

DISK CHANGER

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a disk changer, and more particularly to a disk changer for loading and unloading several disks selectively which have different radius against a turn table disposed in a housing.

2. Description of the Prior Art

In a prior art, there is a disk changer in which a tray having several disks on the same surface thereof rotates onto a turn table for loading and unloading any one of the several disks. In this type of disk changer, a disk player should be stopped to replace the recorded or played back disk with another new disk. Thus, it takes quite a time to replace new disk, moreover it is inconvenient to be interrupted in continuous appreciation of the recorded information in a disk during quite a long replacing time.

U.S. Patent No. 5,107,475 to Kaoru Serita et al. is directed to an automatic disk changer in which tray guides are provided on a large number of levels in a case at right and left portions thereof so that the center line of the tray guide at the right portion and the center line of the tray guide at the left portion extend toward a tray transfer mechanism and meet each other in the form of "V".



This reference is principally directed to a disk changer changing a large number of disks, so the disk player has a substantially high height.



SUMMARY OF THE INVENTION

Therefore, it is an object of the present invention to provide a disk changer for loading and unloading disks having several kinds of different radius selectively against a turn table, wherein at least one kind of disk having generally small radius is rested on a second tray in plural number.

It is another object of the present invention to provide a disk changer that enables one of the plural generally small radius disks seated on the second tray to be loaded onto the turn table unloading the other generally small radius disk recorded or played back from the turn table simultaneously.

It is a further object of the present invention to provide a disk changer having a first tray on which a generally large radius disk or a generally midium radius disk rests and a second tray on which at least more than two generally small radius disks rest, wherein the second tray is positioned bottom of the first tray so that the whole size of the disk player can be reduced.

In accordance with one aspect of the present invention there is provided a disk changer for loading and unloading several disks selectively which have different radius against a turn table disposed in a housing, which comprising:

a first tray having several grooved seats formed about the same center thereof for resting a generally large radius disk or a generally medium radius disk thereon, having a hole perforated



about the same center of the several grooved seats, and having a first radial slot being formed radially in the several grooved seats for allowing a pick-up moving radial direction under a selected disk to read information recorded thereon, said hole being smaller than the grooved seat for the generally medium radius disk,

a transfer means for transferring the first tray toward and backward the turn table,

a second tray having several generally small grooved seats formed around the periphery thereof for resting at least more than two generally small radius disks thereon, and having a second radial slots being formed radially in the several generally small grooved seats for allowing a photo pick-up moving radial direction under a selected generally small radius disk to read information recorded thereon, said second tray being positioned the bottom of the first tray,

a swivel means for swiveling the second tray left and right so that one of the several generally small grooved seats can be positioned under the hole of the first tray about the same center of the hole, and

an elevation means for elevating the first tray and the second tray simultaneously to load and unload a selected disk against the turn table.

In accordance with another aspect of the present invention there is provided a disk changer for loading and unloading several disks selectively which have different radius against a turn table



disposed in a housing, wherein said transfer means comprising:

- a transfer motor for driving a pinion engaged with a rack formed bottom of the first tray, and

- a chassis having a pair of guide rail being combined slidably in a pair of guide groove formed along both side of the first tray for guiding the first tray toward and backward the turn table as the transfer motor operates.

In accordance with still another aspect of the present invention there is provided a disk changer for loading and unloading several disks selectively which have different radius against a turn table disposed in a housing, wherein said swivel means comprising a swivel motor for driving a swivel pinion engaged with a swivel gear formed in the second tray, said swivel motor being mounted on a bracket fastened to the bottom of the first tray.

In accordance with a further aspect of the present invention there is provided a disk changer for loading and unloading several disks selectively which have different radius against a turn table disposed in a housing, wherein said elevation means comprising:

- a cam gear having a cam slot formed therein, said cam gear being driven by the transfer motor,

- a lever being guided in the cam slot such that being pivoted forward and backward as the cam gear rotates, and

- a pair of slider each having a pair of slanted guide hole being combined slidably with each pair of protrusions extending outward from each side of the chassis, said pair of slanted guide hole being



reversely slanted for each slider.

In accordance with still further aspect of the present invention there is provided a disk changer for loading and unloading several disks selectively which have different radius against a turn table disposed in a housing, wherein at each outside of the chassis is provided a pair of vertical guide rail guided sildably up and down in each corresponding pair of recess, said each corresponding pair of recess being formed in each pair of plate fastened on both side of the housing.

The characteristics of the present invention will be understood more fully from the following detail description and accompanying drawings showing a preferred embodiment of the invention.



BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is an exploded perspective view of a disk changer according to a preferred embodiment of the present invention;

FIG. 2 is an exploded perspective view of bottom of a first tray showing a second tray of a disk changer according to a preferred embodiment of the present invention;

FIG. 3 is a plan view of a disk changer according to a preferred embodiment of the present invention, the first tray thereof being transfered backward from a turn table;

FIG. 4 is a plan view of a disk changer according to a preferred embodiment of the present invention, the first tray thereof being transfered toward the turn table;

FIG. 5 is a plan view of a disk changer according to a preferred embodiment of the present invention, a second tray thereof being swiveled right direction to load a selected disk onto the turn table;

FIG. 6 is a plan view of a disk changer according to a preferred embodiment of the present invention, the first tray thereof being lowered after loading the selected disk onto the turn table;

FIG. 7 is a plan view of a disk changer according to a preferred embodiment of the present invention, the second tray thereof being swiveled left direction after the first tray being elevated to load another selected disk onto the turn table unloading the recorded or played back disk from the turn table



simultaneously;

FIG. 8 is a plan view of FIG. 7, the first tray thereof being lowered after loading the another selected disk onto the turn table;

FIG. 9 is a plan view of FIG. 8, the second tray thereof being positioned in its normal position after unloading the another recorded or played back disk from the turn table.



DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 shows a disk changer according to a preferred embodiment of the present invention.

A first tray 10 has several grooved seats 12 and 14 formed about the same center thereof. A generally large radius disk "C" and a generally medium radius disk "D" can be seated on the grooved seats 12 and 14 respectively. A hole 16 is perforated about the same center of the grooved seats 12 and 14, and a first radial slot 18 is formed radially in the grooved seats 12 and 14, wherein said hole 16 is smaller than the generally medium radius disk "D".

A second tray 20 is positioned the bottom of the first tray 10. The second tray 20 has several generally small grooved seats 22 formed around the periphery thereof. At least more than two generally small radius disks can be seated on the generally small grooved seats 22. A second radial slots 24 is formed radially in the generally small grooved seats 22. A swivel gear 36 is formed at one side of the second tray 20 integrated therewith.

Now referring to FIG. 2, the bottom of the first tray 10 showing a second tray 20 of a disk changer according to a preferred embodiment of the present invention is illustrated.

The second tray 20 is pivotably joined in the pivot 26 provided on a bracket 28. A pair of rack 18a,18b is formed bottom of the first tray 10.

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A swivel motor 30 having a driving gear 32 is mounted on the bracket 28. The driving gear 32 is engaged with a swivel pinion 34 which in turn is engaged with the swivel gear 36 of the second tray 20. The bracket 28 is fastened to the bottom of the first tray 10.

Referring to FIG. 1 and FIG. 2, a transfer means for transferring the first tray 10 toward and backward the turn table 38 is illustrated.

A belt 42 is connected between transfer motor 40 and one of the plurality of gears 44,46,48, said plurality of gears 44,46,48 are engaged with each other successively. The gear 48 is engaged with a pinion 50 engaged with the rack 18a of the first tray 10.

A chassis 52 having a pair of guide rail 52a,52b is provided in a housing 53. Each guide rail 52a,52b is combined slidably in a pair of guide groove 10a,10b formed along both side of the first tray 10. Each guide rail 52a,52b is aperted by a connecting member 54 on which the pinions 50a,50b are located.

An elevation means for elevating the first tray 10 and the second tray 20 simultaneously to load and unload a selected disk against the turn table 38 is provided in the housing 53. The elevation means comprises a cam gear 56 having a cam slot 56a formed therein, a lever 58 guided in the cam slot 56a, and a pair of slider 60a,60b having a pair of slanted guide hole 61a,61b respectively. The cam gear 56 is engaged with the gear 46 driven by the transfer motor 40. Each pair of protrusions 62a,62b



extending outward from each side of the chassis 52 is combined slidably in each slanted guide hole 61a,61b. Each slanted guide hole 61a,61b is reversely slanted for each slider 60a,60b. Each end 58a,58b of the lever 58 is joined with respective joint 64a,64b formed under side each of the slider 60a,60b.

A pair of vertical guide rail 66a,66b guided slidably up and down in each corresponding pair of recess 69a,69b formed in each pair of plate 68a,68b fastened on both side of the housing 53 is provided both outside of the chassis 52.

The operation of the disk changer according to a preferred embodiment of the present invention is described hereafter with reference to FIG. 1 to FIG. 9.

FIG. 3 shows a disk changer according to a preferred embodiment of the present invention, wherein the first tray 10 thereof is transfered backward from a turn table 38.

When the transfer motor 40 is driven one direction, plurality of gears 44,46,48 and the pinion 50a are driven, whereby the first tray 10 is transferred backward from the turn table 38 by the rack 18a engaged with the pinion 50a. A pinion 50b engaged with a rack 18b guides the transferring of the first tray 10. In this position, the generally large radius disk " C " or the generally medium radius disk " D " can be seated on the grooved seats 12 and 14 respectively. Generally small radius disk " A " and " B " can be seated on the generally small grooved seats 22 through the hole 16 as well after the second tray 20 is swiveled right and left.



In FIG. 4, the first tray 10 is transferred toward the turn table 38 by the reverse direction driving of the transfer motor 40.

