Dec. 23, 1941. P. C. STRAUCH 2,266,917

FURNACE BLOWER UNIT

Filed Nov. 21, 1939 3 Sheets-Sheet 1

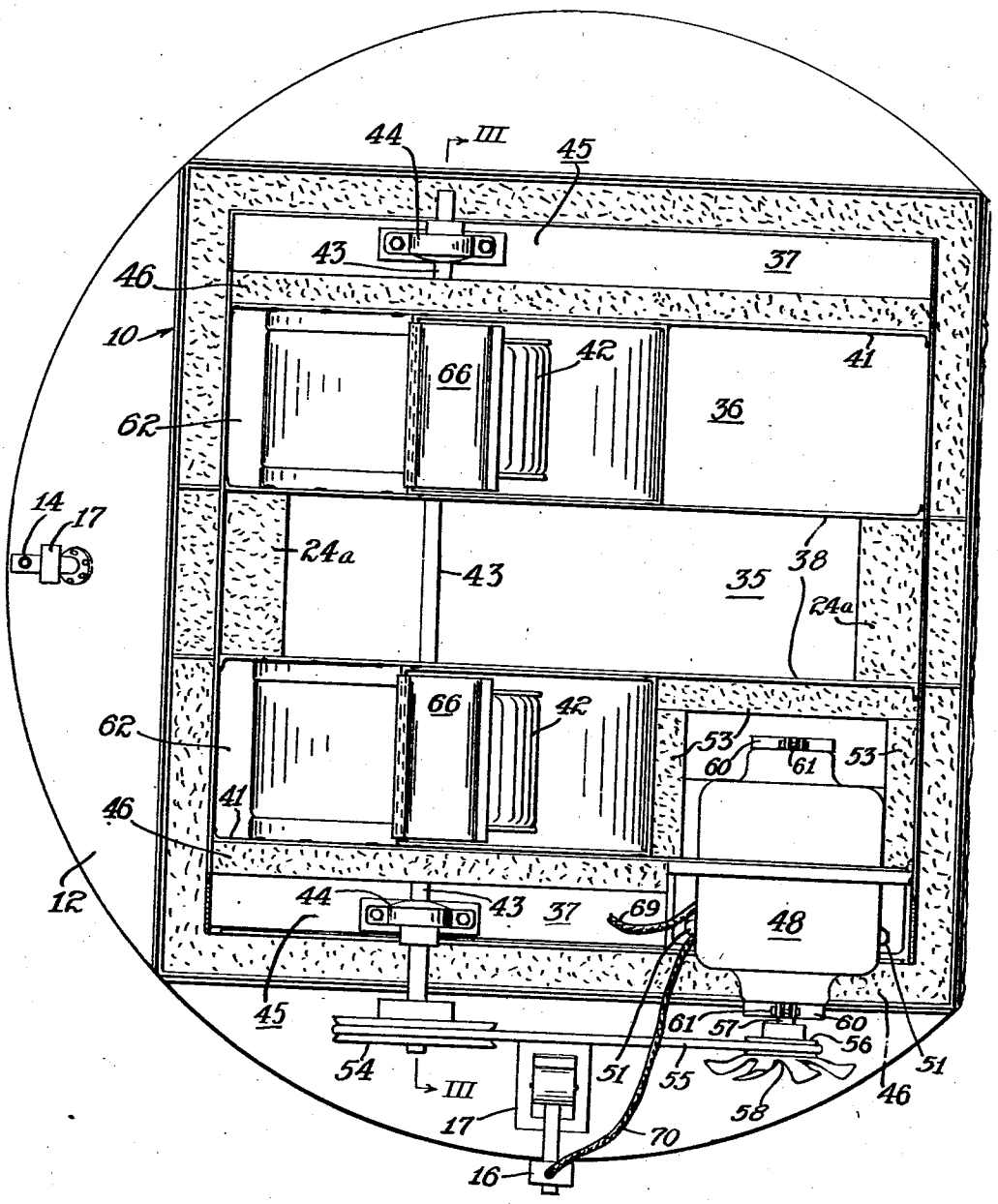


Fig. 1.

