

DISK CARTRIDGE

BACKGROUND OF THE INVENTION

The present invention relates to a disk cartridge which houses therein a disk-like recording medium such as a floppy disk composed of a magnetic sheet.

As known heretofore, out of floppy disk cartridges each containing a floppy disk of a magnetic sheet as a recording medium, one type of 3.5-inch floppy disk cartridges is so prescribed that the diameter of a floppy disk is standardized to 85.8 mm (3.5 inches), and the lateral width of a cartridge for housing a floppy disk rotatably therein is standardized to 90.0 mm.

Meanwhile, also as known, the lateral width of a disk drive adapted for 3.5-inch form factors in the computer industry is standardized to 101.6 mm (4 inches).

Therefore, the width (90.0 mm) of a related art 3.5-inch floppy disk cartridge has a sufficient dimensional margin to the width (101.6 mm) of a disk drive adapted for the 3.5-inch form factors, so that the disk cartridge is constructed to be optimal for the relevant disk drive.

However, in the related art 3.5-inch floppy disk cartridge for a floppy disk of 85.8 mm in diameter, its

data recording capacity is somewhat limited.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a disk cartridge which is applicable to a disk drive adapted for the 3.5-inch form factors while being interchangeable with a related art 3.5-inch floppy disk cartridge and still is capable of increasing a data recording capacity.

According to one aspect of the present invention, there is provided a disk cartridge comprising a disk-like recording medium; a cartridge where the disk-like recording medium is housed rotatably; a recording/reproducing window open at least in a lower surface of the cartridge substantially in a center portion of the front edge thereof; a shutter attached to be slidable laterally along the front edge of the cartridge so as to open or close the recording/reproducing window; and a disk table insertion hole open substantially in the center portion of at least the lower surface of the cartridge; wherein a lateral width of at least the rear edge of the cartridge is set to be more than 90.0 mm but less than 101.6 mm, and the diameter of the disk-like recording medium is set to be more than

85.8 mm.

In the disk cartridge constructed as mentioned, it is possible to easily enlarge the diameter of the disk-like recording medium in excess of 85.8 mm.

According to another aspect of the present invention, there is provided a disk cartridge wherein a pair of positioning holes are formed at left and right side positions in the lower surface of the front edge of the cartridge, and a longitudinal space between the center of the positioning hole and the center of the disk-like recording medium is set to 31.0 mm.

In this disk cartridge, the diameter of the disk-like recording medium is enlarged in comparison with the related art 3.5-inch floppy disk, but the longitudinal space between the center of the disk-like recording medium and the center of each of the paired left and right positioning holes formed in the lower surface of the front edge of the cartridge is set to 31.0 mm which is the same as the corresponding dimension in the related art 3.5-inch floppy disk cartridge, hence achieving desired interchangeability with the related art 3.5-inch floppy disk cartridge or the like.

The above and other features and advantages of the

present invention will become apparent from the following description which will be given with reference to the illustrative accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figs. 1A and 1B are a plan view and a bottom view which illustrate a large disk cartridge for explaining an embodiment of the disk cartridge of the present invention and a disk drive system applying the same;

Fig. 2 shows a partially cutaway plan view and a partially cutaway side view explaining some measures for a cartridge holder in a disk drive and illustrating a state where the large disk cartridge is inserted and loaded in the cartridge holder;

Figs. 3A and 3B are a partially cutaway plan view and a partially cutaway sectional view illustrating a state where a small disk cartridge is inserted and loaded in the cartridge holder shown in Fig. 2;

Fig. 4 is a plan view for explaining a shutter opening/closing mechanism for the large disk cartridge in the disk drive;

Fig. 5 is a plan view illustrating a shutter open state of the large disk cartridge shown in Fig. 4;

Fig. 6 is a partially cutaway plan view for explaining fixed centering guides in the cartridge holder in the disk drive;

Fig. 7 is a partially cutaway plan view for explaining slidable centering guides in the cartridge holder in the disk drive;

Fig. 8 is a partially cutaway plan view illustrating a state where the large disk cartridge is centered by the centering guides shown in Fig. 7;

Fig. 9 is a partially cutaway plan view illustrating a state where the small disk cartridge is centered by the centering guides shown in Fig. 7;

Fig. 10 shows a plan view and a bottom view for explaining the small disk cartridge;

Fig. 11 is an exploded perspective view of the small disk cartridge;

Fig. 12 is a perspective view of a disk drive adapted for 3.5-inch form factors;

Fig. 13 is a schematic sectional side view of the disk drive shown in Fig. 12;

Figs. 14A and 14B are a partially cutaway plan view and a partially cutaway side view illustrating a state where the small disk cartridge is inserted and loaded in

the cartridge holder in the disk drive of Fig. 12;

Fig. 15 is a plan view for explaining a shutter opening/closing mechanism for the small disk cartridge in the disk drive of Fig. 12; and

Fig. 16 is a plan view illustrating a shutter open state of the small disk cartridge shown in Fig. 15.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereinafter some preferred embodiments of the disk cartridge of the present invention and a disk drive system applying the invention will be described with reference to the accompanying drawings.

