

FEMALE COMBINATION CONNECTOR FOR COMPUTER STORAGE DEVICE

FIELD OF THE INVENTION

The present invention relates generally to the field of connectors and more particularly to connectors for computer storage devices.

BACKGROUND OF THE INVENTION

Personal computers (PCs) commonly comprise one or more storage devices (e.g., hard disk drives, floppy disk drives, CD-ROM drives, and tape drives), which may be internal or external to the PC casing. The back of the storage device normally has a plurality of male connectors which mate with corresponding female connectors to electrically connect the device to the rest of the PC.

The connectors on the back of the storage device usually include a connector for supplying electrical power to the storage device (a "power connector"), a connector for carrying data signals to and from the storage device (a "signal connector"), a connector for connecting the storage device to one or more light emitting diodes (LEDs), a connector for connecting the storage device to the PC's speakers (an "audio connector"), and a connector for receiving one or more jumpers to provide a plurality of user-definable settings.

Because the male connectors on the storage device are fairly standard, they are commonly provided in one integral

piece called a 5-in-1 combination connector. Using a single unit having all of the connectors integrated therein instead of five separate connectors results in increased ease of manufacture of the storage device.

While it is common for the male connectors on the storage device to be integrated into a single combination connector, the female connectors which connect thereto have previously always been separate connectors, each requiring its own wiring. For ease of manufacture and mating, it would be desirable to combine several of the female connectors into a single unit.

SUMMARY OF THE INVENTION

Therefore, it is an object of the present invention to provide a female combination connector adapted to mate with the male 5-in-1 combination connector of a computer storage device. The male 5-in-1 combination connector to which the female combination connector mates normally includes, *inter alia*, a male power connector, a male signal connector, and a male audio connector.

The female combination connector of the present invention comprises a body portion, a female power connector mounted on the body portion, a female signal connector mounted on the body portion, and a female audio connector mounted on the body portion. The female power connector is adapted to mate with the male power connector of the male 5-in-1 combination

connector. Similarly, the female signal connector is adapted to mate with the male signal connector of the male 5-in-1 combination connector. Finally, the female audio connector is adapted to mate with the male audio connector of the male 5-in-1 combination connector.

The body portion is preferably made of a plastic material. The body portion is preferably provided with at least one opening at a location other than where the connectors are mounted to thereby reduce the amount of material needed to form the body portion. The body portion preferably comprises at least one tab adapted to secure the female combination connector to a drive control board. The body portion preferably also comprises at least one peg adapted to seat within a corresponding slot in the drive control board to thereby achieve the proper mating position between the female combination connector and the drive control board.

The female power connector is preferably a four-pin female connector. The female signal connector is preferably a forty-pin female connector. The female audio connector is preferably a four-pin female connector. Preferably, the female power connector, the female signal connector, and the female audio connector each comprise a plurality of output leads adapted to be plugged directly into the drive control board rather than connecting thereto via a wire.

Preferably, the female power connector comprises a plurality of contacts having two points for making electrical contact with the male power connector of the male 5-in-1 combination connector.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be more easily understood with reference to the following drawings in which like reference numbers represent like parts throughout the several Figures, wherein:

Figure 1 is a perspective view of the combination connector of the present invention;

Figure 2 is a side view of the combination connector of the present invention;

Figure 3 is a bottom view of the combination connector of the present invention;

Figure 4 is a cross-section view along section line A-A of Figure 2;

Figure 5 is a cross-section view along section line B-B of Figure 2;

Figure 6 is a cross-section view along section line C-C of Figure 2;

Figure 7 is a cross-section view along section line D-D of Figure 2; and

Figure 8 is an enlarged view of the female power connector showing the two-contact-point-type contacts.

DETAILED DESCRIPTION OF THE INVENTION

The present invention is a female combination connector for connecting the male 5-in-1 combination connector of a computer storage device to a drive control board or other similar hardware.

As shown in Figures 1-6, the female combination connector 1 of the present invention comprises four main components: a body portion 2, a female power connector 3, a female signal connector 4, and a female audio connector 5.

The body portion 2 is preferably made out of a plastic material and is preferably formed by an injection molding process. The body portion 2 should be formed with openings adapted to receive the female connectors 3, 4, and 5. Preferably, the span of the body portion 2 between or next to the female connectors 3, 4, and 5 has one or more openings 6 which reduce the amount of material needed to form the body portion 2.