INVENTOR

Paul C. Strauch

By Green & McCallister

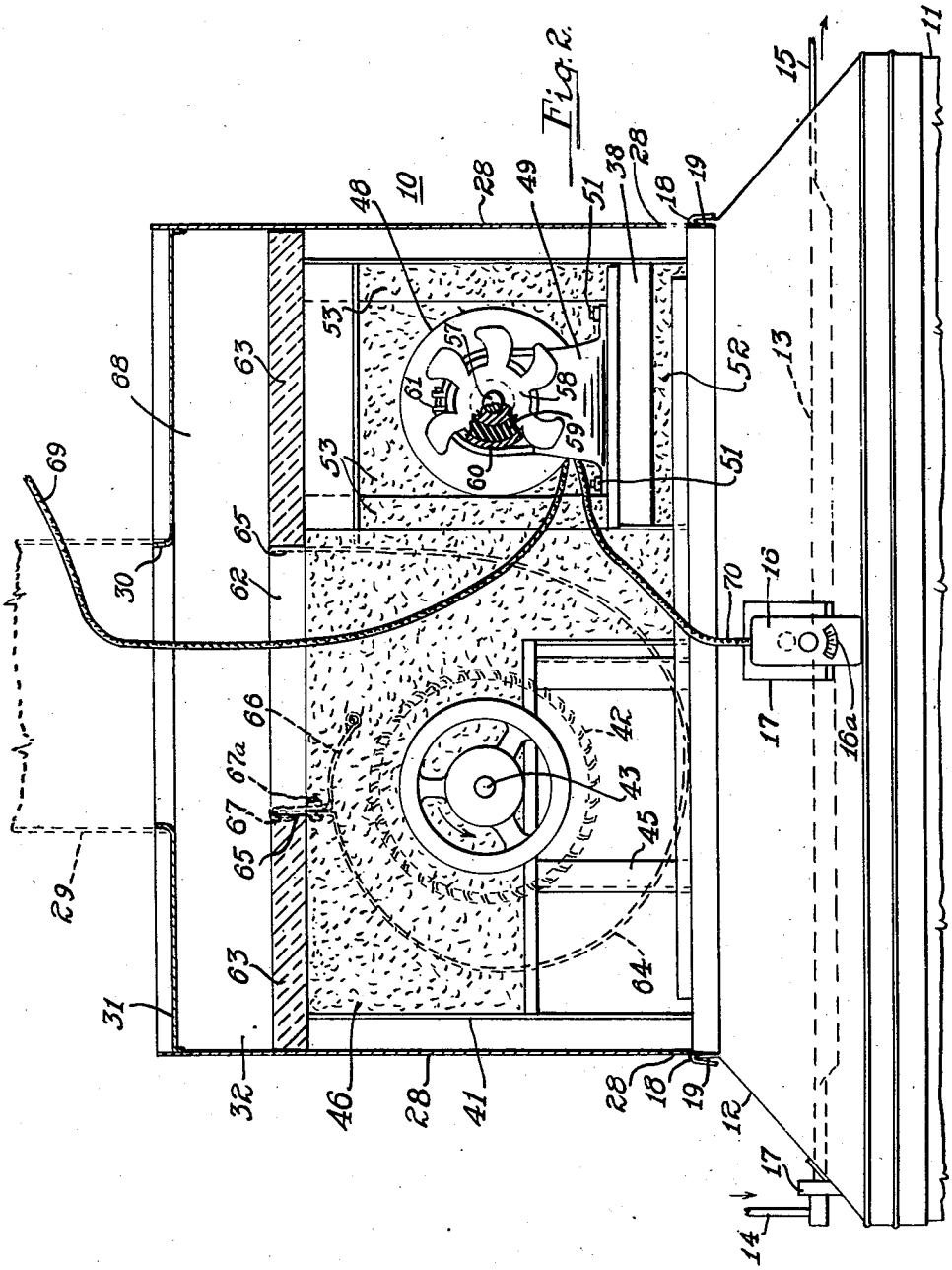
His Attorneys

Dec. 23, 1941. P. C. STRAUCH 2,266,917

FURNACE BLOWER UNIT

Filed Nov. 21, 1939 3 Sheets-Sheet 2

Fig. 2.