[Explanation of small disk cartridge]

Referring first to Figs. 10 and 11, an explanation will be given on a small disk cartridge.

This small disk cartridge 1 consists of a related art 3.5-inch floppy disk cartridge.

Therefore, as known heretofore, a small cartridge 2 of this small disk cartridge 1 is formed into a flat case which consists of upper and lower shells 3a, 3b and is substantially square in plan view, and a small-diameter disk-like recording medium housed rotatably in the small cartridge 2 consists of a small-diameter floppy disk 4

which is composed of a magnetic sheet having a diameter of 3.5 inches.

A square center hole 6 and a rectangular eccentric hole 7 are formed in a center core 5 bonded to the center of the small-diameter floppy disk 4, and the center core 5 is loosely fitted into a circular disk table insertion opening 9 formed substantially at the center of the lower shell 3b constituting the lower surface of the small cartridge 2.

In the upper and lower shells 3a, 3b constituting the upper and lower surfaces of the small cartridge 2 respectively, there are formed a pair of rectangular upper and lower recording/reproducing windows 8 which are open at central positions near a front edge 2a of the small cartridge 2 and extend along the cartridge center P_1 .

A shutter 10, which is substantially U-shaped in cross section, is attached astride the upper and lower external surfaces of the upper and lower shells 3a, 3b in a manner to be slidable laterally along the front edge 2a of the small cartridge 2 in the directions indicated by arrows a and b. The shutter 10 is resiliently urged by a shutter spring 11, which is a torsion coil spring attached to the inside of the small cartridge 2, in a manner to be slid in

the direction of arrow a from an open position denoted by a solid line in Fig. 10 to a closed position denoted by a one-dot chained line. A pair of rectangular upper and lower shutter openings 12 slightly larger than a pair of upper and lower head insertion openings 9 are formed at positions deviated toward one end 10a of the shutter 10 in its closing direction.

A circular spindle support plate 13 is bonded to the inner surface of the upper shell 3a at a position immediately above the center core 5, and a lifter 14 is attached by bonding or welding to the inner surface of the lower shell 3b at a position beside the disk table insertion opening 9.

A pair of upper and lower cleaning sheets 15 are bonded to the inner surfaces of the upper and lower shells 3a, 3b in a manner to cover the upper and lower surfaces of the small-diameter floppy disk 4. Each of such upper and lower cleaning sheets 15 is cut substantially in the shape of a horseshoe to form a slit 15a correspondingly to the disk table insertion opening 9, the spindle support plate 13 and the upper and lower recording/reproducing windows 8. The pair of cleaning sheets 15 are resiliently kept in contact with the upper and lower surfaces of the small-

diameter floppy disk 4 by the pressure from the lifter 14.

In the lower shell 3b which constitutes the lower surface of the small disk cartridge 1 having the above construction, there are formed a pair of left and right lead-in recesses 16 at positions proximate to the front edges 2a of two side faces 2c. Such pair of lead-in recesses 16 are shaped substantially to be semicircular notches and are formed astride the corner portions of the lower surface of the lower shell 3b and the two side faces 2 thereof.

Also in the lower surface of the lower shell 3b, there are formed a pair of left and right positioning holes 17 at left and right side positions which are slightly deviated from the pair of lead-in recesses 16 toward the disk table insertion openings 9. In such pair of positioning holes 17, one is circular while the other is elongate.

Further a mis-erasure preventive tab 18 and a recording capacity discriminator hole 19 relative to 2DD, 2HD, 2ED and so forth are formed at left and right side positions in the lower surface of the lower shell 3b and proximate to the rear edge 2b. And a notch 20 cut approximately at 45° is formed at one corner of the front

edge 2a of the small cartridge 2.

[Explanation of disk drive]

Now a disk drive will be explained below with reference to Figs. 12 to 14A and 14B.

This disk drive 31 is shaped into a flat box and consists of such elementary members as a chassis 32 composed of a metal sheet, a cover 33 composed of a metal sheet thinner than that of the chassis 32 and attached above the chassis 32, and a front panel 34 composed of synthetic resin and attached to the fore ends of the chassis 32 and the cover 33. And a cartridge insertion slot 34a is formed in the front panel 34.

