AN ELECTRICAL FAN WITH THERMOELECTRIC MODULE

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ABSTRACT

An electrical fan includes a fan unit comprising a base from which a stand extends to support a motor-driven blade assembly, whereby an air current is induced to move from a back side of the blade assembly toward a front side by the rotation of the blade assembly. A thermally conductive plate is arranged on the back side of the blade assembly and defines a plurality of air passages through which the air current passes. A thermoelectric module is mounted to the thermal conductive plate used to control the temperature of the thermally conductive plate, which in turn controls the temperature of the air current passing through the air passages of the thermally conductive plate.
ELECTRICAL FAN WITH THERMEOLECTRIC MODULE

FIELD OF THE INVENTION

[0001] The present invention relates generally to an electrical fan, and in particular to an electrical fan to which a thermoelectric module, also known as a Peltier device, is mounted to enhance cooling effect induced by the air current generated by the fan.

BACKGROUND OF THE INVENTION

[0002] Temperature control for people living in tropic areas or in summer is very important to maintain proper human activities. Air conditioner based on compressed coolant is one of the most common cooling devices used in the developed countries. However, the air conditioner is a very power-consuming electrical appliance.

[0003] Electrical fans are an alternative for cooling, which, during operation, generates an air current flowing through an object to carry away heat from the object by heat convection and radiation. Although the electrical fans are effective in providing cooling for certain applications, they may fail in removing heat in situations where environmental temperature is very high and heat convection and radiation do not work to exchange heat between a target object and the air current caused by the electrical fan.

[0004] A solution to such a problem is to add water mist to the air current generated by the electrical fans. The water droplets entraining the air current help removing heat from the target object due to evaporation. However, a serious drawback associated with such a water mist based electrical fan is electrical shock to a user of the fan, if electrical circuiting of the fan is not properly shielded from the mist. In addition, to maintain proper operation, water must be constantly supplemented to the electrical fan, which, to some extents, is troublesome. Further, the mist may increase environmental humidity. This is negative to durability of articles and living quality of human beings in the high humidity environment.

[0005] Thus, the present invention is aimed to provide an electrical fan that has enhanced cooling effect without the disadvantages of the conventional mist based electrical fans.

SUMMARY OF THE INVENTION

[0006] An object of the present invention is to provide an electrical fan having temperature control effect.

[0007] Another object of the present invention is to provide an electrical fan that is combined with a thermoelectric module to control temperature of the air current from back side to the front side of the fan when the air.

[0008] To achieve the above objects, in accordance with the present invention, there is provided an electrical fan comprising a fan unit comprising a base from which a stand extends to support a motor-driven blade assembly, whereby an air current is induced to flow from a back side of the blade assembly to a front side by the rotation of the blade assembly. A thermally conductive plate is arranged on the back side of the blade assembly and defines a plurality of air passages through which the air current passes. A thermoelectric module is mounted to the thermally conductive plate to decrease or increase the surface temperature of the thermally conductive plate, which in turn controls the air current passing through the air passages of the thermally conductive plate.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The present invention will be apparent to those skilled in the art by reading the following description of preferred embodiments thereof, with reference to the attached drawings, in which:

[0010] FIG. 1 is a front-side perspective view of an electrical fan constructed in accordance with a first embodiment of the present invention;

[0011] FIG. 2 is a rear-side perspective view of the electrical fan of the present invention;

[0012] FIG. 3 is a side elevational view of a portion of the electrical fan of the present invention;

[0013] FIG. 4 is a side elevational view illustrating the operation of the electrical fan in accordance with the present invention;

[0014] FIG. 5 is a rear-side perspective view of a portion of an electrical fan constructed in accordance with a second embodiment of the present invention;

[0015] FIG. 6 is a rear-side perspective view of a portion of an electrical fan constructed in accordance with a third embodiment of the present invention; and

[0016] FIG. 7 is a side elevational view of a portion of an electrical fan constructed in accordance with a fourth embodiment of the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0017] With reference to the drawings and in particular to FIGS. 1-3, an electrical fan constructed in accordance with the present invention, generally designated with reference numeral 1, comprises a fan unit that is comprised of a base 14 from which an upright stand 13 extends. A blade assembly 11 is mounted on an upper end of the stand 13, comprising a hub from which a plurality of blades radially extend and driven by a motor-based driving device 17.

[0018] A grating 12 covers the blade assembly 11 to prevent undesired access to the blade assembly 11 for safety and protection purposes. Air current is caused by the rotation of the blade assembly 11 to pass through the blade assembly 11 and the grating 12.

[0019] In an axial flow type fan as illustrated in the drawings, air current moves from the back side of the blade assembly 11, through the blade assembly 11, toward the front side of the blade assembly 11. However, the present invention is also applicable to a radial flow type fan. To this point, the structure of the fan 1 of the present invention is substantially identical to a conventional electrical fan.

[0020] In accordance with an embodiment of the present invention, a temperature control unit comprises a thermally conductive plate 15 arranged on the back side of the blade assembly 11. The thermally conductive plate 15 defines a plurality of through holes 18, functioning as air passages, preferably in a uniform distribution manner. Alternatively,
the thermally conductive plate 15 may be arranged on the front side of the blade assembly 11.

