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DESCRIPTION

DISC CLAMP MECHANISM FOR DISC APPARATUS

BACKGROUND OF THE INVENTION1. Field of the Invention

5 The present invention relates to a disc drive such as a CD player, and more particularly to a disc clamp mechanism capable of thinning a disc drive.

2. Description of the Related Art

10 An example of a conventional disc clamp mechanism for a CD player is shown in Figs. 8A to 10B. As shown in Figs. 8A and 8B, a disc motor 3 is fixedly mounted on a main chassis (not shown), and a turntable 4 is fixedly connected to a rotary shaft of the disc motor 3. A clamper holder 2
15 fixed to a clamper holding chassis 1 holds a clamper 8 over the turntable 4 when a disc 7 is unclamped, as shown in Fig. 8B.

 A lift mechanism for the clamper holding chassis 1 is shown in Fig. 9 and Figs. 10A and 10B. Shafts 1a, 1a,...
20 mounted upright on side walls of the clamper holding chassis 1 are inserted into cam grooves 5a, 5a,... of sliders 5 and 6.

 The sliders 5 and 6 are driven back and forth relative to the main chassis by an unrepresented drive
25 mechanism. As the sliders 5 and 6 move, the clamper

holding chassis 1 is raised or lowered. The shafts 1a, 1a,... are also inserted into vertical grooves (not shown) of the main chassis.

In the disc unclamp state shown in Fig. 8B, the clamper holding chassis 1 is at a raised position. The disc 7 is transported by an unrepresented transport mechanism to a position over the turntable 4 via a space between the turntable 4 and clamper 8. Thereafter, as the clamper holding chassis 1 is lowered, the clamper holder 2 places the clamper 8 on the turntable 4 and becomes spaced from the clamper 8.

The clamper 8 is then attracted by a magnetic force of the turntable 4 to squeeze the disc 7 between the clamper 8 and turntable 4. This state is a clamp state of the disc 7 as shown in Fig. 8A. The clamped disc 7 is rotated by the disc motor 3, and an unrepresented optical pickup element is fed along a disc radial direction to reproduce data recorded in the disc 7.

Unclamping the disc 7 is conducted by raising the clamper holding chassis 1 from the position shown in Fig. 8A. The clamper holder 2 is made of a thin plate in order to prevent a contact with the disc 7 or clamper 8 while the disc 7 is clamped.

In the conventional disc clamp mechanism described above, the clamper 8 greatly lowers toward the turntable 4

from the bottom surface of the clamper holding chassis 1 in the disc unclamp state. It is therefore difficult to provide a large space between the clamper 8 and turntable 4. From this reason, the disc 7 may contact the clamper 8 or turntable 4 while it is transported, and the disc 7 may be damaged.

If a lift stroke of the clamper holding chassis 1 is made large, a large space can be formed between the clamper 8 and turntable 4. However in this case, a height of the apparatus becomes large.

A disc clamp mechanism according to the precharacterizing clause of claim 1 is known from US-A-4,736,358. With said conventional mechanism, a chassis is held pivotably at one end by a first spring, whereas at the other hand a clamper holder is fixed to said chassis by a second spring, said clamper holder being pivotable around the other end of the chassis.

According to US-A-4,797,873, a disc is clamped between a spindle hub and a flange of a collet.

GB-A-2,093,256 describes a conventional turntable apparatus.

It is an object of the present invention to provide a disc clamp mechanism for a disc apparatus capable of providing a large space between a clamper and a turntable in a disc unclamp state even if the apparatus is made compact.

According to the invention, the above object is achieved by a disc clamp mechanism according to claim 1. Preferred embodiments are claimed in the dependent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

Figs. 1A and 1B are front views showing an outline of the structure of a disc clamp mechanism for a CD player according to a first embodiment of the invention.

Fig. 2 is a plan view of the disc clamp mechanism.

Figs. 3A to 3D are partial side views illustrating the operation of the disc clamp mechanism, and Fig. 3E is a plan view showing a clamper holder of the disc clamp mechanism.

Fig. 4 is a perspective view of the disc clamp mechanism.

Fig. 5 is a perspective view showing another state of the disc clamp mechanism.

Figs. 6A and 6B are partial side views illustrating the operation of a disc clamp mechanism for a CD player according to a second embodiment of the invention.

Fig. 7 is a perspective view of a disc clamp mechanism for a CD player according to a third embodiment of the invention.

5 Figs. 8A and 8B are front views showing an outline of the structure of a conventional disc clamp mechanism for a CD player.

Fig. 9 is a plan view of the disc clamp mechanism shown in Figs. 8A and 8B.

10 Figs. 10A and 10B are side views illustrating the operation of the disc clamp mechanism shown in Figs. 8A and 8B.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

15 A disc clamp mechanism for a CD player according to embodiments of the invention will be described with reference to the accompanying drawings. With reference to Figs. 1A and 1B, the operation principle of a disc clamp mechanism for a CD player according to a first embodiment of the invention will be described. In Figs. 1A and 1B, 20 elements having similar functions to those of a conventional mechanism are represented by using identical reference numerals, and the detailed description thereof is omitted.

