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DESCRIPTION



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DISK LOADING DEVICE

TECHNICAL FIELD

The present invention relates to a disk loading device as a mechanism for loading a disk in a disk driving apparatus and, more particularly, to a mechanism for preventing incorrect loading of a disk with an improper diameter.

BACKGROUND ART

A conventional disk loading device in a disk driving apparatus aims to load a 12cm disk correctly in the disk driving apparatus without scratching or contaminating the surface of the disk, as can be seen in a loading system employing a driving roller or in a belt-driven type loading system which is generally adopted in a vehicle-mounted disk driving apparatus, as disclosed in, for example, Japanese Published Utility Model Application No.62-63854.

The driving roller type or belt-driven type loading system for correctly loading a disk in the disk driving apparatus without scratching or contaminating the disk surface, is targeted for 12cm disks. As for disks having diameters smaller than 12cm, a countermeasure against a failure of the disk driving apparatus due to incorrect loading of the smaller-diameter disks has been taken by indicating precautions or the like. Accordingly, incorrect

loading of smaller-diameter disks due to user's forgetting about reading the precautions, carelessness, or the like has caused a failure of the disk driving apparatus.

The conventional disk loading device is constituted as described above, and incorrect loading of disks having sizes different from a prescribed size causes a failure of the disk driving apparatus.

The present invention is made to solve the above-described problem and has for its object to provide a disk loading device which can reliably prevent loading of smaller-diameter disks due to carelessness or the like to prevent a failure of a disk driving apparatus, even when a countermeasure against incorrect loading of smaller-diameter disks, such as indication of precautions, is not taken.

DISCLOSURE OF THE INVENTION

A disk loading device according to Claim 1 of the present invention comprises a pair of independent disk loading detection means which are provided in the vicinity of a disk loading slot, and are operated together when a disk having a predetermined size is loaded; and disk loading control means which are provided in a carrier path of the disk, independently from each other and corresponding to the pair of disk loading detection means, respectively, and are operated in connection with the disk loading detection means to control the carrying enabled/disabled state of the disk carrier path.

As described above, the disk loading device according to Claim 1 of the present invention is provided with a pair of independent disk loading detection means which are provided in the vicinity of a disk loading slot, and are operated together when a disk having a predetermined size is loaded; and disk loading control means which are provided in a carrier path of the disk, independently from each other and corresponding to the pair of disk loading detection means, respectively, and are operated in connection with the disk loading detection means to control the carrying enabled/disabled state of the disk carrier path. Therefore, it is possible to provide a disk loading device that can correctly load only a disk of an operable size into a disk driving apparatus, and can prevent incorrect loading of a disk having an improper size to avoid a failure of the disk driving apparatus, even when a countermeasure against incorrect loading of a smaller-diameter disk, such as indication of precautions or the like, is not taken.

Further, according to Claim 2 of the present invention, in the disk loading device defined in Claim 1, the pair of disk loading detection means include rods which rotate in accordance with insertion/ejection of a disk, on certain points as pivots, along the disk insertion/ejection direction; the disk loading control means include levers which have edges in contact with the rods, and rotate on certain points as pivots in a direction intersecting the disk insertion/ejection direction, whereby the upper and lower positions of the levers are changed with the disk carrier path as a reference

plane; and when a disk which is smaller than the disk of the predetermined size is loaded, at least one of the levers intersects the disk carrier path.

As described above, according to Claim 2 of the invention, in the disk loading device as defined in Claim 1, the pair of disk loading detection means include rods which rotate in accordance with insertion/ejection of a disk, on certain points as pivots, along the disk insertion/ejection direction; the disk loading control means include levers which have edges in contact with the rods, and rotate on certain points as pivots in a direction intersecting the disk insertion/ejection direction, whereby the upper and lower positions of the levers are changed with the disk carrier path as a reference plane; and, when a disk which is smaller than the disk of the predetermined size is loaded, at least one of the levers intersects the disk carrier path, whereby loading of a disk smaller than the disk of the predetermined size is prevented. Therefore, it is possible to provide a disk loading device that can correctly load only a disk of a predetermined operable size into a disk driving apparatus, and can prevent incorrect loading of a disk having an improper size smaller than the predetermined size to avoid a failure of the disk driving apparatus, even when a countermeasure against incorrect loading of the smaller-diameter disk, such as indication of precautions or the like, is not taken.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows a plan view, elevation views of both sides, and a front view of a disk loading side, of a disk loading device according to a first embodiment of the present invention.

Figure 2 shows diagrams for explaining the operation of the disk loading device according to the first embodiment in the case where a 12cm disk is loaded.

Figure 3 shows enlarged views of the neighborhoods of roller rods and disk check levers shown in figure 2.

Figure 4 shows diagrams for explaining the operation of the disk loading device according to the first embodiment in the case where a 8cm disk is loaded so as to be positioned a little toward the left with respect to the center of the disk loading device.

Figure 5 shows enlarged views of the neighborhoods of roller rods and disk check levers shown in figure 4.