INVENTOR

Paul C. Strauch

By Green & McCallister

His Attorneys

Dec. 23, 1941. P. C. STRAUCH 2,266,917

FURNACE BLOWER UNIT

Filed Nov. 21, 1939 3 Sheets-Sheet 3

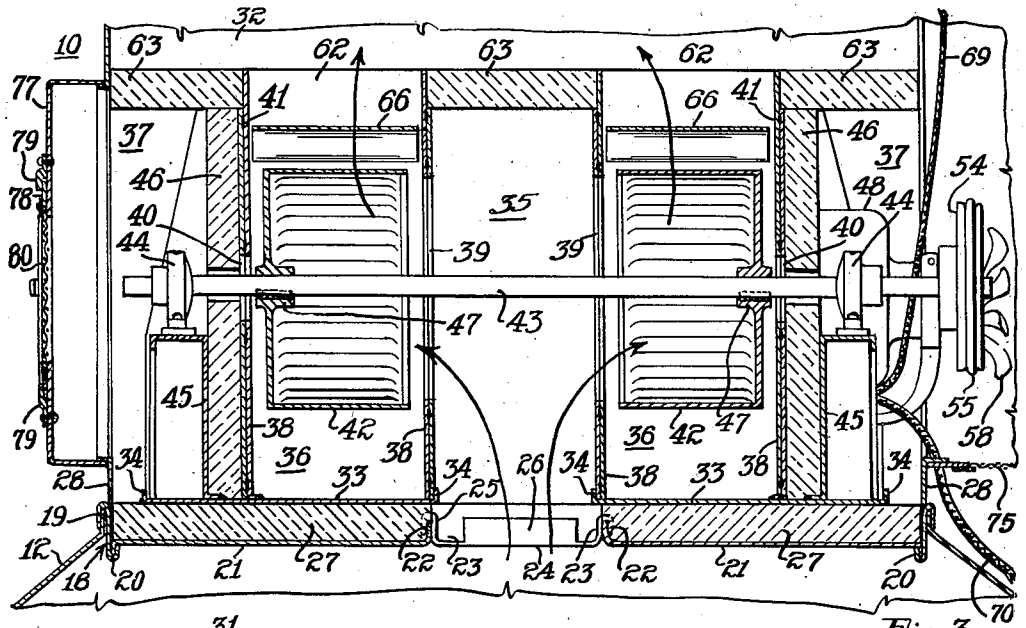


Fig. 3.

