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R. W. SMITH
AIR CIRCULATOR

2,665,841

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2 Sheets-Sheet 1

FIG. 1

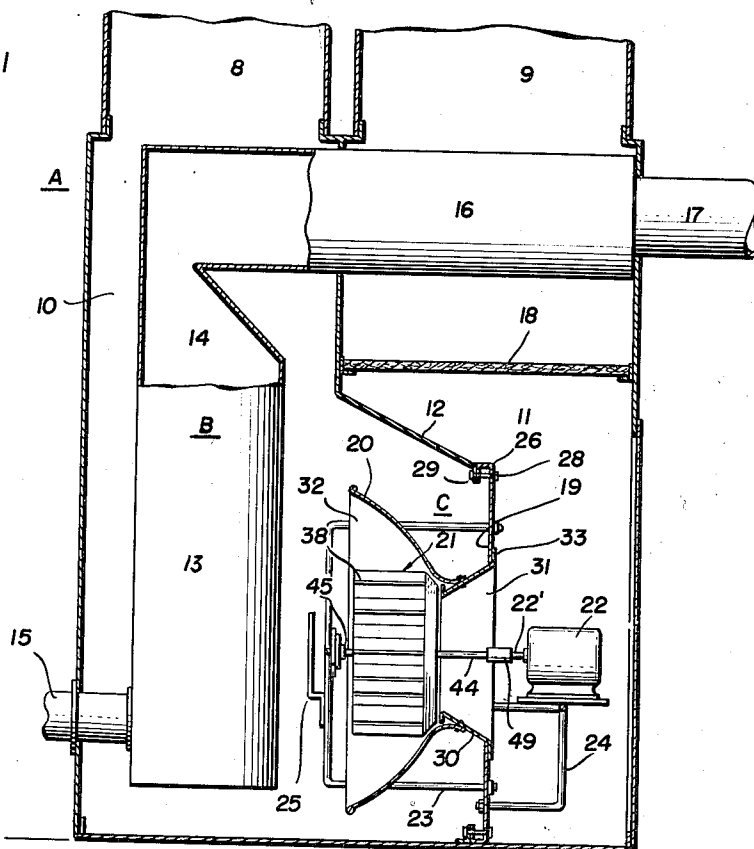
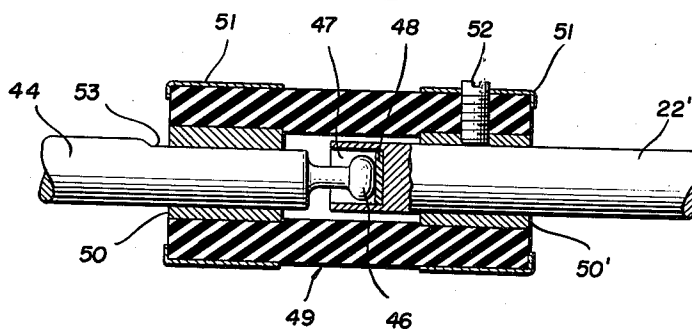


FIG. 2



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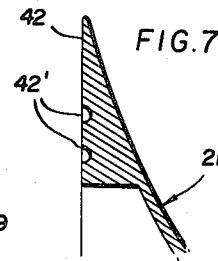
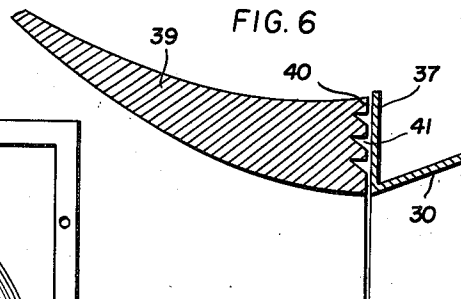
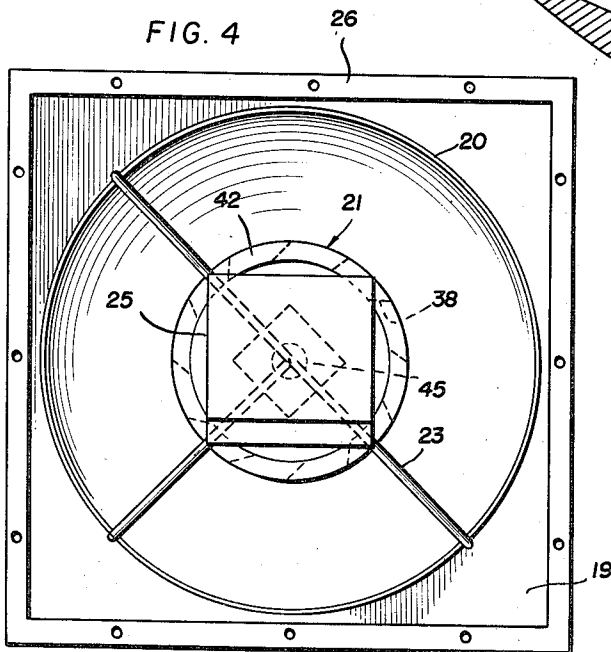
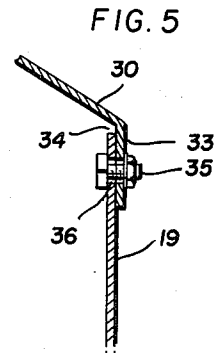
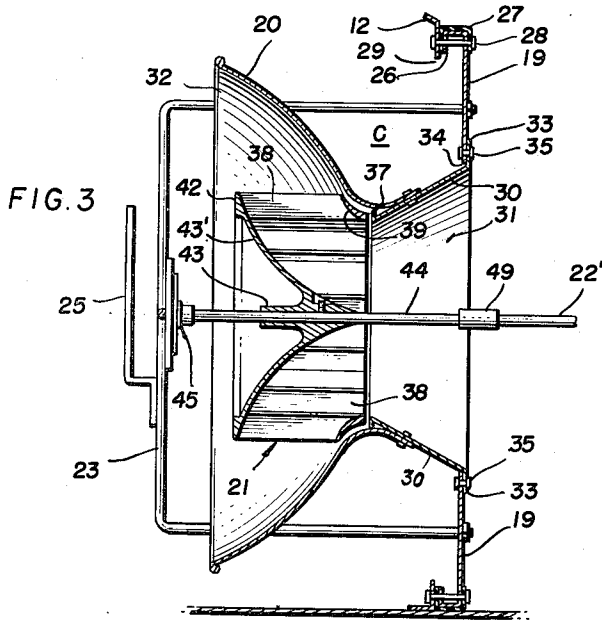
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2,665,841