Figure 6 shows diagrams for explaining the operation of the disk loading device according to the first embodiment in the case where a 8cm disk is loaded so as to be positioned a little toward the right with respect to the center of the disk loading device.

Figure 7 shows enlarged views of the neighborhoods of roller rods and disk check levers shown in figure 6.

Figure 8 shows diagrams for explaining the operation of the disk loading device according to the first embodiment in case where a 8cm disk is loaded so as to be positioned in the center of the disk loading device.

Figure 9 shows enlarged views of the neighborhoods of roller

rods and disk check levers shown in figure 8.

BEST MODE TO EXECUTE THE INVENTION

(Embodiment 1)

Hereinafter, a disk loading device according to a first embodiment of the present invention will be described with reference to figures 1 to 5. Figure 1 shows a top surface, left and right sides, and a side having a disk loading slot, of a disk loading device according to the present invention. In the figure, numeral 1 denotes a mechanical chassis on which parts such as a substrate, a spindle motor and the like are mounted, and numeral 2 denotes a loading chassis which is arranged on the mechanical chassis 1 so as to be opposed to the chassis 1, and is provided with a mechanism for performing loading of a disk 9. Further, numerals 3 and 4 denote roller rods which are rotatable on pivots A and B, respectively, and the roller rods 3 and 4 are provided with, at their edges, rollers 11 that rotate in contact with the surface of the disk 9 when the disk 9 is loaded, while the other edges 3A and 4A of the roller rods hang over the edges of disk check levers, which will be mentioned later, to be engaged with them. Further, numerals 5 and 6 denote a pair of disk check levers which are rotatable on pivots C and D, respectively, and edges 5A and 6A of the disk check levers are positioned beneath the edges 3A and 4A of the roller rods 3 and 4, respectively, while the other edges 5B and 6B of the disk check levers protrude toward the center of the disk 9. According to the lever operation by the engagement

of the roller rod 3 and the disk check lever 5 and the engagement of the roller rod 4 and the disk check lever 6, the diameter of a disk loaded from the front panel 10 side is determined, whereby loading of a disk of improper size is prevented.

Next, the operation will be described. Figure 2 illustrates the state where a 12cm disk is loaded in figure 1. Further, figure 3 shows enlarged views of the neighborhoods of the roller rods and the disk check levers shown in figure 2. As shown in figure 3(a), when a 12cm disk 9 is loaded, the 12cm disk 9 pushes up the rollers 11, which are supported by edges of the roller rods 3 and 4, in the direction of arrow F1, and the roller rods 3 and 4 rotate counterclockwise on the pivots A and B, respectively. Thereby, as shown in figure 3(b), the other edge 3A of the roller rod 3 pushes down the edge 5A of the disk check lever 5 in the direction of arrow F2 while the other edge 4A of the roller rod 4 pushes down the edge 6A of the disk check lever 6 in the direction of arrow F2, and the disk check lever 5 rotates clockwise on the pivot C while the disk check lever 6 rotates counterclockwise on the pivot D, whereby the other edge 5B of the disk check lever 5 and the other edge 6B of the disk check lever 6 are moved from a disk loading preventing position A to a position B to make a slot through which the disk can pass, thereby enabling loading of the 12cm disk.

Next, a description will be given of the operation of the disk loading device shown in figure 1 in the case where a 8cm disk is loaded from the left side with respect to the center of the disk loading

device, with reference to figures 4 and 5. As shown in figures 4(a), (b), (c) and (d), when a disk 9a having a diameter of 8cm is loaded so as to be positioned a little toward the left (toward the disk check lever 6) with respect to the center of the disk loading device, the 8cm disk 9a pushes up the roller 11, which is supported by an edge of the roller rod 4, in the direction of arrow F1 as shown in figure 5(a), whereby the roller rod 4 rotates counterclockwise on the pivot B. Thereby, as shown in figure 5(c), the other edge 4A of the roller rod 4 pushes down an edge 6A of the disk check lever 6 in the direction of arrow F2, and the disk check lever 6 rotates counterclockwise on the pivot D, whereby the other edge 6B of the disk check lever 6 is moved from the disk loading preventing position A to the position B to make a slot through which the disk passes.

On the other hand, as shown in figure 5(b), since the roller 11 supported by an edge of the roller rod 3 is not in contact with the disk 9a and is not pushed up by the disk 9a in the direction of arrow F2, the roller rod 3 does not rotate counterclockwise on the pivot A. Thereby, as shown in figure 5(c), the other edge 3A of the roller rod 3 does not push down an edge 5A of the disk check lever 5 in the direction of arrow F2, and the disk check lever 5 is kept in the initial state, and the other edge 5B of the disk check lever 5 is kept in the disk loading preventing position A. Accordingly, the disk 9a comes into contact with the other edge 5B of the disk check lever 5, whereby loading of the 8cm disk 9a is prevented.