A cartridge holder 35 composed of a metal sheet is disposed horizontally in the disk drive 31 at a position above the chassis 32. This cartridge holder 35 is so installed as to be vertically ascendable and descendable above the chassis 32 with a parallel movement caused by a holder lifting mechanism (not shown). The cartridge holder 35 is equipped thereon with an undermentioned shutter opening/closing mechanism, wherein an eject button 36 projects forward from the front panel 34.

A spindle motor 37 attached horizontally above the chassis 32 is disposed at a position inside the disk

drive 1 and below the cartridge holder 35, and a disk table 39 formed at the top end of a rotor of the spindle motor 37 is fixed horizontally to the top end of a vertical spindle 38 of the spindle motor 37. And a driving pin 40 projects from an eccentric position on the disk table 39.

Further a head shifter 41 is disposed behind the disk table 39 and over the chassis 32 in the disk drive 31.

The head shifter 41 consists of a head carriage 42, a head arm 44 attached to the top thereof via a leaf spring 43 or the like in a manner to be rotatable upward and downward, a pair of upper and lower magnetic heads 45 opposed from above and below to the upper and lower faces of fore ends of the head carriage 42 and the head arm 44, and a stepping motor (not shown) for shifting the head carriage 42.

[Floppy disk recording/reproducing operation]

In the disk drive 31 so constructed as mentioned above, when the small disk cartridge 1 is inserted horizontally through the cartridge insertion slot 34a of the front panel 34 into the cartridge holder 35 in the direction indicated by arrow c, the shutter 10 of the small disk cartridge 1 is opened by an undermentioned shutter opening/closing mechanism, and then the cartridge holder 35

is moved downward by the holder lifting mechanism while being kept in its horizontal posture. Consequently the small disk cartridge 1 is also moved downward horizontally, so that the small-diameter floppy disk 4 contained therein is magnetically chucked from above to the spindle 38 and the disk table 39 by the center core 5, and subsequently the pair of upper and lower magnetic heads 45 are inserted into the small disk cartridge 1 through the pair of upper and lower recording/reproducing windows 8 formed in the small disk cartridge 1, whereby the magnetic heads 45 are brought into contact with the upper and lower surfaces of the small-diameter floppy disk 4.

When the disk is thus loaded, the spindle 38 and the disk table 39 are inserted relatively from below into the disk table insertion opening 9 of the small disk cartridge 1, and then the center core 5 is fitted via the center hole 6 to the periphery of the spindle 38 and is chucked magnetically onto the disk table 39. And simultaneously a driving pin 40 on the disk table 39 is engaged with an eccentric hole 7 formed in the center core 35.

The pair of left and right positioning holes 17 proximate to the front edge 2a of the small disk cartridge

1 are fitted from above to a pair of left and right positioning pins 46 infixed vertically at inner positions on the chassis 32, and the rear edge 2b of the small disk cartridge 1 is mounted on a pair of left and right positioning bases 47 attached horizontally onto the chassis 32 at positions proximate to the rear edge 2b, whereby the small disk cartridge 1 is positioned horizontally on the chassis 32.

After loading the disk, the small-diameter floppy disk 4 is rotated by the spindle motor 37, while the head carriage 42 and the head arm 44 are moved together by the head shifter 41 in the direction of arrows c and d, so that the pair of upper and lower magnetic heads 45 are shifted in the directions of arrows c and d along the radial lines from the center of the small-diameter floppy disk 4 within the pair of upper and lower recording/reproducing windows 8 in the disk cartridge 1. And subsequently a recording and/or reproducing operation is performed by such magnetic heads 45 on the upper and lower surfaces of the small-diameter floppy disk 4.

When the eject button 36 is depressed in the direction of arrow c after completion of the recording and/or reproducing operation, the cartridge holder 35 is

moved upward horizontally by the holder lifting mechanism, whereby the small disk cartridge 1 is also moved upward horizontally. Then the small-diameter floppy disk 4 contained therein is separated upward from the spindle 38 and the disk table 39, and simultaneously the pair of upper and lower magnetic heads 45 are separated upward and downward from the small disk cartridge 1 respectively, and thereafter the small disk cartridge 1 is ejected by an undermentioned shutter opening/closing mechanism in the direction of arrow d from the cartridge insertion slot 34a of the front panel 34.

[Explanation of shutter opening/closing mechanism]

Referring next to Figs. 15 and 16, an explanation will be given on the shutter opening/closing mechanism attached above the cartridge holder 35.

This shutter opening/closing mechanism 51 has a substantially L-shaped shutter opening/closing lever 53 which is kept in a horizontal posture and is supported above the cartridge holder 35 through a vertical fulcrum pin 52 in a manner to be rotatable in the directions of arrows e and f within a horizontal plane, and a shutter opening/closing pin 54 is attached vertically to the fore-end lower surface of the shutter opening/closing lever 53.