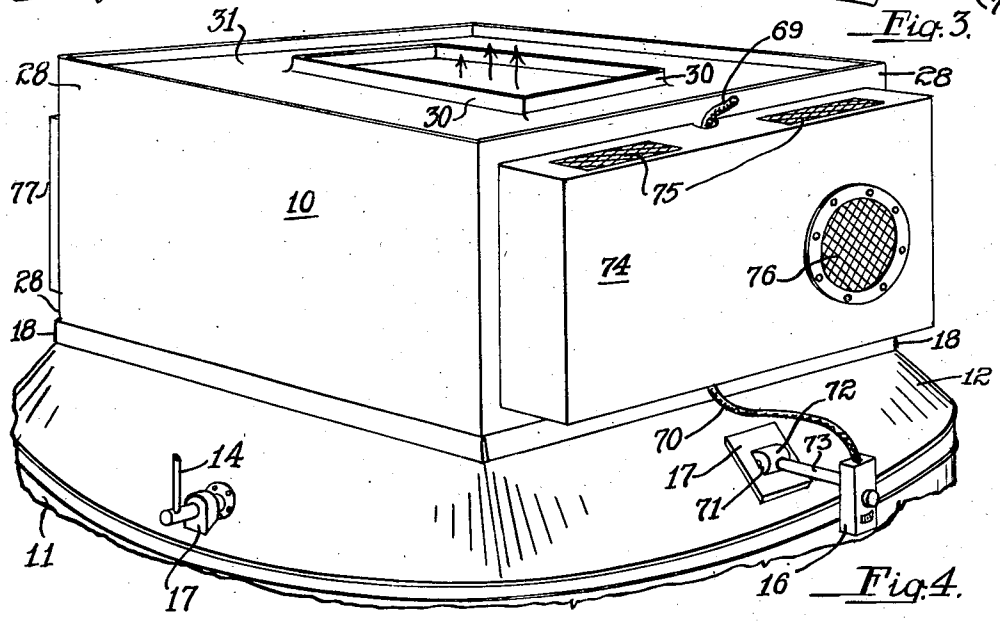


Fig. 4.

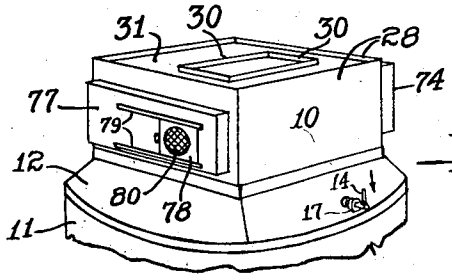


Fig. 5.

INVENTOR

Paul C. Strauch

By Green & McCallister

His Attorneys

Patented Dec. 23, 1941

2,266,917

UNITED STATES PATENT OFFICE

2,266,917

FURNACE BLOWER UNIT

Paul C. Strauch, Edgewood, Pa.

Application November 21, 1939, Serial No. 305,509

2 Claims. (Cl. 126—99)

My present invention relates to the heating art, and more particularly to the provision of a furnace blower unit adapted to be employed in connection with a warm or hot air type of furnace.

In connection with furnace blower units and similar devices, it has been the general custom to mount the same on the cold air side of a furnace, which means adjacent the floor. While units so located have had a comparatively extensive use they are subject to certain disadvantages which the art so far has not been able to obviate. Units mounted on the cold air side of a furnace necessitate the provision of a filter or filter section as an integral part of the blower unit, thus complicating the structure of the blower unit and increasing the cost of manufacturing and servicing the same. A further disadvantage resides in the inherent necessity of locating such units adjacent the floor. This renders the electrical and other equipment involved particularly susceptible to dirt and dampness and, therefore, tends to shorten the efficient life of the same. In addition, the parts are in an inconvenient location for carrying on servicing and repairs when such become necessary. Under such conditions also the life of the filter or filter unit is unavoidably decreased. The most important disadvantage, however, lies in the fact that this constitutes a thermodynamically inefficient arrangement.

While some attempts have been made to alleviate these unsatisfactory conditions, so far as I am aware there has been no satisfactory solution of the problems involved. Retention of the unit on the cold air side of the furnace is, I am convinced, inherently unsound and undesirable engineering practice. No successful blower unit has thus far been developed for use on the hot side of a furnace and such has heretofore been thought to involve insuperable obstacles. For example, it was deemed that the fact that the unit was necessarily intimately associated with the furnace ducts would inevitably cause noise and vibration to be transmitted to all parts of the heating system which would be highly objectionable. Further difficulties were envisaged due to the fact that the electrical equipment was unavoidably exposed to greatly increased temperatures resulting from close juxtaposition to hot furnace portions and gases. In general, therefore, the location of a blower unit on the hot side of a furnace was considered impracticable.

One of the objects of my present invention is to make it possible to mount a furnace blower unit of new and improved structure on the hot side of a furnace without simultaneously giving rise to those objections and difficulties above outlined, particularly with respect to noise, vibration and rapid deterioration due to exposure to heat.