AIR CIRCULATOR

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6 Claims. (Cl. 230-117)

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This invention relates to improvements in an air circulator adapted for use in conjunction with heating or other air conditioning apparatus.

Generally, air circulating apparatuses are made up of numerous elements including a revolving blower, a motor to drive the blower, gearing or belting, an air deflector and other parts requiring separate installations in a furnace or other air conditioning apparatus. Thus, when repairs or replacements of defective blower elements or parts thereof are required, the major part of labor occasioned by such repairs or replacements is performed at the situs of the installation. For instance: The parts requiring repair or renewal are disassembled and removed from the apparatus in which they are installed and subsequently are repaired or new parts supplied and reassembled in the apparatus.

One of the objects of the instant invention is the provision of a unitary air circulator that is readily installed in or removed from a furnace or air conditioning apparatus for the purpose of repair or replacement of the circulator unit.

Another object of the invention is to form a connection between the driving motor and the blower for the unit without intervening gears or belting that ordinarily are used in heating and air conditioning apparatus, which create noises and necessitate frequent repairs or replacements.

Another object of the invention is to fashion the air ducts of the unit so the frictional resistance by the walls of the air ducts to air passing through the unit is substantially negligible.

Another object of the invention is to shape and arrange the opposing faces of the intake end of the revolving blower and the end of the intake nose of the stationary air duct so that leakage of air between the nose and the blower is substantially prevented.

And a further object of the invention is to shape and arrange the opposing faces of the intake end of the revolving blower and the end of the intake nose of the stationary air duct so that leakage of air between the nose and the blower is greatly reduced.

Other objects and advantages of the invention appear in the following description.

An illustrative embodiment of the invention is shown in the accompanying drawings, in which:

Fig. 1 is a side elevational view of a furnace structure showing an air circulator in which the invention is incorporated installed therein, parts being in section through a midportion thereof;

Fig. 2 is an enlarged detail view of a flexible coupling for the motor and blower shafts, parts being in section;

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Fig. 3 is a side elevational view of the blower and its mount, in section through a midportion thereof, the view being drawn to a larger scale than Fig. 1;

Fig. 4 is an end elevational view of Fig. 3; and Figs. 5, 6 and 7 are enlarged detail views of various parts of the structure shown in Fig. 3.

In the illustrative embodiment of the invention the characters A, B and C respectively indicate generally a furnace housing, a heater arranged in the housing, and an air circulator installed in the furnace structure.

The furnace structure shown is exemplary of a known type of heating apparatus to which the instant air circulator C is applicable, and consists of the housing A and heater B of usual construction and relative arrangement.

The housing has at its top an upflow hot air duct 2 and a downflow air inlet duct 9 that have communication respectively with the hot air chamber 10 and the cold air chamber 11 in the housing, the chambers being separated by a partition 12 that extends interveniently therebetween.