The shutter opening/closing pin 54 is inserted into an opening 55 cut out substantially at the center of the rear edge 35a of the cartridge holder 35 at one end thereof in the cartridge insertion direction, and projects vertically into the cartridge holder 35. The shutter opening/closing pin 54 is held on one side of the opening 55 and is movable in the directions of arrows e and f around the fulcrum pin 52. The pin 54 is resiliently urged by an eject spring 57, which is a tension coil spring provided between the shutter opening/closing lever 53 and a spring hook 56 of the cartridge holder 35, in a manner to be movable in the direction of arrow e up to a stop position shown in Fig. 15.

As shown in Fig. 16, the opening 55 in the cartridge holder 35 is so formed as to have a relatively large area for completely opening the upper portions of the recording/reproducing windows 8 in the small disk cartridge 1 inserted fully into the cartridge holder 35.

According to this shutter opening/closing mechanism 51, when the small disk cartridge 1 inserted horizontally into the cartridge holder 35 in the direction of arrow c as mentioned has reached the depth of insertion shown in Fig. 15, the front edge 2a of the small disk

cartridge 1 is brought into contact with the shutter opening/closing pin 54 orthogonally thereto in the direction of arrow c at a right-hand position beside the shutter 10.

Thereafter the small disk cartridge 1 is further inserted continuously in the direction of arrow c up to the position of complete cartridge insertion in the cartridge holder 35 shown in Fig. 16, and until the front edge 2a is brought to a stop while being partially pressed to a cartridge stopper 35b of the cartridge holder 35, the shutter opening/closing pin 54 is pushed by the front edge 2a of the small disk cartridge 1 in the direction of arrow c, whereby the shutter opening/closing lever 53 is rotated on the fulcrum pin 52 in the direction of arrow f against the resilience of the eject spring 56.

During the above operation, the shutter opening/closing pin 54 is moved from the position denoted by a one-dot chained line in Fig. 10 to the position denoted by a solid line in the direction of arrow b along the front edge 2a of the small disk cartridge 1, so that one end 10a of the shutter 10 is pushed by the shutter opening/closing pin 54 orthogonally in the direction of arrow b.

Consequently, the shutter 10 is slid in the

direction of arrow b from the closed position denoted by a one-dot chained line in Fig. 10 to the open position denoted by a solid line against the resilience of the shutter spring. Then the shutter openings 12 of the shutter 10 are superposed at such closed position from above and below on the recording/reproducing windows 8 of the small disk cartridge 1, whereby the recording/reproducing windows 8 are opened.

Upon completion of closing the shutter 10, as denoted by a solid line in Fig. 10, the shutter opening/closing pin 54 drops into a locking recess 58 formed in a portion of the front edge 2a of the small disk cartridge 1, thereby locking the same.

And almost simultaneously with completion of closing the shutter 10, the cartridge holder 35 is moved downward horizontally as mentioned, so that the small-diameter floppy disk 4 is loaded on the spindle 38 and the disk table 39 as shown in Figs. 14A and 14B.

Due to a rotation of the shutter opening/closing lever 53 from the position of Fig. 15 to the position of Fig. 16 in the direction of arrow f, the eject spring 57 is extended to be thereby charged with a force for ejecting the small disk cartridge 1.

As described above, when the eject button 36 is depressed after termination of recording and/or reproducing the small-diameter floppy disk 4, the small disk cartridge 1 is separated upward from the spindle 38 and the disk table 39 by the cartridge holder 35, and immediately the shutter opening/closing lever 53 is rotated by the eject spring 57 in the direction of arrow e, so that the small disk cartridge 1 is ejected from the cartridge holder 35 in the direction of arrow d by the shutter opening/closing pin 54.

And almost simultaneously therewith, the shutter 10 is slid by the shutter spring 11 from the open position denoted by a solid line in Fig. 10 to the closed position denoted by a one-dot chained line in the direction of arrow a, so that the shutter openings 12 are deviated toward one side of the recording/reproducing windows 8 in the small disk cartridge 1, whereby the recording/reproducing windows 8 are closed with the shutter 10.

[Explanation of disk drive dimensions]

As shown in Fig. 12, the disk drive 31 so constructed as mentioned above is standardized in uniform dimensions which sufficiently satisfy the 3.5-inch form factors in the computer industry, wherein the width (W) is

set to 101.6 mm (4 inches) and the thickness (height) H to 25.4 mm (1 inch) respectively.