Another object of my invention resides in the production of a furnace blower unit capable of being located on the hot side of a furnace and yet wherein the electrical equipment is not only highly accessible for installation, replacement or servicing but wherein such electrical equipment is not subjected to appreciable deterioration due to furnace heat and gases.

A further object of my invention resides in providing a furnace blower unit capable of being located on the hot side of a furnace of the direct-fired type and which is characterized by the new and useful feature that the heat is drawn evenly from all sides of the heating surfaces, thus not only producing both more satisfactory and effective heating but also ensuring substantially even cooling of the furnace heating surfaces.

A still further object of my invention resides in the provision of a furnace blower unit mounted on the hot side of a direct-fired furnace, which is not only more economical in operation but which additionally saves floor space.

Other and further objects and advantages include the various combinations, subcombinations and details hereinafter described and claimed, and such other and further matters as will be understood or appreciated by those skilled in this art. Such include, for example, the capacity for mass production at low cost, the unusual noise and heat insulation arrangement, the elimination of metal-to-metal contacts between the blower housing and any part of the duct system of the associated furnace, the provision of means to absorb starting shock and motor hum, the use of plural inlet type centrifugal blower wheels balanced near the ends of the drive shaft provided therefor, the freedom from lubrication troubles, and, in general, the provision of a simple, foolproof, highly efficient device.

In the accompanying drawings wherein I have illustrated one embodiment of the present invention.

Fig. 1 is a plan view of the invention minus its top and disclosing the general arrangement of parts;

Fig. 2 is a front elevational view of the present device but with the outer housing and top asbestos cover in section in order to reveal the nature and relationship of the parts involved;

Fig. 3 is a longitudinal sectional view taken on line III—III of Fig. 1;

Fig. 4 is a perspective view illustrating the present blower unit installed in operative position on a furnace bonnet; and

Fig. 5 is a perspective view on a reduced scale but at an angle of about 180° from that of Fig. 4.

Like numerals designate corresponding parts throughout the various views of the drawings.

The type of housing known as the utility home or utility type home is becoming a greater and greater factor in the building industry. Particularly in connection with so-called low cost housing, the tendency has been to eliminate basements in order to provide housing units within reach of the low income group. In such utility homes space is accordingly at a premium. Not only is this true but all mechanical and electrical installations must be low in initial cost, of long efficient life and as free from servicing and maintenance as is possible. As a result, the so-called utility room or compartment has been developed for the utility type home, in which, for example, the heating unit is located. Due to its propinquity to the living units, i. e., kitchen, living room and frequently bedrooms, and due to the fact that space requirements are strictly limited, it is essential that the furnace be quiet and clean in its operation, since the indicated arrangement inherent in utility homes makes noises, vibration and dirt particularly objectionable.

The furnace blower unit of my present invention has been especially developed for this type of service and a number of installations already made in utility type homes has definitely demonstrated the value and advantages of the present device. As will be noted, the unit, which is designated as a whole by the numeral 10, is mounted on the hot side of a conventional direct-fired warm air or hot air type of furnace illustrated fragmentarily at 11. This furnace is generally cylindrical in nature and may be fired with any suitable or available fuel such as coal, oil or gas. The particular structure of the furnace proper forms no part of the present invention. The furnace, if not already so furnished, is provided with a frusto-conical bonnet 12. This bonnet also acts as an adapter between the round furnace and the rectangular blower unit. Suitably mounted in this bonnet is a water pan 13 adapted to contain a shallow layer of water to provide proper humidification for the heating system, and at the same time to cause the heating system to partake of the nature of an air conditioning system. This water pan is provided with a water inlet 14 and an overflow 15 so as to provide a continuous and full supply of water in the pan 13, and at the same time to prevent an undesirable rise in the temperature of such water to a point where it would boil or vaporize too copiously. The water inlet 14 is connected to a suitable source of water supply, the rate of flow of which is adjusted so as to maintain the pan 13 substantially full. The overflow 15 accomplishes the usual purposes. As will also be noted from the drawings, the furnace bonnet 12 is additionally provided with a thermostatic device indicated at 16, the particular structural details of which are not material here and the function and operation of which will be understood from what follows. The thermostatic device 16, the water inlet 14 and the overflow 15 are mounted in suitable support members on the furnace bonnet as indicated by the numerals 17.