[0021] The thermally conductive plate 15 is preferably of a shape corresponding to a front projection area of the blade assembly 11 when the fan 1 is in operation, whereby back side air current I (see FIG. 4) that is drawn into the fan 1 by the rotation of the blade assembly 1 can completely flow through the through holes 18 of the thermally conductive plate 15, and the blade assembly 11 forces the air that passes through the through holes 18 forward as front side air current II.

[0022] A thermoelectric module 16 is mounted to the thermally conductive plate 15. It is known that the thermoelectric module 16 has a cold end 161 and a hot end 162. In this embodiment illustrated, the cold end 161 of the thermoelectric module 16 is mounted to the thermally conductive plate 15 so as to remove heat from the thermally conductive plate 15 thereby reducing temperature of the thermally conductive plate 15. The back side air current I flowing through the through holes 18 of the thermally conductive plate 15 is subject to cooling by the reduced temperature of the thermally conductive plate 15. Thus, when the blade assembly 11 generates the front side air current II, the front side air current II is of a temperature lower than that of the back side air current I. The cooling effect realized by the fan 1 on the front side air current II is thus enhanced as compared to the conventional fan.

[0023] Alternatively, the hot end 162 may be mounted to the thermally conductive plate 15 so as to increase the temperature of the thermally conductive plate 15.

[0024] To further enhance the cooling effect or heating effect of the electrical fan 1, more than one thermoelectric modules 16 can be used, as illustrated in a second embodiment of the present invention shown in FIG. 5. In the second embodiment of the present invention, three thermoelectric modules 16 are mounted to the thermally conductive plate 15, preferably in an equally-spaced manner around the driving device 17.

[0025] Another alternative is illustrated in a third embodiment of the present invention shown in FIG. 6, wherein the thermoelectric module 16a is made annular-shaped, mounted to the thermally conductive plate 15 and surrounding the driving device 17.

[0026] Referring to FIG. 7, a heat guiding tube 20 may be further mounted to and in thermally-conductive engagement with the thermoelectric module 16. An air flow III passes through the heat guiding tube 20 to help removing heat generated by the thermoelectric module 16.

[0027] The air flow III can be enhanced by any known means. For example, a small fan can be incorporated in the tube 20 to induce the air flow through the tube 20.

[0028] Although the present invention is applied in enhancing cooling effect of an electrical fan, due to the characteristics of a thermoelectric module operated with a Peltier effect, the present invention can also be employed to generate air current heated by the thermoelectric module, whereby the fan functions as a heater.

[0029] Although the present invention has been described with reference to the preferred embodiments thereof, it is apparent to those skilled in the art that a variety of modifications and changes may be made without departing from the scope of the present invention which is intended to be defined by the appended claims.

What is claimed is:

1. An electrical fan comprising:
   a fan unit comprising a blade assembly that is operable to induce an air current that moves from a back side of the blade assembly to a front side of the blade assembly;
   a thermally conductive member mounted to the fan unit; and
   a temperature control unit mounted to the thermally conductive member to control temperature of the thermally conductive member, which in turn controls temperature of the air current from back side of the blade assembly to the front side of the blade assembly when the air current flows through the thermally conductive member.

2. The electrical fan as claimed in claim 1, wherein the fan unit comprises a base from which a stand extends to support the blade assembly.

3. The electrical fan as claimed in claim 2, wherein the fan unit comprises a motor based driving device to drive rotation of the blade assembly.

4. The electrical fan as claimed in claim 1, wherein the fan unit comprises a grating covering the blade assembly.

5. The electrical fan as claimed in claim 1, wherein the temperature control unit comprises at least one thermoelectric module having a hot end and a cold end.

6. The electrical fan as claimed in claim 5, wherein the hot end of the thermoelectric module is mounted onto the thermally conductive member.

7. The electrical fan as claimed in claim 5, wherein the cold end of the thermoelectric module is mounted onto the thermally conductive member.

8. The electrical fan as claimed in claim 1, wherein the temperature control unit comprises a plurality of thermoelectric modules arranged on the thermally conductive member in an equally spaced manner.

9. The electrical fan as claimed in claim 1, wherein the fan unit comprises a driving unit arranged on the back side of the blade assembly to drive rotation of the blade assembly and wherein the temperature control unit comprises a plurality of thermoelectric modules arranged around the driving device.

10. The electrical fan as claimed in claim 9, wherein the thermoelectric modules are arranged in an equally spaced manner around the driving device.

11. The electrical fan as claimed in claim 1, wherein the fan unit comprises a driving unit arranged on the back side of the blade assembly to drive rotation of the blade assembly and wherein the temperature control unit comprises a thermoelectric module of annular configuration surrounding the driving device.

12. The electrical fan as claimed in claim 1, wherein the temperature control unit further comprises a heat guiding tube to remove heat from the thermoelectric module.

13. The electrical fan as claimed in claim 1, wherein the thermally conductive member comprises a thermally conductive plate defining a plurality of air passages through which the air current passes.

14. The electrical fan as claimed in claim 1, wherein the thermally conductive member is mounted on the back side of the blade assembly.