[Explanation of small disk cartridge dimensions]

Referring next to Fig. 10, an explanation will be given on the dimensions preset with regard to the small cartridge 2 contained in the small disk cartridge 1.

The width A_1 at the front edge 2a of the small cartridge 2 formed substantially to be square and the width A_2 at the rear edge 2b thereof are both set to 90.0 mm. And the space A_3 between the front edge 2a and the center of the small floppy disk 4 in its forward-backward longitudinal directions (indicated by arrows c and d) is set to 48.5 mm. The longitudinal space A_4 between the front edge 2a and each of the centers of the paired left and right positioning holes 17 is set to 17.5 mm, while the longitudinal space A_5 between the center of each positioning pole 17 and the center of the small-diameter floppy disk 4 is set to 31.0 mm. And the diameter D_1 of the small floppy disk 4 is set to 85.8 mm. The longitudinal depth A_6 between the front edge 2a and the rear edge 2b is set to 93.0 mm.

[Explanation of large disk cartridge]

Now the large disk cartridge will be explained

below with reference to Figs. 1A and 1B.

This large disk cartridge 21 is so constructed that a large-diameter floppy disk 24, which is a large-diameter disk-like recording medium composed of a magnetic sheet, is housed rotatably in the large cartridge 22, and the other structure thereof is the same as that of the small disk cartridge 1 described already.

However, the large disk cartridge 21 is contrived to be completely applicable to the aforementioned disk drive 31 adapted for the 3.5-inch form factors in the computer industry, and has an improved construction interchangeable with the small disk cartridge 1.

More specifically, the large cartridge 22 of this large disk cartridge 21 is shaped substantially into a convex where its rear edge 22b is uniformly expanded toward the left and right sides in comparison with its front edge 22a.

The width B_1 at the front edge 22a of the large cartridge 22 is set to be dimensionally the same as the width A_1 at the front edge 2a of the small cartridge 2, i.e., to 90.0 mm, while the width B_2 at the rear edge 2b of the large cartridge 22 is set to be dimensionally greater than the width A_2 at the rear edge 2b of the small

cartridge, e.g., to 98.0 mm.

However, the width B_1 at the rear edge 22a of the large cartridge 22 has a tolerance over 90.0 mm and under 101.6 mm so that this width B_1 may be dimensionally within the maximum value, i.e., 101.6 mm, of the width W of the disk drive 31 adapted for the aforementioned 3.5-inch form factors.

The width B_1 at the front edge 22a of the large cartridge 22 is set to a dimension of 90.0 mm which covers a depth B_7 in the longitudinal directions (indicated by arrows c and d) from the front edge 22a to positions beyond the pair of left and right lead-in recesses 16 and the positioning holes 17. Therefore the depth B_7 is dimensionally greater than 17.5 mm, and a lateral level difference B_8 greater than 4.0 mm is formed between a front end 22c₁ and a rear end 22c₂ of the left and right edges 22c. And a tapered face 22c₃ is formed between each front end 22c₁ and each rear end 22c₂.

Due to such a structure where the width B_2 at the rear edge 22b of the large cartridge 22 is expanded to a dimension over 90.0 mm and under 101.6 mm, the large cartridge 22 is formed substantially into a convex, whereby the diameter D_2 of the large floppy disk 24 housed

rotatably therein can be extended with facility up to a dimension of, e.g., 94.0 mm which is greater than the diameter D_1 of 85.8 mm of the small floppy disk.

Since the large disk cartridge 21 is so constructed that the diameter D_2 of the large floppy disk 24 housed therein is extended from 85.8 mm to 94.0 mm, it becomes possible to increase the data recording capacity of the large-diameter floppy disk 24 to consequently realize a large-capacity disk cartridge.

However, as this large disk cartridge 21 is formed to be interchangeable with the small disk cartridge 1, a longitudinal space B_3 between the front edge 22a of the large cartridge 22 and the center of the large-diameter floppy disk 24 is set to a dimension of 48.5 mm which is equal to the corresponding space A_3 in the small cartridge 2.

Similarly, a longitudinal space B_4 between the front edge 22a and each of the pair of left and right positioning holes 17 is set to be equal to the corresponding space A_4 having a dimension of 17.5 mm in the small cartridge 2. Further a longitudinal space B_5 between the center of each positioning hole 17 and the center of the large-diameter floppy disk 24 is set to be equal to the

corresponding space A_5 having a dimension of 31.0 mm in the small cartridge 2.

However, a longitudinal depth B_6 between the front edge 22a and the rear edge 22b of the large cartridge 22 may be extended to a value slightly greater than a dimension of 93.0 mm which is the corresponding depth A_6 of the small cartridge. It is to be noted that the thicknesses of the small and large cartridges 2 and 22 are not limited to any specified values.

