A cooling fan with anti-friction shaft and bearing set, which is able to decrease the friction between a metal shaft and a corresponding bearing, and thereby is capable of both reducing the noise and extending the lifetime of a cooling fan. The metal shaft of the cooling fan is coated with a layer of ceramic material. The corresponding bearing is also made of ceramic material. The cooling fan has a compression portion to orient the ceramic coating of the metal shaft to correspond to the bearing. The metal shaft contacts the inner surface of the bearing with its ceramic coating. The cooling fan of the present invention is thereby able to perform a high speed operation without generating noise.
FIG. 6
PRIOR ART
COOLING FAN WITH ANTI-FRITION SHAFT AND BEARING SET

BACKGROUND OF THE INVENTION

[0001] The present invention relates in general to a cooling fan with a high rigidity, which decreases the friction between a shaft and a bearing, and thereby is able to reduce the noise as well as to extend the lifetime of a cooling fan.

[0002] As shown in FIG. 4, a conventional cooling fan 5 has a shaft 52 installed at the center of a rotor 51. A corresponding bearing 54 is installed in the middle of a casing 53 to support the shaft 52 of the rotor 51. The bearing 54 is an oiled bearing. Both the shaft 52 and the bearing 54 are made of metal material so that they possess high rigidity. Their high rigidity nature facilitates a high speed operation of the cooling fan 5.

[0003] The metal characters provide the shaft 52 and the bearing 54 of the conventional cooling fan 5 the high rigidity they need. But, it also brings them some problems. Owing to their metal characters, the rotation of the shaft 52 relative to the bearing 54 will incur static electricity when the lubrication of the bearing 54 is not sufficient. Further, because the lubrication is not enough the shaft 52 and the bearing 54 will be worn out soon. This damage will generate noise and reduce the lifetime of a cooling fan.

DETAILED DESCRIPTION OF THE INVENTION

[0012] FIG. 5 is a partial enlarged view of FIG. 4.

[0013] FIG. 6 is an exploded view of a conventional cooling fan.

[0014] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers are used in the drawings and the description to refer to the same or like parts.

[0015] Referring to FIG. 1 through FIG. 3, a cooling fan structure in accordance with the present invention is shown. The cooling fan with a high rigidity and anti-friction shaft and bearing set of the present invention comprises a casing 1, a bearing 2, a rotor 3, and a stator 4.

[0016] The casing 1 has a receptive portion 11. From the receptive portion 11 a collar 12 is extended, perpendicular to the receptive portion 11, to support the bearing 2. The bearing 2, which is installed inside the collar 12, is a cylinder in shape and is made from ceramic material for reducing friction.

[0017] The rotor 3 has a wheel 31. The wheel 31 has a plurality of blades 32 formed around and extended from its outer circumference. The wheel 31 further has a permanent magnet 33 installed around its inner circumference and a shaft 34 disposed at its center. A compression portion 36, including a compression spring 362 and a retainer 361, is disposed beneath the bearing 2 in order to orient the shaft 34.

[0018] The shaft 34 is made from metal material, and further coated with a layer of ceramic material, as shown in FIG. 2 and FIG. 3. The layer of ceramic material, defined as a ceramic coating 35, is able to decrease the friction. When the shaft 34 is installed into the bearing 2, the shaft 34 contacts the inner surface of the bearing 2 with its ceramic coating 35. The shaft 34 of the rotor 3 has an annular groove 341 formed at its one end and a neck 342 formed at the other end. The annular groove 341 of the shaft 34 is able to securely connect the shaft 34 to the wheel 31. The neck 342 of the shaft 34 is locked by the retainer 361 of the compression portion 36 in order to secure the rotor 3 on the casing 1. The compression spring 362, with its one end pressing against the bearing 2 and its other end pressing against the retainer 361, orient the shaft 34 to a designated location at which the ceramic coating 35 of the shaft 34 corresponds to the inner surface of the bearing 2. This disposition effectively reduces the friction between the shaft 34 and the bearing 2 while the high rigidity character of the shaft 34 is retained.

[0019] The stator 4 is sleeved onto the collar 12 and oriented above the receptive portion 11 of the casing 1. The stator 4 includes an electrical board 41, an electrical wire 42, and a coil 43 corresponding to the permanent magnet 33. The stator 4 is able to drive the rotor 3 to rotate. Referring to FIG. 4 and FIG. 5, two cross-sectional views of the present invention are shown. The coil 43 of the stator 4 is able to generate a rotating magnetic field that interacts with the permanent magnet 33 of the rotor 3 and thereby drives the rotor 3 to rotate. The rotor 3 rotates around the shaft 34 which contacts with the bearing 2 with the ceramic coating.
35. The present invention thereby decreases the friction between the shaft 34 and the bearing 2. The cooling fan of the present invention is able to perform a high speed operation, to reduce the noise, and to extend the lifetime of a cooling fan.

[0020] While an illustrative and presently preferred embodiment of the invention has been described in detail herein, it is to be understood that the inventive concepts may be otherwise variously embodied and employed and that the appended claims are intended to be construed to include such variations except insofar as limited by the prior art.

What is claimed is:
1. A cooling fan, comprising:
   a casing with a collar and a receptive portion in the middle thereof;
   a bearing which is made of ceramic material installed inside the collar;
   a stator which is sleeved over the collar and rested above the receptive portion; and
   a rotor which is received by the casing with a shaft which is coated with a ceramic layer supported by the bearing for decreasing the friction between the shaft and the bearing.
2. The cooling fan of claim 1, wherein the shaft is made of metal.
3. The cooling fan of claim 1, wherein the bearing is made into a cylinder.
4. The cooling fan of claim 1, wherein the shaft has an annular groove formed at one end for fixing the shaft to the rotor.
5. The cooling fan claim 1, wherein the shaft has a neck at the other end for securing the rotor on the casing.
6. The cooling fan of claim 1, wherein the rotor further comprising:
   a wheel;
   a plurality of blades formed around the circumference of the wheel;
   a permanent magnet installed inside the wheel; and
   a compression portion.
7. The cooling fan of claim 6, wherein the compression portion comprises a compression spring and a retainer.
8. The cooling fan of claim 7, wherein the retainer is clipped onto a neck of the shaft for securing the rotor on the casing.
9. The cooling fan of claim 7, wherein the compression spring presses against the bearing with one end and against the retainer with the other end.

* * * * *