The lever 58 does not pivot forward and backward during the transferring of the first tray 10 toward and backward the turn table 38, whereby the first tray 10 remains in its elevated position.

FIG. 5 shows a disk changer according to a preferred embodiment of the present invention, wherein the second tray 20 thereof is swiveled right direction to load a selected disk "A" onto the turn table 38.

The second tray 20 is swiveled right direction by the swivel motor 30. The first tray 10, in this state, is at the elevated position because each pair of protrusions 62a, 62b is positioned at the elevated position in each pair of slanted slot 61a, 61b.

Now referring to FIG. 6, the first tray 10 is lowered after loading the selected disk "A" onto the turn table 38.

To load the selected disk "A" onto the turn table 38, the transfer motor 40 is driven further to pivot the lever 58 guided in the cam slot 56a of the cam gear 56. Thus, the lever 58 pivots about a pivot pin 58c, whereby each slider 60a, 60b is slid backward and forward respectively by each end 58a, 58b of the lever 58. Accordingly, each slider 60a, 60b lowers the chassis 52 of which the protrusions 62a, 62b are combined slidably in each slanted slot 61a, 61b. At this time, each pair of vertical guide rail 66a, 66b of the chassis 52 is guided slidably in each corresponding pair of recess 69a, 69b of the respective plate 68a, 68b. After



loading the selected disk " A" onto the turn table 38 in this way, the first tray 10 is lowered a little more, and then the transfer motor 40 is stopped. Then, a pick-up 72 moves under any one of the selected disk for recording or playing back the selected disk with the driving of the pick-up motor 70 . As the pick-up 72 moves, a turn table motor(not shown) rotates the turn table 38. Thus, an objective lens 76 reads the information of the selected disk through the first radial slot 18 or the second radial slot 24.

In FIG. 7, the second tray 20 is swiveled left direction after the first tray 10 is elevated to load another selected disk " B" onto the turn table 38 unloading the recorded or played back disk " A" from the turn table 38 simultaneously.

To load another selected disk " B" onto the turn table 38, the elevation means lowers the first tray 10(see FIG. 8) in the similar manner described above with reference to the FIG. 6.

When the disk player is turned off, the first tray 10 is elevated after the turn table motor is stopped, and then the second tray 20 is swiveled its normal position unloading the recorded or played back disk " B" from the turn table 38 as shown in FIG. 9.

It is understood that the foregoing description is only illustrative of the invention. Various alternatives and modifications can be devised by those skilled in the art without departing from the invention. Thus, the present invention is intended to cover all such alternatives and modifications which fall within the scope of the appended claims.



What is claimed is:

1. A disk changer for loading and unloading several disks selectively which have different radius against a turn table disposed in a housing, which comprising:

a first tray having several grooved seats formed about the same center thereof for resting a generally large radius disk or a generally medium radius disk thereon, having a hole perforated about the same center of the several grooved seats, and having a first radial slot being formed radially in the several grooved seats for allowing a pick-up moving radial direction under a selected disk to read information recorded thereon, said hole being smaller than the grooved seat for the generally medium radius disk,

a transfer means for transferring the first tray toward and backward the turn table,

a second tray having several generally small grooved seats formed around the periphery thereof for resting at least more than two generally small radius disks thereon, and having a second radial slots being formed radially in the several generally small seats for allowing a photo pick-up moving radial direction under a selected generally small radius disk to read information recorded thereon, said second tray being positioned the bottom of the first tray,

a swivel means for swiveling the second tray left and right so that one of the several generally small grooved seats can be



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positioned under the hole of the first tray about the same center of the hole, and

an elevation means for elevating the first tray and the second tray simultaneously to load and unload a selected disk against the turn table.

2. The disk changer, as set forth in claim 1, wherein said transfer means comprising:

a transfer motor for driving a pinion engaged with a rack formed bottom of the first tray, and

a chassis having a pair of guide rail being combined slidably in a pair of guide groove formed along both side of the first tray for guiding the first tray toward and backward the turn table as the transfer motor operates.

3. The disk changer, as set forth in claim 1, wherein said swivel means comprising a swivel motor for driving a swivel pinion engaged with a swivel gear formed in the second tray, said swivel motor being mounted on a bracket fastened to the bottom of the first tray.

4. The disk changer, as set forth in claim 1, wherein said elevation means comprising:

a cam gear having a cam slot formed therein, said cam gear being driven by the transfer motor,



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a lever being guided in the cam slot such that being pivoted forward and backward as the cam gear rotates, and

a pair of slider each having a pair of slanted guide hole being combined slidably with each pair of protrusions extending outward from each side of the chassis, said pair of slanted guide hole being reversely slanted for each slider.

5. The disk changer, as set forth in claim 1, wherein at each outside of the chassis is provided a pair of vertical guide rail guided sildably up and down in each corresponding pair of recess, said each corresponding pair of recess being formed in each pair of plate fastened on both side of the housing.



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