[Comparison of recording capacities of small-diameter floppy disk and large-diameter floppy disk]

Next a comparison will be made between the capacities of recording data in the small-diameter floppy disk 4 and the large-diameter floppy disk 24.

First, an annular recording area of the small floppy disk 4 with the diameter D_1 of 85.8 mm is so formed as to have an innermost circumferential radius of 23.0 mm and an outermost circumferential radius of 39.5 mm, so that the recording area thereof becomes 3240 mm².

Meanwhile an annular recording area of the large floppy disk 24 with the diameter D_2 of 94.0 mm is so formed as to have an innermost circumferential radius of 23.0 mm, but since its outermost circumferential radius is

extendable to 43.5 mm, the recording area thereof can be increased up to 4289 mm².

Consequently, the recording area of the large-diameter floppy disk 24 can be increased 1.32 times in comparison with the recording area of the small-diameter floppy disk 24.

As a result, in one example where the small-diameter floppy disk 4 has a recording capacity of 1.44 MB (megabytes), the recording capacity of the large-diameter floppy disk 24 can be increased to 1.9 MB (megabytes). In another example where the small-diameter floppy disk 4 has a recording capacity of 80 MB, the recording capacity of the large-diameter floppy disk 24 can be increased to 105 MB. And in a further example where the small-diameter floppy disk 4 has a recording capacity of 500 MB, the recording capacity of the large-diameter floppy disk 24 can be increased to 660 MB.

[Explanation on measures for disk drive]

Referring now to Figs. 2 to 9, an explanation will be given below with regard to some measures for interchangeability between the small disk cartridge 1 and the large disk cartridge 21 in the aforementioned disk drive 31.

First, as shown in Figs. 2 and 3, both side edges 35c of the metal-sheet cartridge holder 35 are shaped by press working in conformity with the substantially convex external dimensions of the large cartridge 22 of the large disk cartridge 21, and rear ends 35c₁ (in the direction to insert the cartridge) of the left and right side edges 35c are drawn inside toward the center P₂ of the cartridge holder in a manner to form a pair of left and right parallel centering guides 61 each having a width B₁ (A₁) and a depth B₇. Meanwhile, front ends (in the direction to eject the cartridge) 35c₂ of the left and right side edges 35c are so shaped as to have a width B₂, and a pair of left and right tapered faces 62 are formed at the ends of the left and right centering guides 61 on the cartridge ejection side thereof.

Accordingly, when the small disk cartridge 1 is inserted into the cartridge holder 35 of the disk drive 31 horizontally in the direction of arrow c from the front edge 2a of the small cartridge 2 as shown in Fig. 3, the front edge 2a of the small cartridge 2 is guided by the pair of left and right tapered faces 62 formed at the two side edges 35c of the cartridge holder 35, whereby the small disk cartridge 1 is inserted inside the pair of left

and right center ring guides 61. Thereafter the front edge 2a of the small cartridge 2 is brought to a stop at the position of complete insertion while being partially pressed against the cartridge stopper 35b.

At this time, the cartridge center P_1 of the small cartridge 2 is positioned on the center P_2 of the cartridge holder 35 by the centering action of the pair of left and right centering guides 61, so that the center of the small-diameter floppy disk 4 is positioned correctly on the center of the spindle 38.

Subsequently, the cartridge holder 35 is moved downward horizontally as mentioned, whereby the center core 5 of the small-diameter floppy disk 4 is mounted on the spindle 38 and the disk table 39, and simultaneously the small cartridge 2 is placed horizontally on the pair of left and right positioning bases 47 while its pair of left and right positioning holes 17 are fitted to the pair of left and right positioning pins 46, so that the small cartridge 2 is loaded exactly at the proper position.

When the small disk cartridge 1 is inserted horizontally into the cartridge holder 35 in the direction of arrow c, the shutter 10 of the small disk cartridge 1 is opened by the shutter opening/closing mechanism 51 shown in

Figs. 15 and 16.

Next, when the large disk cartridge 21 is inserted into the same cartridge holder 35 of the same disk drive 31 horizontally in the direction of arrow c from the front edge 22a of the large disk cartridge 22 as shown in Fig. 2, the front edge 22a of the large cartridge 22 is guided by the pair of left and right tapered faces 62 formed at the two side edges 35c of the cartridge holder 35, whereby the large disk cartridge 21 is inserted inside the pair of left and right center ring guides 61. Thereafter the front edge 22a of the large cartridge 22 is brought to a stop at the position of complete insertion while being partially pressed against the cartridge stopper 35b.

