ends of the cylindrical casing 40 receive the cylindrical projections 32 on the end walls and the casing is rotatably mounted thereon. Thus, the end walls close the opposite ends of casing 40. A knob 41 located within the compartment A and adjacent the opening 31 in the front wall is provided for rotating the casing. A stop 42 at another point on the casing is also provided.

The fan casing 40 forms a passageway for air between the compartments A and B. The casing is provided adjacent one end thereof with a relatively large rectangular air inlet aperture 43. Adjacent the other end of the casing is a similar air outlet aperture 44. The latter aperture is circumferentially spaced substantially 180 degrees from the aperture 43. Located between the apertures 43 and 44 and extending radially of the casing from side to side thereof is a partition 45. This plate has a central orifice therein defined by a draw neck 46 extending toward the outlet end of the casing. Partition 45 divides the casing into a fan chamber adjacent opening 44 and an air chamber adjacent opening 43.

Secured to the side wall 28 of the housing is a supporting member 47 to which non-reversible electric motor 48 is attached. The motor shaft extends through the wall 28 axially of the fan casing 40 and at its inner end carries a centrifugal fan 49. The fan is radially aligned with the outlet aperture 44 in the casing and the inlet end of the fan is positioned adjacent and axially aligned with the opening in the plate 45.

Within the fan chamber is a cut off plate 50 which cooperates with the fan 49 in a well known manner to effect a discharge of air through opening 44. The cut off plate is secured to the casing so that its relationship to the fan and opening 44, as shown in Figure 5, is preserved regardless of the position of casing 40. The cut off plate extends axially from one end of the fan chamber to the other, i. e., from wall 27 to partition 45.

A rotatable cover 33 is provided for the opening 31 in front wall 29. The cover is formed of sheet metal and is of circular shape. It is rotatably mounted about a central axis placed adjacent one apex of the triangular opening 31. The cover 33 has three sectors 34, 35 and 36 of substantially equal area. An opening is provided in the sector 34 of substantially the same area as the area of opening 31. Sector 36 is provided with a plurality of louvres 37, and sector 35 is imperforate. It will be seen that by rotating the cover to any one of three different positions the opening 31 can be left completely open to permit access to the interior of the housing; it can be completely closed; or the louvres 37 can be

placed over the opening to break up and deflect the air stream passing through the opening 31.

Coming now to the operation of the circulator, it will be apparent that the direction of the flow of air through the fan casing 40 is always the same, that is, from the inlet aperture 43 through the orifice in the plate 45 and out through the outlet aperture 44. See Figures 9 and 10, wherein the arrow indicates the direction of flow of the air. The direction of the flow of air through the housing of the unit can be reversed, however, by rotating the fan casing on the bearings 32, so as to position the air inlet aperture 43 in one compartment and the outlet aperture in the other compartment, or vice versa. Thus, when the casing 40 is in the position shown in Figures 5, 6 and 9, inlet aperture 43 is in communication with compartment B and outlet aperture 44 is in communication with compartment A. The air then flows from compartment B to compartment A, as indicated by the arrows.

On the other hand, by reaching into the housing through opening 31, grasping knob 41 and rotating the casing 40 until stop 42 strikes plate 38, aperture 43 is put into communication with compartment A and aperture 44 into communication with compartment B. The air then flows as shown by the arrows in Figures 7, 8 and 10. Thus, compartments A and B constitute separate air ducts which can be placed in open communication with either opening 43 or 44 by merely rotating casing 40.

When the circulating unit is employed in connection with a trailer heater, as illustrated in Figures 1 and 2, the top of the housing is partially closed by the bottom wall 19 of the heater, but compartment B is in open communication with the space between the wall 18 and shell 22 of the heater through the openings 21. The bottom compartment A of the housing opens into the space between the upper and lower floorings 10 and 11 through the opening 14. Compartment A can be opened directly into the room, if desired, by rotating the cover 33 to position either the open sector 34 or the louvered sector 36 over the opening 31. Preferably the register 15 is closed at the same time.

It will be apparent from the foregoing that when the fan casing 40 is positioned as shown in Figures 7, 8 and 10, air can be drawn into the compartment A, either through register 15 and the bottom of the housing, or through opening 31, or both, and discharged upwardly through the heater. The solid arrows in Figure 1 indicate in a general way the paths of the air. On the other hand, when the fan casing is rotated to the position of Figures 5, 6 and 9, air will be drawn from the heater into compartment B through openings 21 and discharged through opening 31, or register 15, or both, as indicated by the dotted arrows.