The heater B consists of a shell 13 providing a combustion chamber 14 and has an inlet 15 extending through the adjacent wall of the housing, through which fuel is supplied to the combustion chamber, and the heater has at its upper end an extension 16 of the combustion chamber that preferably extends transversely through the hot and cold air chambers 10 and 11 and terminates with a smoke flue 17 through which the products of combustion from the heater are expelled into the atmosphere. The extension thus arranged has the effect of tempering the cold air that passes down through the duct 9, past the extension, and from thence through an ordinary air filter 18 into the cold air receiving chamber 11.

The air circulator unit C is an assemblage of elements in which are included a base-plate 19, funnel 20, blower 21, motor 22, an inner bracket 23 extending from the base-plate 19 supporting the funnel, an outer bracket 24 extending from the base-plate supporting the motor, and a reflector 25 supported on said inner bracket.

The outer marginal edges of the base-plate 19 are shaped to form a rim or channel 26 which is covered by a rubber strip to form a cushion 27, the channel together with the cushion being secured to the partition 12 by means of bolts 28. By this means the air circulating unit C receives support and the opening 29 in the partition 12 is closed, the cushion serving to absorb vibrations developed by the air circulator.

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The air funnel 20 (Fig. 3) is stationary and preferably is formed of two parts, a frustrum shaped nose 30 constituting an intake port 31, and a bell-shaped inner end portion constituting a discharge outlet 32. The outer end of the nose 30 has an external flange 33 that extends through an opening 34 in the base-plate 19 and overlaps the outer face thereof where it is secured in place by bolts 35. The bolt openings 36 in the flange and base-plate are sufficiently large as to permit play of the bolts in the openings for centering adjustments. The nose has an external flange 37 surrounding its inner end which serves as an abutment hereinafter referred to.

The blower 21 has a series of peripheral slanting tangential blades 38, spaced apart from each other, and extending parallel with the axis thereof. The forward end of the blower has an annular flange 39 to which the adjacent ends of the blades 38 are secured and supported thereby. The distal end of the flange 39 is preferably of increased thickness and presents an abutment face 40 that is disposed parallel with and closely adjacent to the abutment 37 on the nose 30 of the funnel when the blower is in operating position. Sufficient clearance is left between the opposing faces of the abutment and the rim of the blower to permit rotation of the blower without contacting the nose while restricting free flow of air therebetween. Preferably, the abutting face 40 of the rim has an annular series of convolute grooves 41 in which air accumulates and tends to choke leakage of air between the opposing faces of the nose and rim. The opposite ends of the blades 38 are secured to an annular ring 42 that extends around the perimeter of the flanged hub 43 for the blower which serves the dual purpose of a chuck ring for use in machine dressing the hub and for convenience in counterbalancing the blower by drilling cavities 42' in selected places in the ring as in the usual manner of displacing weight. The outer face of the hub flange 43' and the opposing inner face of the funnel 20 are suitably spaced apart from each other and streamlined to affect passage of air drawn by operation of the blower through the funnel from the cold air chamber 11 and discharged into the heating chamber 10 without material obstruction.

The blower 21 is secured upon a drive-shaft 44 that is aligned with the axis of the funnel, the inner end of the drive-shaft being mounted for rotation in a bearing 45, preferably of the ball bearing type, which is supported by the inner bracket 23. The forward end of the drive-shaft has thereon a knob 46 (Fig. 2) that projects into a socket 47 in the adjacent end of the motor-shaft 22' and rests against a lubricant saturated pad 48 in the socket. The drive-shaft 44 is held by its ball bearing support 45 from having longitudinal movement so the clearance between the nose 30 and the blower 21 is constantly maintained.

The blower drive-shaft 44 and motor-shaft 22' are connected by a coupler consisting of a flexible tube 49, the ends of which have corresponding bushings 50-50' and encompassing ferrules 51. One end of the coupler is secured to the motor-shaft 22' by a set screw 52 so that as the motor-shaft rotates the tube 49 is activated accordingly. One end of the drive-shaft 44 is flattened to form a seat 53 into which the bushing 50 fits, so that as the flexible tube is activated the drive-shaft is rotated and has axial play in said bushing, by which to compensate for any endwise

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vibration developed upon operation of the blower.

By constructing and applying the coupler in this manner, torque pulsations developed by the motor are absorbed, thus relieving strain upon the set screws or other fastening means for securing the coupler on the motor shaft and the hub of the blower on its drive-shaft, so that loosening of the set-screws is averted.

The reflector 25 is secured upon the inner bracket 23 with its upper portion spaced therefrom, disposed between the bearing 45 and the adjacent wall of the heater B, and serves as a shield for the bearing to prevent it from becoming overheated by hot rays radiated from the adjacent wall of the heater.

Operation

In using the invention, the air circulator unit is bodily moved into the housing A and secured in place to the partition 12 that separates the chambers 10 and 11 therein. The cushion 27 that is interposed between the base-plate 19 and the partition 12 in the housing, and the resilient tube 49 that forms part of the coupling between the motor-shaft 22' and the blower drive-shaft 44 are contributing factors to silent operation of the air circulator, which is essential to avoidance of resonant annoying sounds that ordinarily are inherently common in the operation of apparatus of the character here involved.