At this time also, the cartridge center P_1 of the small cartridge 22 is positioned on the center P_2 of the cartridge holder 35 by the centering action of the pair of left and right centering guides 61 as in the foregoing case of the small cartridge 2, so that the center of the small-diameter floppy disk 24 is positioned correctly on the center of the spindle 38.

Regarding the large cartridge 22, substantially the entire longitudinal lengths of the left and right side edges 22c thereof can be centered by the pair of left and

right centering guides 61 and the entire longitudinal lengths of the left and right side edges 35c of the cartridge holder 35.

Subsequently, the cartridge holder 35 is moved downward horizontally as mentioned, whereby the center core 5 of the large-diameter floppy disk 24 is mounted on the spindle 38 and the disk table 39 as in the foregoing case of the small cartridge 2, and simultaneously the large cartridge 22 is placed horizontally on the pair of left and right positioning bases 47 while its pair of left and right positioning holes 17 are fitted to the pair of left and right positioning pins 46, so that the large cartridge 22 is loaded exactly at the proper position.

Also when the large disk cartridge 21 is inserted into the cartridge holder 35 in the direction of arrow c, as shown in Figs. 4 and 5, the shutter 10 of the large disk cartridge 21 can be opened by the aforementioned shutter opening/closing mechanism 51 as in the foregoing case of the small disk cartridge 1.

As illustrated in Fig. 4, the longitudinal length L of the pair of left and right centering guides 61 is set to be greater than the longitudinal motion stroke S of the shutter opening/closing pin 54 denoted by a solid line and

a one-dot chained line in Fig. 4, and one end 61a of each of the centering guides 61 on the cartridge ejection side thereof indicated directionally by an arrow d is so disposed as to project in the direction of arrow d beyond the stop position of the shutter opening/closing pin 54 denoted by a solid line in Fig. 4 and on the side indicated arrow d.

As a result, when the small or large disk cartridge 1 or 21 is selectively inserted into the cartridge holder 35 in the direction of arrow c, the front edge 2a or 22a of the small or large disk cartridge 1 or 21 can be centered by the pair of left and right centering guides 61 before being pressed against the shutter opening/closing pin 54 in the direction of arrow c.

And during the process where the small or large disk cartridge 1 or 21 is further inserted deep into the cartridge holder 35 in the direction of arrow c while being centered continuously, the front edge 2a or 22a presses the shutter opening/closing pin 54 in the direction of arrow c to thereby open the shutter 10 as described.

Consequently, the operation of opening the relevant shutter 10 can be performed correctly without fail while another operation of centering the small or large

disk cartridge 1 or 21 is performed with certainty.

[Explanation for preventing erroneous insertion of large disk cartridge]

As described with reference to Fig. 2, a proper insertion of the large disk cartridge 21 into the cartridge holder 35 is achieved by inserting the front edge 22a of the large cartridge 22 in the direction of arrow c.

However, if the large disk cartridge 21 is erroneously inserted into the cartridge holder 35 in such a manner that the forward-backward longitudinal direction thereof is reverse with the rear edge 22b of the large cartridge 22 turned in the direction of arrow c, the rear edge 22b of the large cartridge 22 butts against the pair of left and right tapered faces 62 before the pair of left and right centering guides 61, whereby further insertion is rendered impossible. Therefore, erroneous insertion of the large disk cartridge 21 can be prevented in advance.

[Consideration on centering guides]

The pair of left and right centering guides 61 of the cartridge holder 35 may be formed by press working integrally with the left and right side edges 35c of the metal-sheet cartridge holder 35 as shown in Figs. 2 and 3, or such centering guides 61 molded of synthetic resin or

the like may be anchored in parallel to the two side positions of the rear edge 35a inside the cartridge holder 35 as shown in Fig. 6, whereby the structure can be simplified with another advantage of reducing the production cost. These fixed centering guides 61 may be formed by a combination of plural guide pins or the like as well.

In another modified structure shown in Figs. 7 to 9, the pair of left and right centering guides 61 molded of synthetic resin or the like are attached to the inside of the cartridge holder 35 in a manner to be slidable in the longitudinal directions of arrows c and d, and such centering guides 61 are urged resiliently by a pair of left and right guide springs 63 which are tension springs or the like to slide the centering guides 61 in the cartridge ejecting direction indicated by arrow d.

In this case, when the large disk cartridge 21 is inserted horizontally into the cartridge holder 35 in the direction of arrow c as shown in Fig. 8, the front edge 22a of the large cartridge 22 is centered by the pair of left and right centering guides 61, while these centering guides 61 are pushed in the direction of arrow c, against the resilience of the guide springs 63, by the tapered faces

22c₃ formed along the two side edges 22c of the large cartridge 22.

