Aug. 4, 1931. A. G. SUTCLIFFE 1,816,920

SELF COOLED ELECTRIC MOTOR

Filed April 22, 1929

Fig. 1.

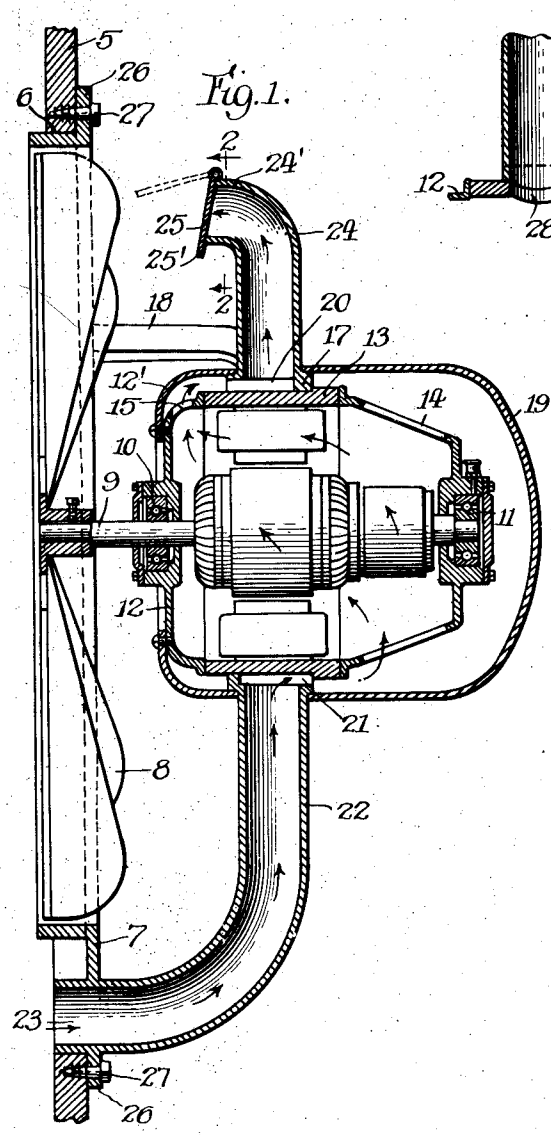


Fig. 5.

Fig. 2.

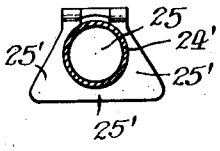


Fig. 3.

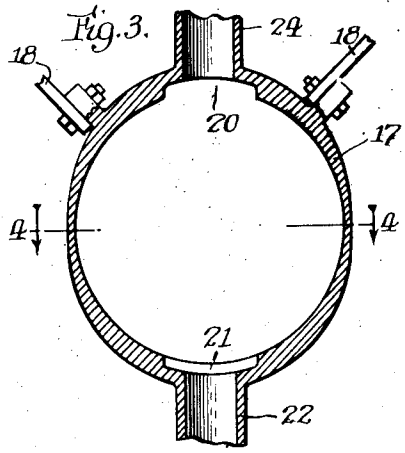
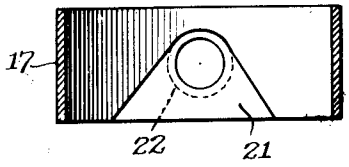


Fig. 4.



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UNITED STATES PATENT OFFICE

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SELF COOLED ELECTRIC MOTOR

Application filed April 22, 1929. Serial No. 357,017.

This invention relates to the art of self-cooled electric motors, and in its chief intended application relates more specifically to electric motors used to operate ventilating fans of the propeller type.

In Letters Patent No. 1,441,460, granted January 9, 1923 to my assignee I have disclosed a self-cooled electric motor operating a propeller-type fan wherein the motor is enclosed in a casing the bottom of which communicates with a cold air inflow pipe and the front wall of which, lying behind the central portion of the fan, is provided with an opening located slightly above the axis of the fan and motor through which the heated air in the motor casing is withdrawn by the suction of the fan. By reason of the location of this opening near the axis of the fan, the suction effect is rather limited.

In a later Patent No. 1,487,766, granted March 25, 1924 to my assignee I have disclosed a self-cooled electric motor operating a propeller-type fan wherein the cooling effect is produced by a thermo-syphon flow of air through a cold air inflow pipe communicating with the bottom of a casing completely inclosing the motor and a warm air outflow pipe leading from the top of the casing to a point outside the room in which the fan and motor are located. In this device, since the flow of the cooling air is wholly on the thermo-syphon principle, the cooling effect on the motor is also rather limited.

The main object of my present invention is to provide an improved construction wherein the flow of cooling air through the parts of the motor will be more rapid and effective than in the construction of either of my former patents aforesaid, and wherein also the motor may be fully protected against the deleterious effects of moisture or chemical fumes flowing into the motor casing.

Other objects and attendant advantages of the invention will be apparent to persons skilled in the art as the same becomes better understood by reference to the following detailed description, taken in connection with the accompanying drawings wherein I have illustrated one simple and practical embodiment of the invention, and in which—

Fig. 1 is a central vertical section through a ventilating fan equipped with my present improvement and mounted on a wall;

Fig. 2 is a detail sectional view on the line 2—2 of Fig. 1;

Fig. 3 is a sectional detail of the ported motor supporting ring;

Fig. 4 is a section on the line 4—4 of Fig. 3;

Fig. 5 is a fragmentary sectional view illustrating a slight modification.

