

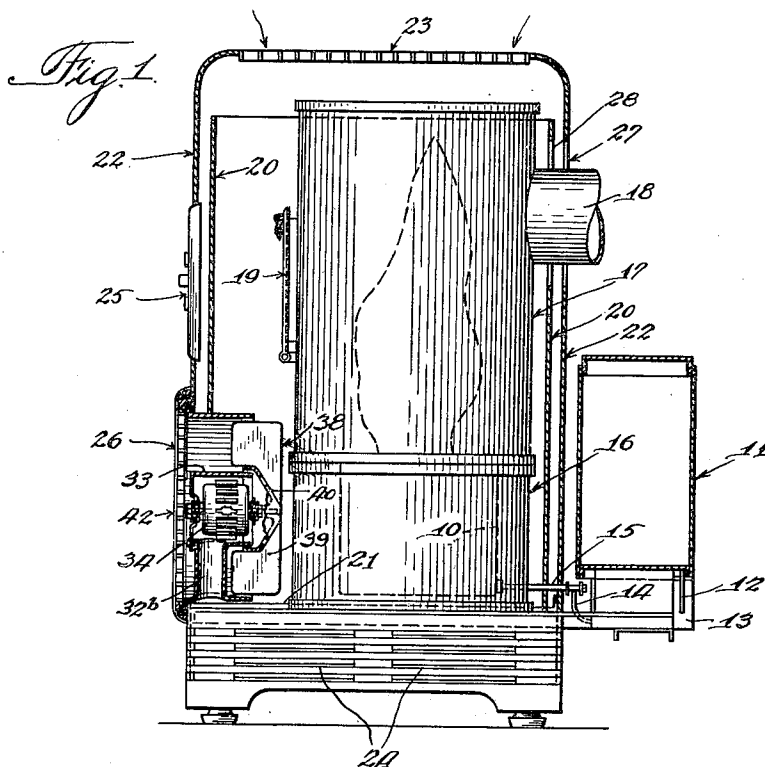
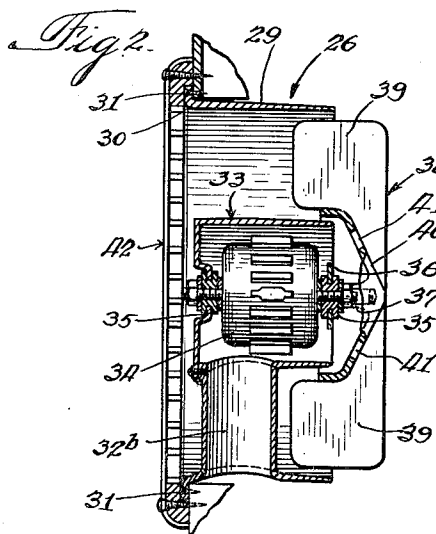
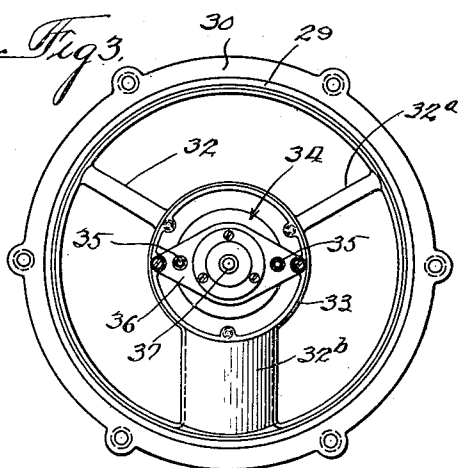
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AIR CONDITIONING AND CIRCULATING APPARATUS

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AIR CONDITIONING AND CIRCULATING APPARATUS

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3 Claims. (Cl. 230—117)

This invention relates to an air conditioning and circulating apparatus and has special reference to an apparatus for maintaining the air in a room or other enclosure at a substantially uniform temperature for the purpose of comfort and for circulating the air in the room or other enclosure for the purpose of ventilation.