As will be observed best from Figs. 2 and 3, it will be appreciated that the furnace blower unit 10 is mounted in the top of the furnace bonnet 12. One satisfactory way of mounting the unit is shown and includes providing an S-shaped interlocking collar 18, one end of which hooks over the upstanding flange 19 of the furnace bonnet 12 and the other end of which presents a groove for the reception of the downwardly turned flanges 20 of the blower unit base plates 21. The latter are in the form of transversely extending tray-like metal members spaced apart and in parallel disposition with their inner marginal edges turned upwardly to form flanges 22, bounding either side of the central opening 23 formed by this arrangement. A pair of bridging members 24 is provided, one of which is disposed at each end of opening 23. Each member 24 has hook-shaped extremities 25 engaging with flange 22 of a base plate 21 and a lateral upstanding end flange 26. Members 24 are adapted to carry insulation material such as asbestos padding 24a, which is maintained in place by flanges 26. The balance of opening 23 communicates with the interior of bonnet 12.

The base plates 21 are, as shown, provided with the relatively thick asbestos pads 27, which are preferably of the order of at least one inch in height. The pads 27 are substantially coextensive with and overlie base plates 21. The vertical wall 28 forming the main outer closure of the unit 10 and defining a main chamber has its lower open end wedged between the periphery of the asbestos pads 27 and the vertical central portion of the S-shaped collar 18, rising therefrom a height which is determined in the first instance by the space requirements and limitations of the particular installation and in the second instance by the thermodynamics of the particular set-up. Relative to this first requirement, it will be noted that the duct system of the furnace involved connects with a single central take-off duct fragmentarily illustrated at 29 in broken lines in Fig. 2 and interengaging with an upturned flange 30 in the cover plate 31 of the present unit in the well-known manner of a stovepipe connection, for example. It is, however, to be understood that this arrangement is not a restriction upon the present invention, as I may equally well make the main chamber, say 6" higher and with the ducts leading to the living quarters emanating from the sides of such chamber instead of from the top thereof, particularly where the thermodynamic efficiency indicates the provision of a chamber 32 of maximum possible vertical extent.

The main chamber is shown as rectangular, and preferably the upstanding flange 30 with which the duct 29 connects is of the same outline, although the size and shape of the latter necessarily govern the size and shape of the former, which in turn may vary depending upon the particular furnace and/or bonnet construction. While it is preferred that the main chamber and the flange 30 be square, it is to be understood that this likewise is not deemed to constitute a limitation upon the invention, as the members in question may partake of other rectangular or similar shapes without departing from the scope and principles hereof.

A second set of transversely extending spaced tray-like metal plate members 33 rests upon the pads 27. Members 33 are somewhat narrower than plates 21 and constitute a support for the members to be described. The members 33 have

upturned marginal edge flanges 34. A number of spaced partitions rise from and are secured to members 33. These partitions, in conjunction with the plate members 33, divide the main chamber into a central compartment 35, blower compartments 36 flanking the central compartment and end compartments 37 flanking the blower compartments. Fig. 3 shows four partitions 38, the inner two having large apertures 39 and the outer two having small apertures 40 and serving as support and holding members for additional asbestos pads, such as those indicated at 41, and which have the dual role of acting as heat- and sound-proofing insulation. In the blower compartments 36 blower wheels 42 are provided, one in each such compartment. The specific structure of such blower wheels is not a part of this invention and is not original with me. I prefer to use the squirrel cage type of blower, but blower wheels of any suitable type may be employed without departing from the essentials of this invention.

The drive shaft 43 extends through the compartments 35 and 36 and into the compartments 37. Near each end thereof this shaft is provided with a bearing member 44, each such bearing being supported by a standard 45, which rests upon and is preferably secured to one of the plate members 33. Each bearing is suitably secured to its standard which forms a firm base therefor. Between standards 45 and the partitions 41 relatively thick vertically disposed asbestos pads 46 are provided which, like the pads previously mentioned, constitute insulation against sound and heat.