Thus, the air can be drawn from the upper part of the trailer and discharged along, or through, the floor, or drawn from above or below the floor or both and discharged toward the ceiling. This arrangement provides for variation in the air circulation according to the individual desires of the owner.

Figure 11 discloses the use of the air circulating unit in connection with a furnace for heating a home. The furnace 54, shown in Figure 11, is of conventional construction, and is provided with one or more outlet ducts 51 and return ducts 52. Return duct 52 is connected to the compartment B of the air circulator, and the compartment A is

placed in communication with the air jacket of the furnace 54. Of course, when the air circulator is mounted at one side of the furnace rather than beneath it, the top of the housing is closed by a top wall 53. Aside from the differences in location and connection to the furnace, the device operates in a manner similar to that disclosed in connection with the trailer heater. By rotating the fan casing to one position air is drawn through the return duct 52 and discharged through the outlet or warm air duct 51, as indicated by the solid arrows. Rotating the casing to the other position will reverse the flow of air as indicated by the dotted arrows.

It will be apparent from the foregoing that this invention provides a novel air circulator employing a highly efficient fan and in which provision is made for reversing the direction of flow of air through the unit and its associated heater without reversing the direction of flow of air through the fan itself. The unit is of simple construction, is exceedingly compact, and is easily manufactured.

The scope of the invention is indicated in the appended claims.

What I claim is:

1. An air circulating unit comprising a housing having two spaced apart openings therein, baffle means in said housing between said openings dividing the housing into two compartments each of which communicates with one of said openings, said baffle means including a cylindrical fan casing having an inlet aperture in the side wall thereof adjacent one end communicating with one compartment and an outlet aperture in the side wall thereof adjacent the other end communicating with the other compartment, said inlet and outlet apertures being spaced apart circumferentially of the casing and constituting the only openings of substantial size in said baffle means, a fan in said casing for circulating air from one compartment to the other through said casing, said casing being rotatable to interchange the positions of said inlet and outlet apertures relative to said compartments and thereby reverse the direction of flow of air between said compartments.

2. An air circulating unit comprising a housing having two spaced apart openings therein, baffle means in said housing between said openings dividing the housing into two compartments each of which communicates with one of said openings, said baffle means including a cylindrical fan casing having an inlet aperture in the side wall thereof adjacent one end communicating with one compartment and an outlet aperture in the side wall thereof adjacent the other end communicating with the other compartment, said inlet and outlet apertures being spaced apart circumferentially of the casing and constituting the

only openings of substantial size in said baffle means, a plate having a central orifice therein extending transversely of the casing intermediate the apertures in the casing, a centrifugal fan in said casing in registry with said outlet aperture and having its inlet adjacent the orifice in said plate for circulating air from one compartment to the other through said casing, said casing being rotatable to interchange the positions of said inlet and outlet apertures relative to said compartments and thereby reverse the direction of flow of air between said compartments.

3. An air circulating unit comprising a housing, two opposite walls of said housing being formed to provide bearings to receive the ends of a rotatable fan casing, said housing having two spaced apart openings therein, baffle means in said housing between said openings dividing the housing into two compartments each of which communicates with one of said openings, said baffle means including a cylindrical fan casing having an inlet aperture in a side wall thereof adjacent one end communicating with one compartment and an outlet aperture in the side wall thereof adjacent the other end communicating with the other compartment, said inlet and outlet apertures being spaced apart circumferentially of the casing and constituting the only openings in said casing, and a fan in said casing for circulating air from one compartment to the other through said casing, the ends of said casing being rotatably mounted on said bearings whereby the positions of said inlet and outlet apertures relative to said compartments may be interchanged to reverse the direction of flow of air between said compartments.

4. An air circulating unit comprising a housing having two spaced apart openings therein, baffle means in said housing between said openings dividing the housing into two compartments, each of which communicates with one of said openings, said baffle means including a fan casing having an inlet aperture in the side wall thereof adjacent one end communicating with one compartment and an outlet aperture in the side wall thereof adjacent the other end communicating with the other compartment, said inlet and outlet apertures being spaced apart circumferentially of the casing, a fan in said casing for circulating air from one compartment to the other through said casing, said casing comprising a cylindrical tube having open ends mounted on opposite walls of said housing in substantially airtight engagement therewith, said tube being rotatable relative to said walls to interchange the positions of said inlet and outlet apertures relative to said compartments and thereby reverse the direction of flow of air between said compartments.

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