More particularly, this invention relates to an air conditioning and circulating apparatus employing an air mover comprising a motor having a housing surrounding the motor in a spaced relation therefrom to provide an air passage therebetween, a propeller being mounted at one end of the motor and having means thereon for creating a suction draft in the passage between the housing and the motor in the direction of the propeller for cooling the motor with the air of the passage being drawn from a point outside of the path of motion of the propeller.

The present air conditioning and circulating apparatus is of the forced air circulating type which may be disposed directly in a room or other enclosure at any position therein consistent with the arrangement of the fixtures thereof. In order for the apparatus to function successfully in the room to be heated it is desirable that the casing therefor be relatively cool so that it will not be uncomfortable to the touch and the present apparatus conforms to this requirement. Such a condition is accomplished in the use of a suction fan which creates a suction draft in the air passage between the inner air conditioning casing and the outer cabinet, the air being exhausted over the motor through an opening in the cabinet.

The use of a suction fan and its disposition in the cabinet at the lower front end thereof brings the hottest air into contact with the hottest surfaces and the coolest air into contact with the coolest surfaces prior thereto. A substantial number of additional advantages are obtained in the use of a suction fan such as to efficiently move the air through the apparatus; to maintain a substantially uniform velocity of air movement in the path of the air stream, and therefore an efficient heat transfer; to maintain the operation of the fan under a minimum suction and to exhaust against a negligible pressure, and other like advantages such as is more particularly described in a copending application of James M. Funk, Serial No. 274,793, filed May 20, 1939, under the same title, and assigned to the assignee of the present application.

In exhausting the conditioned air by the fan over the motor into the room or other enclosure,

the air in most instances being heated, the temperature of the motor would be raised above the normal operating temperature thereof. Such a condition would normally reduce the efficiency of the motor. It is, of course, desirable to cool the motor rather than add to the temperature thereof by means of the hot air exhausting from the cabinet. However, it is desirable to employ a single suction fan for both the purpose of exhausting air from the cabinet into the room and for cooling the motor. The principal object of the present invention is, therefore, to employ the propeller or air mover that circulates the air through the conditioning apparatus into the room for cooling the motor by creating a suction draft in an opposite direction, the air being obtained from a point outside of the path of air exhausted from the cabinet.

One of the objects of this invention is to provide an air conditioning and circulating apparatus of the character indicated above which is simple in construction, comparatively inexpensive and simple to operate, and is durable.

Another object of this invention is to provide an air conditioning and circulating apparatus of the type hereinabove mentioned wherein the air mover thereof creates a suction draft in the direction opposite to the movement of the conditioned air from the cabinet to cool the motor thereof.

Other objects and advantages of this invention will hereinafter be more particularly pointed out and, for a more complete understanding of the characteristic features of this invention, reference may now be had to the following description when taken together with the accompanying drawing, in which latter:

Figure 1 is a side elevational view of the air conditioning and circulating apparatus incorporating the features of this invention, showing a portion of the outer casings of the apparatus in section;

Fig. 2 is an enlarged sectional view of the air moving unit; and

Fig. 3 is a front elevational view of the air moving unit with the grille removed therefrom.

Referring now more particularly to the drawing, the air conditioning and circulating apparatus incorporating the features of this invention is shown as comprising a firepot 10 into which liquid fuel is fed from a tank of fuel 11, the fuel being fed through a duct 12 into a flow controlled mechanism 13 and therethrough to the ducts 14 and 15 connected to the firepot. The firepot 10 is enclosed by a casing 16 having an extension 17

at its upper end to form a combustion chamber above the firepot. The upper end 17 of the casing is provided with a flue 18 which latter is connected to a stack in order to permit the burned gases from the firepot to escape. A door 19 is disposed in the upper end 17 of the casing for the firepot so that access may be had directly to the firepot therethrough.