When the motor is in operation, the blower is revolved causing air from the cold air chamber 11 to be drawn through the funnel 20 from which it is directed through its discharge outlet 32 into the hot air chamber 10 against the adjacent wall of the heater B. The air thus forced into the chamber 10 becomes heated by contact with the heater and passes up through the duct 8 into the building (not shown) with which the ducts 8 and 9 are connected in the usual manner. The air from the building then is drawn downwardly through the air duct 9 into the cold air chamber 11, after which it is recirculated through the housing A as in the former instance.

The air circulator thus constructed and made up entirely of factory-assembled elements is conveniently installed in the housing in readiness for operation, and is readily removable from the housing without disturbance or dismemberment of its elements which is advantageous in servicing the apparatus.

Variations from the particular construction above disclosed may be resorted to by the exercise of skill in the art, without departure from the spirit or scope of the invention.

What I claim is:

1. A unitary air circulator including a motor and adapted to be mounted on a partition of an air conditioning apparatus comprising a base-plate, said base-plate being formed to include a central opening and a channel structure around its marginal edges for attachment of said base-plate to said partition, a cushion member supported on said channel structure for contacting said partition and preventing transmission of motor vibrations between said base-plate and said partition, a first bracket mounted on one side of said base-plate for supporting said motor coaxially of said opening, a second bracket mounted on the other side of said base-plate and including a bearing aligned with the shaft of said motor, a blower including a supporting shaft mounted at one end in said bearing, a vibration absorbing coupling connected to the shaft of said motor and to the other end of said blower shaft for supporting and driving said blower shaft

whereby motor vibration is not transmitted to said blower, and an air funnel mounted on said base-plate coaxially with said blower for defining an air path through said circulator.

2. A unitary air circulator including a motor and adapted to be mounted on a partition of an air conditioning apparatus comprising a base-plate, said base-plate being formed to include a central opening and a rim for attachment of said base-plate to said partition, a cushion member supported on said rim for contacting said partition and preventing transmission of motor vibrations between said base-plate and said partition, bracket structure mounted on said base-plate for supporting said motor coaxially of said opening and including a bearing aligned with the shaft of said motor, a blower including a supporting shaft mounted at one end in said bearing, a vibration absorbing coupling connected to the shaft of said motor and to the other end of said blower shaft for supporting and driving said blower shaft whereby motor vibration is not transmitted to said blower, and an air funnel mounted on said base-plate coaxially with said blower for defining an air path through said circulator.

3. An air circulator comprising a base-plate formed with a centrally disposed opening, an air funnel, said air funnel comprising at the intake end thereof a frustum shaped nose member joined at its outer and large end to said base-plate and extending within said opening, and a bell-shaped member forming the discharge end of said funnel and joined at its small end to the small and inner end of said nose member, said inner end including a peripheral flange, and a blower rotatably mounted within the bell-shaped member of said funnel, said blower including peripheral slanting blades disposed parallel to its axis of rotation, and an annular flange joined to the ends of said blades and abutting said peripheral flange, the distal end of said annular flange being formed to have increased thickness and an annular series of convolute grooves facing said peripheral flange for choking leakage of air between said flanges.

4. An air circulator comprising a base-plate formed with a centrally disposed opening, an air funnel, said air funnel comprising an intake nose member extending within said opening and a bell-shaped member forming the discharge end

of said funnel and joined at its small end to the inner end of said nose member, said inner end including a peripheral flange, and a blower rotatably mounted within the bell-shaped member of said funnel, said blower including peripheral blades, and an annular flange joined to the ends of said blades and abutting said peripheral flange, the distal end of said annular flange being formed to have increased thickness and an annular series of convolute grooves facing said peripheral flange for choking leakage of air between said flanges.

5. An air circulator comprising a base-plate formed with a centrally disposed opening, an air funnel comprising an intake nose member joined at its outer end to said base-plate and a bell-shaped member forming the discharge end, a dividing flange mounted intermediate the ends of said funnel, and a blower rotatably mounted within the bell-shaped member of said funnel, said blower including peripheral blades, and an annular flange joined to the ends of said blades and abutting said dividing flange, the distal end of said annular flange being formed to have increased thickness and an annular series of grooves facing said peripheral flange for choking leakage of air between said flanges.

6. An air circulator comprising a base-plate formed with an opening, an air funnel extending within said opening, a dividing flange mounted intermediate the ends of said funnel, and a blower rotatably mounted within the discharge end of said funnel, said blower including an annular flange abutting said dividing flange and formed to have annular grooves facing said dividing flange for choking leakage of air between said flanges.

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