This invention relates to an air heating and ventilating means.

An object of this invention is to provide a combined heating and ventilating structure which may be mounted in the ceiling or wall of a building and which, during the use of the device for heating purposes, is adapted to force air from the attic or other air space into the building, the device being so constructed that when it is used for cooling or ventilating purposes the air from the building or room is drawn from the building or room and into the attic or other air space.

Another object of this invention is to provide a device of this kind embodying a reversible electric fan motor and a heater which are adapted to be mounted in or above the ceiling, and also embodying a concentrating shield for causing the air to pass only through the heater, the shield being readily removable so that a large volume of air may be drawn from the room upon reversal of the fan motor, and the heater being de-energized when the fan motor is reversed in its operation.

A further object of this invention is to provide a structure of this kind which will not take up any space in a room and which is designed for heating buildings having no other heating system, the structure being used in localities where the atmospheric temperature is normally such as not to require a heating system. This device may also be used to supplement existing heating or ventilating systems.

A further object of this invention is to provide a structure of this kind which may be used as a circulating means for heated air by forcing the heated air downwardly and drawing the unheated air from an upper air space such as an attic or other air space and providing screened inlets which communicate the attic or upper space with the air below the attic or upper air space so as to thereby re-circulate the air.

To the foregoing objects and others which may hereinafter appear, the invention consists of the novel construction, combination and arrangement of parts as will be more specifically referred to and illustrated in the accompanying drawings, but it is to be understood that changes, variations and modifications may be resorted to which fall within the scope of the invention as claimed.

In the drawings:

Figure 1 is a detail top plan partly broken away of a combined heating and ventilating structure constructed according to an embodiment of this invention.

Figure 2 is a sectional view taken on the line 2—2 of Figure 1 and showing diagrammatically the electric circuit associated with this invention.

Figure 3 is a detail bottom plan of the device, Figure 4 is a fragmentary sectional view taken on the line 4—4 of Figure 1, and Figure 5 is a fragmentary sectional view taken on the line 5—5 of Figure 1.

Referring to the drawings the numeral 10 designates a square box-like duct or housing open at its upper and lower ends and which is adapted to be mounted in an opening formed in the ceiling 11. The duct 10 is preferably in the upper portion of the building, and the space above the ceiling 11 may be either an attic space or an air space between the ceiling and the roof of the building.

In order to provide a means whereby the space below the ceiling 11 may be either heated by air being forced downwardly into this space, or whereby the hot air in the space below the ceiling may be drawn upwardly into the air space above the ceiling 11, I have provided a fan structure generally designated as 12. The fan structure 12 includes a reversible fan motor 13 provided with a shaft 14 on which a fan blade structure 15 is secured. The fan blade 15 is of such a configuration that when the motor 13 is operating to rotate the shaft 14 in one direction, air will be forced downwardly, and when the motor 13 is operating to reverse the rotation of the shaft 14, the fan blade structure 15 will draw the air upwardly from the space below the ceiling 11.

The motor 13 is supported from the duct or housing 10 by means of a supporting structure generally designated as 16. The supporting structure 16 includes a substantially square frame 17 which is formed at the corners thereof with lugs 18 through which fastening devices 19 are adapted to engage for securing the frame 17 on the upper edges of the housing 10. The frame 17 includes a flat horizontally disposed plate 20 which is provided adjacent the marginal edge portions thereof with an upstanding flange or rib 21 and the plate 20 is formed with a circular opening 22, the marginal edges of which are reinforced by an upstanding rib or flange 23.

A spider shaped motor supporting bracket structure generally designated as 24 is secured to or formed integral with the frame structure 17, and includes a plurality of radially arranged inverted U-shaped supporting bracket members 25.
which have their outer legs 26 secured to or formed integral with the frame 11 and extending upwardly from the circular flange 23. The lower ends of the legs 26 may be extended horizontally outwardly as at 27 to form a reinforcing rib when grooves are made in its outer end at the upstanding flange structure 21.