A shield 20 preferably entirely surrounds the casing 16 and the combustion chamber 17 and is suitably spaced laterally therefrom, the shield being open at its upper end and being enclosed at its lower end by a pair of pivotally mounted dampers 21. The dampers 21 are preferably mounted centrally at the bottom of the apparatus to swing downwardly therefrom by mechanical or automatic means as desired to effect a change of circulation. In the operating condition of the apparatus at present described the lower ends of the shield 20 and the casing 16 are closed, the upper end of the shield 20 being open at all times in any condition of use of the apparatus. The casings 16 and 17 for the firepot forming the combustion chamber thereof together with the spaced shield 20 are suitably enclosed by a cabinet 22, the walls of the cabinet being spaced laterally from the shield. The upper end of the cabinet is provided with a grille 23 and the side and front walls of the cabinet at the lower end thereof are provided with louvres 24 below the dampers 21. The front of the cabinet is provided with a door 25 in registration with the door 19 for access to the latter. The air is circulated through the cabinet by action inducing a suction flow, the air moving unit 26 being preferably installed in an opening in the front of the cabinet at the lower end thereof. Openings 27 and 28 are provided in the cabinet 22 and the shield 20, respectively, about the flue 18. With the dampers 21 closed and the air mover 26 in operation, there also being a fire in the firepot 10, the air mover unit 26, together with the normal gravity flow of air, causes a rising of a column of air along the outer surface of the cabinet. A second column of air is caused to rise on the inside of the cabinet, the air column having intimate contact with the heat transfer walls of the cabinet and moving upwardly within the passage between the cabinet and the shield. Similarly a column of air will rise along the outer wall of the shield 20 in the passage between the cabinet and shield to have intimate contact with the heat transfer surfaces of the shield for conditioning the air. All of the air columns thus mentioned are influenced by gravity as well as by the action of the air mover.

The aforementioned columns of air augmented by air passing through the grille 23 form a downdraft column of air wholly influenced by the air mover 26 to have intimate contact on the inner side of the heat transfer surfaces of the shield 20 and the outer side of the casing 17. The downdraft columns of air by reason of their intimate contact with the heat transfer surfaces of the inner wall of the shield and the outer wall of the casing from the upper ends thereof to the lower ends thereof are thus conditioned for exhaust through the fan opening. Also a column of air is drawn through the openings 27 and 28 communicating with the passages formed between the casing shield and cabinet to have intimate contact with the heat transfer surfaces of the flue 18, the column of air thus drawn through the openings

27 and 28 merging with the air in the passages for subsequent exhaust by the air mover unit.

In the circulation of air through the air conditioning and circulating apparatus as above described, the air of lower temperature has contact first with the heat transfer surfaces of lower temperature and progressively the air comes in contact with heat transfer surfaces of higher temperatures to obtain an evenly accelerated expansion of air thus reducing turbulence and strains on the materials of the apparatus as well as other features desirable in such devices.

When the temperature of the heater rises to a predetermined limit the air mover 26 may be cut off and the dampers 21 may be automatically or manually actuated to open the lower ends of the shield 20 and casing 16 thus to admit air from the floor to rise therethrough. The columns of air will rise in the spaces between the shield and the casing and the cabinet and the shield and thus the forced air heater may be transformed into a radiation convection heater. Further, when there is no heat in the combustion chamber, the air mover may operate merely as a circulator of air, the air mover being energized and creating a suction draft to circulate air from the floor through the diffuser thereof to the room.

Referring now more particularly to Figs. 2 and 3 of the drawing, the air moving apparatus is shown enlarged for purposes of better illustration. A shroud 29 in the form of an annular ring having a peripheral flange 30 at one end thereof is disposed in an opening in the front of the cabinet 22 adjacent the bottom thereof. The ring is supported by and secured to the material of the cabinet surrounding the opening as by means of screws 31 extending through countersunk apertures in the flange and into the material of the cabinet. A plurality of struts 32, 32a and 32b are secured to the ring 30 and extend radially inwardly therefrom for connection to an open ended housing 33, the housing being spaced peripherally from a motor 34 supported thereby. One of the struts 32b is hollow to form a conduit communicating with the space between the motor and the housing from a point outside of the periphery of the ring 29, the ring having an opening in the periphery thereof registering with the opening of one end of the strut and the housing likewise having an opening communicating with the other end of the hollow strut.