Further, figures 6 and 7 are diagrams for explaining the

operation of the disk loading device in case where a 8cm disk 9a is loaded from the right side with respect to the center of the disk loading device. As shown in figures 6(a), (b), (c) and (d), when the disk 9a having a diameter of 8cm is loaded so as to be positioned a little toward the right (toward the disk check lever 5) with respect to the center of the disk loading device, as shown in figure 7(b), when the 8cm disk 9a is loaded, the 8cm disk 9a pushes up the roller 11 which is supported by an edge of the roller rod 3, in the direction of arrow F1, whereby the roller rod 3 rotates counterclockwise on the pivot A. Thereby, as shown in figure 7(c), the other edge 3A of the roller rod 3 pushes down an edge 5A of the disk check lever 5 in the direction of arrow F2, and the disk check lever 5 rotates clockwise on the pivot C, whereby the other edge 5B of the disk check lever 5 is moved from the disk loading preventing position A to the position B to make a slot through which the disk passes.

On the other hand, as shown in figure 7(a), since the roller 11 supported by an edge of the roller rod 4 is not in contact with the disk 9a and is not pushed up by the disk 9a in the direction of arrow F1, the roller rod 4 does not rotate counterclockwise on the pivot B. Thereby, as shown in figure 7(c), the other edge 4A of the roller rod 4 does not push down an edge 6A of the disk check lever 6 in the direction of arrow F2, and the disk check lever 6 is kept in the initial state, and the other edge 6B of the disk check lever 6 is kept in the disk loading preventing position A. Accordingly, the disk 9a comes into contact with the other edge 6B of the disk

check lever 6, whereby loading of the 8cm disk 9a is prevented.

Further, figures 8 and 9 are diagrams for explaining the operation of the disk loading device in the case where a 8cm disk 9a is loaded from the center of the disk loading device. As shown in figures 8(a), (b), (c) and (d), when the disk 9a having a diameter of 8cm is loaded so that the center of the disk 9a is positioned in the center of the disk loading device, since, as shown in figure 9(a), the 8cm disk 9a does not push up the rollers 11, which are supported by edges of the roller rod 3 and roller rod 4, in the direction of arrow F1, the roller rods 3 and 4 do not rotate on the respective pivots A and B. Therefore, as shown in figure 9(b), the other edge 3A of the roller rod 3 does not push down an edge 5A of the disk check lever 5 in the direction of arrow F2 while the other edge 4A of the roller rod 4 does not push down an edge 6A of the disk check lever 6 in the direction of arrow F2, and the other edge 5B of the disk check lever 5 and the other edge 6B of the disk check lever 6 are kept in the disk loading preventing position A, whereby the disk 9a comes into contact with the other edge 5B of the disk check lever 5 and the other edge 6B of the disk check lever 6, and thus loading of the 8cm disk 9a is prevented.

In this way, since the disk loading device is constructed so that it prevents loading of the 8cm disk 9a and permits loading of the 12cm disk 9 only, a failure of the disk driving apparatus due to incorrect loading of the 8cm disk 9a can be avoided.

As described above, according to the embodiment of the

invention, the disk loading device is provided with, in the vicinity of both sides of the opening as the disk loading slot, the roller rods 3 and 4 which rotate in contact with the disk by loading of the disk, and the disk check levers 5 and 6 which rotate in contact with the rods 3 and 4 according to the principle of levers, whereby, only when a disk of a predetermined size is loaded, the rods 3 and 4 are operated together to move the disk check levers 5 and 6 together from the disk loading preventing position A to the position B, thereby enabling the disk to pass through the slot. On the other hand, when a disk smaller than the predetermined size is loaded, the disk does not come into contact with either or both of the rods 3 and 4, and at least one of the disk check levers 5 and 6 is kept in the disk loading preventing position A to disable the disk from passing through the slot. Therefore, the disk loading device can automatically detect a difference in sizes of disks by simply loading the disks and, when the size of the disk is not the predetermined one, the device can prevent the disk from being loaded into the inside.

APPLICABILITY IN INDUSTRY

As described above, the disk loading device according to the present invention can correctly load only a disk having an operable size into the disk driving apparatus, and can prevent incorrect loading of a disk having an improper size to avoid a failure of the disk driving apparatus, even when a countermeasure against incorrect loading of a smaller-diameter disk is not taken by giving precautions

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or the like.

CLAIMS

1. A disk loading device comprising:

a pair of independent disk loading detection means which are provided in the vicinity of a disk loading slot, and are operated together when a disk having a predetermined size is loaded; and

disk loading control means which are provided in a carrier path of the disk, independently from each other and corresponding to the pair of disk loading detection means, respectively, and are operated in connection with the disk loading detection means to control the carrying enabled/disabled state of the disk carrier path.

2. A disk loading device as defined in claim 1, wherein

the pair of disk loading detection means include rods which rotate in accordance with insertion/ejection of a disk, on certain points as pivots, along the disk insertion/ejection direction;

the disk loading control means include levers which have edges in contact with the rods, and rotate on certain points as pivots in a direction intersecting the disk insertion/ejection direction, whereby the upper and lower positions of the levers are changed with the disk carrier path as a reference plane; and

when a disk which is smaller than the disk of the predetermined size is loaded, at least one of the levers intersects the disk carrier path.