25 In the first embodiment, a clamber holder 2 is made of a plate spring. A contact portion of the clamber holder 2

with a clamper 8 is moved upward due to deformation in a disc unclamp state. In this state, the bottom surface of the clamper 8 held by the clamper holder 2 is raised higher than the bottom surface of a clamper holding chassis 1. Fig. 1B shows a clamp state of a disc 7.

With reference to Figs. 2 to 5, the way the clamper holder 2 is deformed will be described. Fig. 3E shows the shaper of the clamper holder 2. The clamper holder 2 has a projection 2a at its distal end portion. In a natural state not applied with a force, the clamper holder 2 is bent two steps so that the surface of the projection 2a is lower than its base end portion.

The base end portion of the clamper holder 2 is fixed to a lever 9 shown in Fig. 2. The lever 9 is rotatively fitted in the clamper holder chassis 1 and is rotated by a slider 5 as shown in Figs. 4 and 5.

More specifically, a shaft 5b mounted upright on the slider 5 is inserted in a vertical groove (not visible in Figs. 4 and 5) formed in a bent portion of the lever 9. As shown in Fig. 4, as the slider 5 makes the clamper holder chassis 1 rise, the lever 9 is rotated in the clockwise direction as viewed from a higher position, whereas as shown in Fig. 5, as the slider 5 makes the clamper holding chassis 1 lower, the lever 9 is rotated in the counter-clockwise direction as viewed from a higher position.

While the lever 9 is rotated as the clamper holding chassis 1 is raised or lowered, a relative motion of the lever 9 and clamper holding chassis 1 raises the projection 2a of the clamper holder 2 fixed to the lever 9.

Figs. 3A to 3D shows a raising of the projection 2a due to deformation of the clamper holder 2. Figs. 3A to 3D are drawn assuming that a weight of the clamper 8 is not applied to the clamper holder 2. The clamper holding chassis 1 is raised in the sequential order of Figs. 3A to 3D. As shown, the projection 2a of the clamper holder 2 moves along the motion direction of the clamper holding chassis 1.

Accordingly, as shown in Fig. 1B, the bottom surface of the clamper 8 becomes higher than the bottom surface of the clamper holding chassis 1 in the unclamp state of a disc 7. It is therefore possible to form a large space between the clamper 8 and a turntable 4 and prevent the disc 7 from contacting the clamper 8 or turntable 4 and being damaged while the disc 7 is transported. Furthermore, a stroke of the clamper holding chassis 1 necessary for reserving the space becomes small so that the disc apparatus can be made compact.

Figs. 6A and 6B show a second embodiment of the invention. Similar to the first embodiment, the lever 9 is fitted in the clamper holding chassis 1 and rotated as the

clamper holding chassis 1 is raised or lowered. The clamper holder 2 made of a plate spring is fixed to the clamper holding chassis 1. In a natural state not applied with a force, a contact portion of the clamper holder 2 with the clamper 8 is positioned higher than the base portion of the clamper 8.

Fig. 6A shows an unclamp state, and Fig. 6B shows a clamp state. Also with the configuration of the second embodiment, the bottom surface of the clamper 8 can be set higher than the bottom surface of the clamper holding chassis 1 in the unclamp state of a disc.

Fig. 7 shows a third embodiment of the invention. Similar to the first embodiment, the lever 9 is fitted in the clamper holding chassis 1 and rotated as the clamper holding chassis 1 is raised or lowered. The lever 9 is formed with three slanted surfaces 9b. A clamper holder 10 is of a ring shape with three projections 10a.

The projections 10a of the clamper holder 10 are inserted into grooves 1b formed in the clamper holding chassis 1 and ride on the slanted surfaces 9b of the lever 9. Also with the configuration of the third embodiment, the bottom surface of the clamper 8 can be set higher than the bottom surface of the clamper holding chassis 1 in the unclamp state of a disc.

The invention is not limited to the above embodiments.

For example, instead of deforming the clamper holder by the slider for raising or lowering the clamper holding chassis, it may be deformed by a drive mechanism with another motor dedicated to this mechanism.

5 According to the disc clamp mechanism for a disc apparatus of this invention, the bottom surface of the clamper can be made higher than the bottom surface of the clamper holding chassis in the disc unclamp state. It is therefore possible to form a large space between the
10 clamper and turntable to prevent the disc from becoming in contact with the clamper or turntable and being damaged while the disc is transported.

 Furthermore, since a stroke of the clamper holding chassis necessary for reserving the space can be made
15 small, the disc apparatus can be made compact.

CLAIMS

1. A disc clamp mechanism for a disc apparatus wherein a disc (7) is clamped or unclamped by moving a clamped holding chassis (1) near to or remote from a turntable (4), said chassis (1) holding a clamped (8) with a clamped holder (2, 10), and a holding portion (2a) of said clamped holder (2, 10) with the clamped (8) is movable relative to said chassis (1),

characterized in that

said chassis (1) is movable perpendicular to the surface of said disc (7) and

the movability of said holding portion (2a) of said clamped relative to said chassis (1) is in said direction perpendicular to the surface of said disc (7).