The motor 34 is provided with suitable pairs of spaced bearings 35 at each end thereof, one pair of the bearings being received in a strap 36 extending across the open face of the housing 33 and the other pair of bearings 35 being seated in apertures in the closed end of the housing 33. Thus the motor 34 is mounted in the housing 33 which latter is, in turn, mounted through the struts to the ring 29.

A motor shaft 37 extends from the motor out of the open end of the housing 33 for supporting a propeller 38. The blades 39 of the propeller extend from a substantially conical-shaped hollow hub 40, the open end of the hub overlying at least a portion of one end of the motor 34 and being spaced therefrom to provide an air passage therebetween. The hub is provided with openings 41, preferably one for each blade, seated adjacent the blade on the conical surface of the hub for inducing a suction draft around the motor in the space between the motor and the

housing. The suction draft is created in a direction counter to the normal air flow produced by the blades in motion. The air stream on the conical surface of the hub creates a low pressure area having the effect of producing an air flow through the opening from within the hollow hub structure and such suction draft created within the hollow hub draws air from the air space between the housing 33 and the motor 34 to cool the motor. The normal flow of air through the propeller is in the direction of the grille 42 which latter is secured to the cabinet and covers the cabinet opening into which the ring 29 is inserted and secured and the air from the hollow hub structure merges with the normal flow of air to pass out therewith into the room or other enclosure. Thus the air induced by suction through the openings in the conical surface of the hub is drawn from a point adjacent the floor or the support for the cabinet through the hollow strut 32b into the space between the housing and the motor to cool the motor, the air merging with the air conditioned in the cabinet and passing into the room.

While but a single embodiment of this invention is herein shown and described, it is to be understood that various modifications thereof may be apparent to those skilled in the art without departing from the spirit and scope of this invention and, therefore, the same is only to be limited by the scope of the prior art and the appended claims.

I claim:

1. An air moving apparatus comprising in combination, a motor, a propeller having a hub and a plurality of blades extending therefrom, a housing surrounding said motor in a spaced relation therefrom to provide an air passage therebetween, said propeller being mounted at one end of said motor for rotation thereby, a shroud structure having an inner surface extending over at least a portion of the tips of said blades, a plurality of struts connected to said shroud and extending inwardly therefrom to support said housing, at least one of said struts forming a conduit for admitting air to the passage of said housing from a point below

the shroud structure, and means on said propeller for causing said blades to create a suction draft in said passage in a direction counter to the normal air flow produced by the blades in motion for cooling said motor.

2. An air moving apparatus comprising in combination, a motor, a propeller having a hub and a plurality of blades extending therefrom, an open-ended housing surrounding said motor in a spaced relation therefrom to provide an air passage therebetween, said propeller being mounted adjacent the open end of said housing and at one end of said motor for rotation thereby, an annular ring surrounding said propeller, a plurality of struts connected to said ring and extending radially inwardly therefrom to support said housing, one of said struts being hollow forming a conduit for admitting air to the passage of said housing from a point beyond said ring, and means on said propeller for causing said blades to create a suction draft in said passage in a direction counter to the normal air flow produced by the blades in motion for cooling said motor.

3. An air moving apparatus comprising in combination, a motor, a propeller having a hollow substantially conical-shaped hub and a plurality of blades extending therefrom, an open-ended housing surrounding said motor in a spaced relation therefrom to provide an air passage therebetween, said propeller being mounted adjacent the open end of said housing and at one end of said motor for rotation thereby, an annular ring surrounding said propeller, a plurality of struts connected to said ring and extending radially inwardly therefrom to support said housing, one of said struts being hollow to form a conduit for admitting air to the passage of said housing from a point beyond the periphery of said ring, a grille on one face side of said ring for diffusing air directed therethrough in one direction by said propeller, said hub having openings for causing said blades to create a suction draft in said passage in a direction counter to the normal air flow produced by the blades in motion for cooling said motor.

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