

BREATHER FILTER UNIT FOR MAGNETIC DISK DRIVE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a breather filter unit for a magnetic disk drive.

2. Description of the Related Art

In recent years, a magnetic disk drive as a kind of external storage for a computer have been increasingly made thinner and more compact with a reduced power consumption. Further, the improvement in recording density of a magnetic disk has also been desired and the number of magnetic disks to be mounted in the disk drive have also been increased for a large capacity. In general, a magnetic disk drive for a computer adopts a contact start and stop (CSS) system defining a relation between a magnetic head and a magnetic disk facing it. In this system, while the disk is being rotated, the head is kept flying above the disk at a microscopic height owing to the balance between a flying force applied to the head by an air flow generated by high-speed rotation of the disk and an elastic force of a spring arm pressing the head on the disk.

When the rotation of the magnetic disk is stopped, the head is moved to a contact allowed zone on the disk and then comes into contact with the disk. When the rotation of the disk is stopped, the head is kept in contact with the disk. Thus, during the rotation of the disk, the head is kept flying above the disk at a microscopic height. Accordingly, dust or the like even in a small amount can cause head crash or the like. To cope with this problem, magnetic disks and a head actuator for writing/reading data on the magnetic disks are contained in a sealed disk enclosure (housing).

However, it is difficult to maintain a sealed condition inside the magnetic disk drive for a long time, and the flying height of each magnetic head changes with variations in pressure inside the disk drive due to a temperature change or the like. To prevent this, a small vent is formed through a cover of the magnetic disk drive to make the pressure inside the disk drive substantially equal to the pressure outside the disk drive. A breather filter is usually mounted at the small vent to thereby prevent dust from entering the inside of the disk drive through the small vent. However, such a breather filter generally used in the related art allows water vapor, corrosive gas, etc. to pass into the inside of the disk drive. Some techniques for solving this problem have been proposed. U.S. Pat. No. 4,751,594 discloses a narrow long air passage for suppressing the entry of water vapor into the inside of the disk drive due to diffusion of the air.

Further, Japanese Patent Laid-open No. 60-147983 discloses a restriction and a drying agent provided in an air passage to prevent the entry of water vapor into the inside of the disk drive. Japanese Patent Laid-open No. 5-109260 discloses a filter assembly (filter unit) formed by combining a nonwoven fabric, a metal-coated filter, and activated carbon and mounted in the disk drive to remove harmful gas molecules in the disk drive.

The corrosive gas contained in the air entering the magnetic disk drive oxidizes the disk surface and a magnetic head transducer to shorten the life of the disk and the magnetic head. It is known that activated carbon is provided in the magnetic disk drive to trap the corrosive gas. In a large-sized magnetic disk drive such as a 8-inch magnetic disk drive or a 5.25-inch magnetic disk drive, it is possible to provide a sufficient amount of activated carbon and drying

agent in the disk drive. However, in a small-sized magnetic disk drive such as a 3.5-inch magnetic disk drive, it is impossible to provide a sufficient amount of activated carbon and/or drying agent in the disk drive because of its limited installation space. If the amount of activated carbon is small, the ability of the activated carbon to adsorb the corrosive gas disappears soon and the life of the activated carbon is shortened.

In the technique disclosed in U.S. Pat. No. 4,751,594, a narrow long air passage is formed to suppress the entry of water vapor, corrosive gas, etc. into the disk drive. However, as the air passage is long, a ventilation device becomes complex and large. Furthermore, the mere formation of the narrow long air passage cannot prevent the entry of the air into the disk drive due to a pressure difference between the inside and the outside of the disk drive. Further, the technique of merely mounting a restriction and a drying agent in a vent as disclosed in Japanese Patent Laid-open No. 60-147983 is unsatisfactory for a reduction in diffusion of the air. In this technique, however, the drying agent adsorbs not only the water vapor entering the inside of the magnetic disk drive, but also the water vapor present outside the disk drive, thus causing a decrease in the life of the drying agent.

Although the amount of the drying agent may be increased to extend the life of the drying agent, it is impossible, particularly in a small-sized magnetic disk drive having a limited installation space, to provide the drying agent in such an amount as to match the life of the disk drive. A technique that can be readily analogized from this literature is mounting of activated carbon in the vent. However, the mere mounting of the activated carbon in the vent causes a decrease in the life of the activated carbon. The activated carbon whose life is over allows the corrosive gas to pass into the magnetic disk drive.

The filter unit described in Laid-Open Japanese Patent No. 5-109260 is a filter for removing harmful gas circulating in the magnetic disk drive, but not a breather filter designed to be mounted in the vent. In such a filter unit, water vapor and corrosive gas outside the disk drive are allowed to enter the inside of the disk drive because the inside and the outside of the disk drive are in communication with each other through the vent. Furthermore, after water vapor and corrosive gas spread over the inside of the disk drive, the filter unit starts adsorbing the water vapor and the corrosive gas. Accordingly, much time is required for complete adsorption, thus adversely affecting the disk and the head. In addition, since the inside and the outside of the disk drive are in communication with each other through the vent, the filter unit continues to always adsorb the water vapor and the corrosive gas existing outside the disk drive, causing a decrease in the life of the filter unit. To extend the life, the size of the filter unit must be enlarged.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a breather filter unit for a magnetic disk drive which can remove metal corrosive gas by adsorption for a long time with a small size and a simple structure.

It is another object of the present invention to provide a magnetic disk drive which can effectively prevent dust and metal corrosive gas from entering the inside of the magnetic disk drive.

In accordance with an aspect of the present invention, there is provided a breather filter unit for a magnetic disk drive including a base and a cover fixed to said base, said