Referring to the drawings, 5 designates a wall which may be assumed to be an external wall of a kitchen or a laboratory, having an opening 6 in which is set a fan-supporting panel 7. As herein shown, the space to the right of the wall 5 may be assumed to represent the interior of the room or chamber to be ventilated, and the space to the left of said wall may be assumed to represent the outer atmosphere or another room or chamber into which the fan discharges. The panel 7 may be ring-shaped to fit a round wall opening, or rectangular to fit a transom opening, or any other shape conforming to the shape of the opening it is designed to occupy.

8 designates a ventilating fan of the propeller type which is mounted on a fan shaft 9 disposed coaxially with the fan opening of the panel 7 and journaled in anti-friction bearings 10 and 11, the bearing 10 being carried by a front hood member 12 covering the front end of the field frame 13 of an electric motor, and the bearing 11 being carried by a rear frame piece extension 14 secured to the field frame. The motor is supported from the panel 7 by a saddle ring 17 embracing the field frame 13 and connected to the panel 7 by radial arms 18 and a tubular arm 22 hereinafter described. Completely covering the outer end of the motor, or that which is remote from the fan 8, is a hood member 19, the open inner end of which may be secured to the motor-supporting ring 17, which latter may similarly support the inner end of an extension 12′ of the front hood member 12. It will thus be seen that the front hood section 12, 12′, the supporting ring 17, and the rear hood section 19 together constitute a hood or casing

completely enclosing the motor. In the upper and lower sides of the inner periphery of the supporting ring 17, there are formed shallow ports or passageways 20 and 21, each closed on one edge of the ring but leading through the opposite edge and communicating with the interior of the hood, as clearly shown in Fig. 1. In the drawings, I have shown the passageway 20 communicating with the rear portion of the hood to insure a flow of air through the field of the motor, but this may be reversed, or both passageways may communicate with either the rear or the front portion of the hood.

From the lower side of the ring 17, there extends a downwardly and forwardly curved pipe 22, the upper end of which registers with the port 21 and the lower end of which registers with an opening 23 in the lower side of the panel 7 and communicates with the space outside the wall 5. From the upper side of the ring 17 there extends an upwardly and forwardly curved pipe 24, the lower end of which registers with the port 20, and the upper end portion 24′ of which extends horizontally toward the deepest or peripheral portion of the fan 8 and is located in the path of the strongest portion of the air current created by the fan, whereby the suction of the fan induces a flow of cold air upwardly through the pipe 22, the motor-supporting ring and casing, and the pipe 24, as indicated by the arrows; this air current penetrating and bathing the parts of the motor and preventing overheating of the latter.

The open upper end of the pipe 24 is preferably guarded by a flap valve 25 that normally closes by gravity and prevents deleterious gases or fumes in the room in which the motor is located from backing down into the motor casing through the end of the pipe. When the fan starts up, this flap valve opens under the suction of the fan, as indicated by dotted lines; and to facilitate this opening movement, the flap is preferably formed with marginal extensions 25′ laterally overhanging the end 24′ of the pipe 24 and lying in the path of the air current, so that the flap is more easily caught and opened by the latter.

I have herein shown the fan-supporting panel 7, the motor-supporting ring 17, the arms 18, and the pipes 22 and 24 formed as an integral casting; but, manifestly, the parts may be formed as separate elements suitably united if desired. To secure the panel in the wall opening, it may be made with integral lugs 26 apertured to receive fastening screws 27. The pipe 22 also serves the function of a motor-supporting arm.

In Fig. 5, I illustrate a slight modification, wherein the laterally opening ports 20 and 21 in the ring 17 are dispensed with, and the inner ends of the pipes 22 and 24 register with holes 28 in the field frame 28 of the motor between adjacent pole pieces of the latter. This slightly simplifies the construction and also dispenses with the outer front hood section 12′.

It is evident that the more rapid the flow of cooling air through the field and casing of the motor, the more perfect will be the cooling effect on the motor; and I have found that by locating the suction opening through which the flow is induced at a point directly behind the outer or peripheral portion of the fan, a more rapid and efficient flow of air than is possible with either of the devices of my former patents above identified is secured. It is to be understood that the description of the discharge opening as located "behind the peripheral portion of the fan" as used herein, means an opening located opposite the deepest portion of the fan where, as above explained, the pull of the fan is at its maximum.

I claim—

1. The combination with a wall formed with an opening, of an electric motor mounted on one side of said wall, a casing enclosing said motor, a propeller-type fan driven by said motor opposite said opening, an air inflow pipe connecting the space on the other side of said wall with the lower portion of the interior of said casing, an air outflow pipe communicating with the upper portion of the interior of said casing and having a discharge opening located behind the peripheral portion of said fan, and a self-closing valve guarding said discharge opening adapted to be opened by the air current created by said fan.

2. The combination with a wall formed with an opening, of an electric motor mounted on one side of said wall, a casing enclosing said motor, a propeller-type fan driven by said motor opposite said opening, an air inflow pipe connecting the space on the other side of said wall with the interior of said casing, an air outflow pipe communicating with the interior of said casing and terminating at its upper end at a point behind the peripheral portion of said fan, and a self-closing flap guarding the upper end of said outflow pipe, said flap having marginal extensions lying in the path of the air current created by said fan.

3. The combination of a fan, an electric motor, a motor-supporting frame having an air-inflow pipe to the motor, an air-outflow pipe from the motor having a discharge opening located behind the peripheral portion of the fan, and a self-closing valve guarding said discharge opening adapted to be opened by the suction of the fan.

ARTHUR G. SUTCLIFFE.