2. The disc clamp mechanism according to claim 1, wherein when the disc (7) is unclamped, a bottom surface of the clamped (8) is made flush with or higher than a plane extending from the surface of said chassis (1).

3. The disc clamp mechanism according to claim 1 or 2, wherein a bottom surface of the clamped (8) remote from the turntable (4) is positioned higher than a lower surface of said chassis (1).

4. The disc clamp mechanism according to any preceding claim, wherein

said chassis (1) is perpendicularly movable relative to a disc surface and has an opening having a diameter at least larger than a diameter of the clamped (8);

a rotatable member (9) is provided, rotatable relative to the chassis (1) in position alignment with the opening of said chassis (1), said rotatable member (9) having an opening having a diameter at least larger than the diameter of the clamber (8); and

said holding portion (2a) extends into the opening of said rotatable member (9) for holding the clamber (8) from a lower surface thereof; and wherein

when the disc (7) is clamped, the holding portion (2a) detaches from a lower surface of a flange of the clamber (8), and

when the disc is unclamped, said rotatable member (9) rotates as said chassis (1) moves, and said chassis (1) raises the holding portion (2a) to make the clamber (8) detach from the turntable (4).

5. A disc clamp mechanism according to claim 4, wherein said holder (2) has a first member bent downward and a second member bent upward relative to the first member and having the holding portion (2a), and as said rotatable member (9) rotates, the first member rides on said chassis (1) to raise the holding portion (2a).

6 The disc clamp mechanism according to any of claims 1 to 3, wherein said chassis (1) is perpendicularly movable relative to a disc surface and has an opening having a diameter at least larger than a diameter of the clamber (8);

a rotatable member (9) is provided, rotatable relative to the chassis (1) in position alignment with the opening of said chassis (1), said rotatable member (9) having an opening having a diameter at least larger than the diameter of the clamber (8); and

holding portion (2a) extends into the opening of said rotatable member (9) for holding the clamber (8) from a lower surface of a flange of the clamber (8); and wherein

when the disc (7) is unclamped, the holding portion (2a) raises the clamber (8) to make the clamber (8) be remote from the turntable (4), and

when the disc is clamped, said rotatable member (9) rotates as said chassis (1) moves, and said chassis (1) lowers the holding portion (2a) to make the clasper (8) be near to the turntable (4).

7. The disc clamp mechanism according to claim 6, wherein said holder (2) has a first member bent upward, a second member bent downward relative to the first member, and a third member bent upward relative to the second member and having the holding portion (2a), and as said rotatable member (9) rotates, said rotatable member (9) rides on the first member to lower the holding portion.

8. The disc clamp mechanism according to any preceding claim, wherein said clamp holder (2) is deformable.

9. The disc clamp mechanism according to any preceding claim, wherein said clasper holder (2) is made of a plate spring.

10. The disc clamp mechanism according to any of claims 4 to 9, wherein said rotatable member (9) is rotatively positioned by a flange formed on an opening end portion of said chassis (1).

11. The disc clamp mechanism according to any of claims 1 to 3, wherein said chassis (1) is perpendicularly movable relative to a disc surface, said chassis (1) having an opening having a diameter at least larger than a diameter of the clasper (8);

a rotatable member (9) is provided rotatable relative to the chassis (1) in position alignment with the opening of said chassis (1), said rotatable member (9) having an opening having a diameter at least larger than the diameter of the clasper (8), and

said holder (10) is capable of being raised and lowered relative to said rotatable member (9) and said chassis (1), said holder (10) extending into the opening of said rotatable member (9) for holding the clasper (8) from a lower surface of a flange of the clasper (8); and wherein

when the disc (7) is clamped, said rotatable member (9) rotates to lower said holder (10) to make a bottom surface of the clasper (8) be near to the turntable (4), as said chassis (1) moves closer to said disc (7) in said perpendicular direction, and

when the disc (7) is unclamped, said rotatable member (9) rotates to raise said holder (10) to make the clasper (8) be remote from the turntable (4), as said chassis (1) moves away from said disc (7) in said perpendicular direction.

12. The disc clamp mechanism according to claim 11, wherein said holder (10) is of a ring shape having an inner diameter smaller than a diameter of the clasper (8) and has a projection (10a) formed on an outer periphery thereof and extending radially, said projection (10a) is movably inserted into a groove (1b) formed in said chassis (1) and placed on a slanted portion (9b) formed on said rotatable member (9), and said projection (10a) rises or lowers on said slanted portion (9b) as said rotatable member (9) rotates.

13. The disc clamp mechanism according to any of claims 4 to 12, further comprising a slider (5) for making said chassis (1) slide, wherein said rotatable member (9) is mounted on a shaft (5b) formed on said slider (5) and rotates as said movable member (9) moves in said parallel direction.