The inner legs 28 of the inverted U-shaped brackets or supporting members 25 are relatively shorter in length than the outer legs 26, and have secured thereto or cast integral therewith an integral plate 29. The plate 29 is disposed in a horizontal position and has the lower face thereof substantially coplanar with the upper edge of the circular rib 23 as shown in Figure 2. The plate 28 is formed with a central opening 30 through which the bearing 31 carried by the motor 12 for the shaft 14 projects. The motor 12 is secured to the upper side of the plate 28 by means of fastening devices 32 in the form of bolts or the like, and preferably a cushioning washer 33 is interposed between the upper side of the plate 28 and the adjacent end or lower side of the motor 12.

The motor 12 is a reversible electric motor and has a pair of conductors 34 and 35 connected therewith which are extended through a flexible casing or sheath 36. The motor 12 also has connected therewith a second pair of conductors 37 and 38 whereby the motor 12 may be reversed in its rotation when electric current is connected with the latter conductors. The conductors 34 and 35 are connected to terminals 39 and 40 respectively of a reversing switch structure 41. The switch structure 41 is a conventional reversing switch being shown diagrammatically, and the conductors 37 and 38 are connected to a second pair of terminals 42 and 43 respectively. A double bladed movable circuit closing member 44 is disposed between the pairs of terminals, and is connected by means of conductors 45 and 46 to a source of electric current supply.

A screen or perforate shield 47 is disposed below the fan blades 18 and is interposed between a square molding structure 48 which is secured by fastening devices 49 to the underside of the housing 10. An electric heater 51 is positioned on the upper side of the screen or perforate member 48 and is secured thereto in means of a plurality of bolts 52. A washer 53 is interposed between the upper end or head of the bolt 52 and the upper side of the heating coil or member 5, and a second washer 54 is interposed between the nut 55 and the lower side of the screen or perforate member 48.

The coil or heating member 51 has connected therewith a pair of conductors 56 and 57 which are connected with the conductors 34 and 35. In this manner, when the switch blade structure 41 is moved to a position connecting the terminals 39 and 40 with the source of electric current for rotating the motor 12 in a direction to force the air downwardly, the electric circuit including the conductors 56 and 57 will also be closed to the heating coil or member 51.

A lower shield structure generally designated as 58 is disposed below the screen 47 and is secured to the lower side of the molding 46 by means of wing nuts 58 mounted on bolts 59. The shield 58 is a removable shield and comprises a plate 59 which is formed with a downwardly offset outer marginal flange portion 60 connected to the plate 59 by means of a downwardly extending flange 61. The shield 58 also includes a centrally disposed body 62. The outer marginal portions of the central body 62 are connected with the plate 98 by means of webbed sections 65. The central body 62 is formed with a plurality of circumferentially spaced apart openings 64 which are of sector shape, and which are positioned beneath the heating coil or member 51. The openings 64 in the central body 62 form webs or supporting arms 65 which are disposed between the sector shape openings 64. The plate or body 62 may also be formed with an inner reinforcing rib 66 and an outer reinforcing rib 67 positioned therewith. The ribs 66 and 67 define the inner and outer marginal portions of the sector shape openings 64.

In the use and operation of this combined heating and ventilating structure, the frame structure 17 is adapted to be secured to the upper edges of the housing 10 which is in communication with either the attic or an air space above the ceiling 11. It will be understood that the attic or air space above the ceiling 11 may be in communication with the outside atmosphere through suitable openings or windows. The motor 12 is connected by means of the conductors 44, 45, 37, 38 and 42 to the reversing switch 41 and the conductors 56 and 57 are connected with the conductors 34 and 35.