On the other hand, when the small disk cartridge 1 is inserted horizontally into the cartridge holder 35 in the direction of arrow c as shown in Fig. 9, the small cartridge 2 can be inserted between the pair of left and right centering guides 61 in the direction of arrow c to be thereby centered while the centering guides 61 are slidably urged in the direction of arrow c by the resilience of the guide springs 63.

According to the disk cartridge of the present invention having the above-described structure, the following advantageous effects are attainable.

First, the cartridge containing a disk-like recording medium rotatably therein is so shaped that the width of at least its rear edge is set to be more than 90.0 mm but less than 101.6 mm, and the diameter of the disk-like recording medium is easily extendable in excess of 85.8 mm. Consequently, although the disk cartridge is essentially constructed to be applicable to the disk drive adapted for the 3.5-inch form factors, its data recording capacity can be increased with facility due to the reason that the diameter of the disk-like recording medium is

enlarged in comparison with the related art 3.5-inch floppy disk or the like, whereby a larger-capacity disk cartridge is realizable.

Next, the diameter of the disk-like recording medium is enlarged in comparison with the related art 3.5-inch floppy disk, but the longitudinal space between the center of the disk-like recording medium and the center of each of the paired left and right positioning holes formed in the lower surface of the front edge of the cartridge is set to 31.0 mm which is the same as the corresponding dimension in the related art 3.5-inch floppy disk cartridge, hence achieving desired interchangeability with the related art 3.5-inch floppy disk cartridge or the like.

Moreover, although the diameter of the disk-like recording medium is enlarged in comparison with the related art 3.5-inch floppy disk, the width at the front edge of the cartridge is set to 90.0 mm which is the same as the corresponding dimension in the related art 3.5-inch floppy disk cartridge, whereby desired interchangeability is attainable with the related art 3.5-inch floppy disk cartridge or the like.

Further, regardless of the structure where the diameter of the disk-like recording medium is enlarged in

comparison with the related art 3.5-inch floppy disk, the width at the front edge of the cartridge is set to 90.0 mm over more than the longitudinal depth from at least the front edge of the cartridge to the pair of left and right lead-in recesses, hence achieving desired interchangeability with the related art 3.5-inch floppy disk cartridge or the like.

More specifically, the cartridge can be exactly centered or positioned, when it is loaded in the related art 3.5-inch floppy disk drive, by directly utilizing the function of the centering guides in the cartridge holder or the function of the positioning pins on the chassis.

In addition, the disk-like recording medium is composed of a magnetic sheet, so that it becomes possible to realize a large-capacity floppy disk cartridge adapted for the 3.5-inch form factors.

Although the present invention has been described above with regard to some preferred embodiments thereof, it is to be understood that the present invention is not limited merely to such embodiments shown in the accompanying drawings, and a variety of modifications may be contrived on the basis of the technical concept of the invention.

For example, a disk-like recording medium applicable to the present invention is not limited to the shown floppy disk composed of a magnetic sheet, and it may be any of various disk-like recording media each adapted for recording and/or reproducing data by the use of, e.g., an optical disk or a magneto-optical disk.

The scope of the invention, therefore, is to be determined solely by the appended claims.



WHAT IS CLAIMED IS:

1. A disk cartridge comprising:
 - a disk-like recording medium;
 - a cartridge where said disk-like recording medium is housed rotatably;
 - a recording/reproducing window open at least in a lower surface of said cartridge substantially in a center portion of the front edge thereof;
 - a shutter attached to be slidable laterally along the front edge of said cartridge so as to open or close said recording/reproducing window; and
 - a disk table insertion hole open substantially in the center portion of at least the lower surface of said cartridge;

wherein a lateral width of at least the rear edge of said cartridge is set to be more than 90.0 mm but less than 101.6 mm, and the diameter of said disk-like recording medium is set to be more than 85.8 mm.
2. A disk cartridge according to claim 1, wherein a pair of positioning holes are formed at left and right side positions in the lower surface of the front edge of said cartridge, and a longitudinal space between the center of said positioning hole and the center of said disk-like



recording medium is set to 31.0 mm.

3. A disk cartridge according to claim 1 or 2, wherein the lateral width at the front edge of said cartridge is set to 90.0 mm.

4. A disk cartridge according to claim 3, further comprising a pair of lead-in recesses formed astride the corner portions of the lower surface of the front edge of said cartridge and the left and right side edges thereof; wherein the lateral width at the front edge of said cartridge is set to 90.0 mm over more than the longitudinal depth from at least the front edge thereof to said lead-in recesses.

5. A disk cartridge according any of claims 1 to 4, wherein said disk-like recording medium is composed of a magnetic sheet.