The female power connector 3 is preferably a four-pin female connector adapted to mate with the standard male power connector of the male 5-in-1 connector. As best shown in Figure 8, the contacts of the female power connector 3 are preferably two-contact-point-type contacts rather than circular-type contacts. This reduces the engagement friction between the female power connector 3 and the male power connector since the contacts of the male connector only engage

the two contact points 12 of the female contact rather than engaging over almost all of its surface area. This allows the male and female power connectors to be more easily mated and unmated.

The female signal connector 4 is preferably a forty-pin female connector adapted to mate with the standard signal power connector of the male 5-in-1 connector.

Finally, the female audio connector 5 is preferably a four-pin female connector adapted to mate with the standard signal audio connector of the male 5-in-1 connector.

Each of the female connectors 3, 4, and 5 have output leads 7, 8, and 9, respectively, which may be plugged directly into the drive control board rather than connecting to a wire. The body portion 2 preferably comprises one or more tabs 10 for securing the female combination connector 1 to the drive control board. The body portion 2 preferably also comprises one or more pegs 11 which are adapted to seat within corresponding slots in the drive control board to thereby achieve the proper mating position between the female combination connector 1 and the drive control board.

Because the tolerances of each of the female connectors 3, 4, and 5 have a cumulative effect when combined into a single unit, the components of the female combination connector are preferably produced with tighter tolerances than typical female connectors commonly used with storage devices

in order to ensure proper mating with the corresponding male connectors. Individual storage device connectors typically have tolerances of about $\pm 0.25\text{mm}$ when assembled separately on a drive control board. However, since the female combination connector 1 of the present invention combines three such connectors into a single unit, these tolerances will "stack-up" and result in a total tolerance of as much as $\pm 0.75\text{mm}$. This additional tolerance might prevent the unit from mating properly with the male 5-in-1 connector. Therefore, in order to alleviate this problem, the female combination connector is preferably manufactured with an overall tolerance of $\pm 0.25\text{mm}$, thereby ensuring that each of the female connectors will mate properly with the corresponding male connectors of the male 5-in-1 connector.

While the apparatus disclosed herein constitutes the preferred embodiment of the present invention, it is to be understood that the invention is not limited to the precise apparatus disclosed, and that minor modifications may be made therein without departing from the scope of the invention as defined by the following claims.

CLAIMS



What is claimed is:

1. A female combination connector for mating with a male 5-in-1 combination connector mounted on a computer storage device and having a male power connector, a male signal connector, and a male audio connector, said female combination connector comprising:
 - a. a body portion;
 - b. a female power connector mounted on the body portion, said female power connector being adapted to mate with the male power connector of the male 5-in-1 combination connector;
 - c. a female signal connector mounted on the body portion, said female signal connector being adapted to mate with the male signal connector of the male 5-in-1 combination connector; and
 - d. a female audio connector mounted on the body portion, said female audio connector being adapted to mate with the male audio connector of the male 5-in-1 combination connector.

2. A female combination connector as recited in claim 1, wherein the body portion is made of a plastic material.



3. A female combination connector as recited in claim 1, wherein the body portion is provided with at least one opening at a location other than where the connectors are mounted to thereby reduce the amount of material needed to form the body portion.
4. A female combination connector as recited in claim 1, wherein the female power connector is a four-pin female connector.
5. A female combination connector as recited in claim 1, wherein the female signal connector is a forty-pin female connector.
6. A female combination connector as recited in claim 1, wherein the female audio connector is a four-pin female connector.
7. A female combination connector as recited in claim 1, wherein the body portion comprises at least one tab adapted to secure the female combination connector to a drive control board.
8. A female combination connector as recited in claim 1, wherein the female power connector, the female signal



connector, and the female audio connector each comprise a plurality of output leads adapted to be plugged directly into a drive control board rather than connecting thereto via a wire.

9. A female combination connector as recited in claim 1, wherein the body portion comprises at least one peg adapted to seat within a corresponding slot in a drive control board to thereby achieve the proper mating position between the female combination connector and the drive control board.
10. A female combination connector as recited in claim 1, wherein the female power connector comprises a plurality of contacts having two points for making electrical contact with the male power connector of the male 5-in-1 combination connector.