When it is desired to heat the space below the ceiling 11, the switch blades 44 are moved to the left as viewed in Figure 2 so as to close the electric circuit to the conductors 34 and 35 and also close the electric circuit to the conductors 45 and 46 in order to energize the heating member 51. When the fan blades 18 are rotating to force the air downwardly, the downwardly moving air must pass through the convolutions of the heating coil or member 51, and the heated air will then pass downwardly through the screen 41 directly below the heating coil 51 and through the sector shaped openings 64.

In the event it is desired to reverse the operation of the motor 12 and draw air out of the air space below the ceiling 11, the shield 58 may be removed so as to expose the entire surface of the screen 47. The switch blades 44 may then be moved to close the electric circuit to the conductors 37 and 38. This will effect a reversed rotation of the motor 12 so that the fan blades 18 will pull the air upwardly into the air space above the ceiling 11. When the fan blades 18 are drawing air upwardly through the screen 47 and past the heating member 51, it is desirable that one or more windows in the room below the ceiling 11 be opened to the desired degree in order to permit air from the outside to enter the air space below the ceiling 11. When the motor 12 is rotating in a direction to draw the air upwardly from the air space below the ceiling 11, the heating coil 51 will be de-energized, in view of the fact that the conductors 56 and 57 are only connected to that side of the motor 12 which effects rotation of the fan blades 18 in a direction to force the air downwardly.

This heating and ventilating structure has been designed particularly for use in homes where it is not necessary to provide a conventional heating system due to the very short period of cold weather, and although it is used, this heating and ventilating structure may be means of a complete heating device or supplement to a regular heating system. This combined heating and ventilating structure has been placed in actual operation and has been found to be sufficient to provide the desired temperature of air in the building, and this device may be operated at a relatively low cost so that it may
be readily installed in small dwellings which are not provided with any heating systems.

What is claimed is:

1. A combined heating and cooling device comprising a housing open at each end for mounting in an opening in a ceiling, a substantially square frame having a central circular opening disposed on the upper end of said housing, radially arranged inverted U-shaped supporting means carried by said frame, a centrally apertured plate fixed to the inner legs of said supporting means, a fan motor seated on said plate and having the shaft thereof extending through said opening, fan blades fixed to said shaft below said plate, a screen fixed to the lower end of said housing, an electric heater carried by said screen, an electric circuit connected with said motor for operating said motor to rotate said blades in one direction, a heater circuit connected with said first circuit for energizing said heater when said motor is operating in said one direction, a reversing circuit connected to said motor for operating motor to rotate said blades in a reverse direction, a reversing switch interposed in said first and latter circuits, and a shield disposed beneath said screen, said shield having a plurality of circumferentially spaced apart sector-shaped openings having a width substantially equal to the width of said heater between the inner and outer diameters thereof.

2. A combined heating and cooling device comprising a housing open at each end for mounting in an opening in a ceiling, a substantially square frame having a central circular opening disposed on the upper end of said housing, radially arranged inverted U-shaped supporting means carried by said frame, a centrally apertured plate fixed to the inner legs of said supporting means, a fan motor seated on said plate and having the shaft thereof extending through said opening, fan blades fixed to said shaft below said plate, a screen fixed to the lower end of said housing, an annular electric heater carried by said screen, an electric circuit connected with said motor for operating said motor to rotate said blades in one direction, a heater circuit connected with said first circuit for energizing said heater when said motor is operating in said one direction, a reversing circuit connected to said motor for operating motor to rotate said blades in a reverse direction, a reversing switch interposed in said first and latter circuits, and a shield disposed beneath said screen, said shield having a plurality of circumferentially spaced apart sector-shaped openings having a width substantially equal to the width of said heater between the inner and outer diameters thereof.

3. In combination, a combined heater and cooler comprising a housing, a reversible electric fan in said housing, an electric circuit for operating said fan in one direction, a heater carried by said housing for heating air forced in one direction by said fan, a heater circuit connected to said first circuit, a reversing circuit connected to said fan, and a reversing switch interposed in said first and latter circuits, said heater circuit being de-energized when said fan is operating in a reverse direction.

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