The blower wheels 42 aforementioned are mounted on the said drive shaft 43, as shown best in Fig. 3, and the arrangement is such as to produce a steady balanced assembly which is unusually free from noisiness and vibration. The shaft passes through partition openings 39 and 40 and through the insulating pads 46. Each blower wheel 42 has a sleeve bearing 47 by means of which it is suitably connected to said shaft for rotation therewith. While the usual key connection is preferred, a set screw or other fastening may also be employed. Suitable means for lubrication are likewise provided with relation to each such bearing 44, and, as will be pointed out more fully hereinafter, the said bearings are readily accessible for lubrication, servicing, etc.

As will be appreciated best from Figs. 1 and 2, an electric motor 48 of suitable type, but preferably of the inexpensive split-phase washing machine type, is mounted by means of a suitable standard 49 on a channel 50, being bolted thereto as at 51, which is somewhat spaced from the asbestos pad 52 which absorbs vibration and noise and which at the same time protects said motor against the heat of the furnace, said motor being also protected by the other asbestos padding shown, e. g., 46 and 53. The end of the said drive shaft 43 adjacent motor 48 is provided with a suitable pulley 54 over which passes a belt 55, which also encompasses a motor pulley 56 suitably provided on the motor shaft 57. The motor pulley is provided, as shown, with a fan-like element 58 made up of a central disc secured as by spot welding to the face of said pulley and a plurality of curved radiating arms which act as fan or propeller blades. The purpose of this will be explained hereinafter. The motor is mounted, in effect, in ring-shaped hard rubber bearings 59 within metal ring 60, the whole maintained in proper assembled condition by clamp means 61.

Each of the said blower compartments 36 communicates at the top thereof with an opening 62 in a relatively thick asbestos cover member 63, one portion of which encloses the top of the motor compartment (see Fig. 2). As will be understood best from Fig. 2, each blower lies within a casing or housing 64 which gradually increases in size spirally, the upper end 65 of this casing or housing terminating flush with the upper end of the said asbestos cover member 63. The casing 64 is preferably provided with a scroll 66, one (U-shaped) end 67 of which overhangs and depends from the adjacent housing terminus 65. The scroll is secured to part 65 by a screw or the like 67*a*. The coiled scroll end is free. The scroll is removed when the blower wheel is to be removed through opening 62.

The blowers communicate, as will be appreciated, with the overhead chamber 68, and thence with the duct system of the furnace fragmentarily designated at 29. The electric motor 48 is provided with one insulated conductor 69 which leads to a suitable source of current and another insulated conductor 70 which leads to and is connected into the thermostatic device 16. This device has a member (not visible) projecting into the interior of the bonnet 12 which is thermosensitive so that when the temperature within the bonnet reaches a predetermined temperature such as that set on the indicator 16*a* of the thermostatic device, the electric motor is automatically started and thus the unit set in operation. The arrangement is such that when the temperature falls a predetermined amount, say 15–20° F., the unit is rendered inoperative. Means is also provided such as by a push-pull button or a switch, or by suitable movement of the thermostatic device as a whole pivoting it around the axle member 71, for starting up the unit manually when and as desired, e. g., for summer use. Cylindrical member 72 constitutes the means by which the thermostatic device is mounted in the furnace bonnet and the tubular member connects 16 and 72 and contains suitable elements for control and actuation purposes such as a bimetal element or a thermocouple.

At one end of the main chamber an external box-like member 74 is attached in suitable manner (see Fig. 4) and which is provided top and bottom with the foraminous sections 75. On its vertical face there is provided a foraminous section forming a port 76. At the opposite end of the main chamber an additional box-like member 77 is provided which has a door 78 slidable back and forth in the slideways 79. This constitutes an access door for the rear shaft bearing assembly 44, as will be understood. The door has a foraminous port 80 therein similar to port 76 so that when it is in its normally closed position air will have access to the interior of the member 77 and the rear bearing compartment of the plenum chamber. During operation the fan-like element 58 on the motor pulley creates an inwardly directed draft or current of air which is exhausted through some or all of the foraminous openings 75 in the bottom and top of the member 74 and which, therefore, serves as a positive cooling means for the motor and its accessories. This I have found to be of great importance as it is the only way known to me in which a motor can be used on the hot side of a

furnace without causing relatively rapid deterioration of such motor and other disadvantageous effects. By means of port **80** a cooling effect can be maintained with respect to the adjacent bearing **44**, thus keeping the temperature of the bearing within reasonable limits.

In the operation of the present unit it will be appreciated that hot air is drawn from the furnace, is caused to enter central compartment **35**, is there divided into streams one of which is drawn into each compartment **36** and there subjected to the action of the blowers **42**, is recombined in chamber **68** and is finally injected into the furnace duct system which is suitably connected to chamber **68**. Due to the unusual construction, nature and mounting of unit **10**, no objectionable noises are created or transmitted, starting torque of the motor is absorbed and the unit in general fulfills all requirements admirably, not the least of which is the versatility thereof, i. e., the adaptability to various furnaces and space limitations. The unit contributes to use of minimum floor and head space and to use in corners, etc. where known units cannot be suitably installed.

It will be appreciated further that the present device partakes of the nature of an air conditioning unit in that it not only positively discharges and distributes filtered heated air but also humidifies that air. The extent of humidification depends upon the temperature of the air, the volume and rate of travel thereof, and upon the exposed surface of water in the water pan, but these facts are well understood and are suitably correlated and adjusted for given conditions. Not only is the device of utility in connection with heating but can be employed to advantage during hot and/or dry weather for cooling and/or humidifying purposes. For example, if the device is operated in the summertime when the furnace is not in operation, the conditioned current of air which is caused to travel through the furnace ducts will produce a distinct cooling effect. This, of course, may be enhanced by the use of ice or other cooling medium in the water pan, should such be desired.

The foregoing is intended as illustrative and exemplary and not as restrictive or limitative, and within the scope and principles hereof I may make many modifications, substitutions, additions and omissions, all of which are deemed to be a part of this invention so long as they fall within the terms of the appended claims. I am not in any way restricted, for example, as to size of the unit or the specific materials used therein. Duct and blower sizes, motor speed (a constant speed motor is preferably employed), and size of water pan may all be subject to whatever variation may be required for the purpose of adapting the device to a wide variety of installation conditions. As hereinbefore indicated, such filters as are employed in connection with the present invention are installed on the cold air side of the furnace, thus not only facilitating installation, removal and maintenance but avoiding complication of the present unit or undesirable increase in the expense thereof. A unit made in accordance with this invention is not only unusually quiet and long lived but, barring purely electrical troubles such as may be encountered by overloading electrical circuits, the present device normally needs practically no maintenance or attention even over an extended period.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A blower structure adapted to be supported on the top of a furnace casing, the structure comprising a base portion forming the top wall of the furnace and having a medial opening for discharge of air from the furnace casing into the structure, a sound and heat insulating body supported on said base portion providing pad portions on opposite sides of said opening, a blower unit mounted on each pad portion out of metallic contact with the base portion and in communication with said opening, driving means for the blower units including a motor mounted on said insulating body, and means free of metallic contact with said blower units and in communication therewith for receiving discharged air therefrom.

2. A blower structure adapted to be supported on the top of a furnace casing, the structure comprising a base portion forming the top wall of the furnace and having an opening for discharge of air from the furnace casing into the structure, a sound and heat insulating body supported on said base portion, a blower unit in communication with said opening, a driving means for said blower unit including a motor, said blower unit and motor being mounted on said body out of metallic contact with said base portion, and means free of metallic contact with said blower unit and in communication therewith for receiving discharged air therefrom.

PAUL C. STRAUCH.