PICKUP FEED MECHANISM FOR DISC-TYPE RECORDING MEDIUM PLAYERS

BACKGROUND OF THE INVENTION

1) Field of the Invention

This invention relates to a pickup feed mechanism for feeding a pickup unit of a disc-type recording medium player.

2) Description of the Prior Art

In disc-type recording medium players for reproducing the information recorded or stored in a disc-type recording medium such as a compact disc or the like, a laser beam is irradiated from a pickup unit onto a recording surface of the recording medium while being rotated so as to read out the information from the recording medium based on the intensity of light rays reflected from the recording surface.

In this instance, while keeping the pickup unit at rest, the oblique angle of an objective lens is continuously changed to shift the direction of irradiation of the laser beam continuously in a radial outward direction of the recording medium, thereby reading out the information. When the amount of shift of the direction of laser irradiation becomes equal to a predetermined value (0.5 mm, for example), the pickup unit is fed in the radial outward direction (pitch

feeding). The foregoing cycle of operation is repeated until a desired reproduction of the recorded information is achieved. During the pitch feeding of the pickup unit, the objective lens is moved rapidly to search the positional information of the pickup unit while at the same time the pickup unit is abruptly jogged to reciprocate back and forth until its arrival at the next scanning position. To this end, in mounting the objective lens, a necessary consideration is given to the objective lens's capability in undertaking such an extremely rapid movement within the pickup unit.

The known players of the type described above include a pickup feed mechanism, such as shown in Figures 7 and 8 of the accompanying drawings. The conventional pickup feed mechanism includes a pickup feed screw a, a nut c held in threaded engagement with the pickup feed screw a and mounted on a part of a pickup unit b, and a drive motor d for rotating the pickup feed screw a to feed the pickup unit b along a straight guide rod e. The nut c is engageable with a connecting portion g extending from a body f of the pickup unit b, but it is spaced from the connecting portion g by a small gap or clearance h. The gap h is provided in a direction of rotation of the nut b so as

to avoid negative influences excerted on the positioning accuracy of the pickup unit b which would otherwise occur when the guide rod e and the pickup feed screw a are out of accurate parallelism due to difficulty in assembly.

Owing to the gap h provided between the connecting portion g and the nut c, the nut c is oscillated in circumferential direction when the motor d is driven to repeat its rotation in forward and reverse directions at short period of intervals to search the position of the pickup unit b. As a consequence of this oscillation, the nut c produces vibrations which are in turn transmitted to the body f of the pickup unit b concurrently with an impact shock or chattering produced when the nut c impinges against the connecting portion g.

Due to the thus-transmitted vibrations, an objective lens i which is mounted in the pickup unit b is caused to be shaked or vibrated abruptly with the result that the reading of the information from the recording surface requires a long period of time and sometimes becomes impossible.

SUMMARY OF THE INVENTION

With the foregoing difficulties in view, it is accordingly an object of the present invention to

provide a pickup feed mechanism for disc-type recording medium players, which is capable of operating smoothly and reliably to thereby enable a rapid and accurate reading-out of the information from the recording surface of a disc-type recording medium.

According to the present invention, there is provided a pickup feed mechanism for a disc-type recording medium player including a pickup unit, comprising:

at least one guide rod slidably supporting thereon the pickup unit;

a connecting portion connected to a body of the pickup unit;

a nut loosely but non-rotatably received in a portion of said connecting portion and slightly movable relative to said connecting portion until its engagement with said connecting portion; and

a power-driven pickup feed screw extending parallel to said guide rod and held in threaded engagement with said nut, said pickup feed screw being drivingly rotatable to feed the pickup unit along said guide rod, and a resilient member is disposed on said connecting portion engageable with said nut for

concurrently applying a resilient pressure to urge said nut in the radial direction of said feed screw and a resilient resistance tending to prevent rotation of said nut, characterized in that said nut is arranged on a connecting portion extending out from a main body of said pickup unit to permit limited movement of said nut in the direction of rotation of said feed screw and in the direction of movement of said pickup unit.

With the resilient member disposed on the connecting portion, the nut is continuously subjected to the radial resilient pressure and the resilient resistance to rotation. Consequently, the nut is closely fitted with the pickup feed screw without intervention of a clearance therebetween and can be moved in the longitudinal direction of the pickup feed screw without causing undesired oscillation in the circumferential direction of the same.

Many other advantages and features of the present invention will become manifest to those versed in the art upon making reference to the detailed description and the accompanying sheets of drawings in which preferred structural embodiments incorporating the principles of the present invention are shown by way of illustrative example.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view, with parts cut away for clarity, of a disc-type recording medium player in which the present invention is embodied;

Figure 2 is a perspective bottom view of a pickup feed mechanism according to the present invention;

Figure 3 is a cross-sectional view taken

along line III - III of Figure 2;

Figure 4 is a cross-sectional view taken along line IV - IV of Figure 1;

Figure 5 is a view similar to Figure 4, but showing a second embodiment of the present invention;

Figure 6 is a view similar to Figure 4, but showing a third embodiment of the present invention;

Figure 7 is a perspective bottom view showing a conventional pickup feed mechanism; and

Figure 8 is a plan view showing a nut of the conventional pickup feed mechanism.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

Certain preferred embodiments of the present invention will be described hereinafter in detail with reference to Figures 1 through 6.

Referring now to Figure 1, there is shown a disc-type recording medium player 1 in which the present invention is emdodied. The player 1 includes a playback or reporducing unit 2 disposed at a substantially central portion of the player 1. As in the conventional reproducing units, this reproducing unit 2 comprises a motor 3, a turntable 4 drivingly rotated by the motor 3, a clamper 5 and a pickup unit 6.

The motor 3 is secured to the underside of a base plate 7 by a pair of mounting screws 8, 8. The

motor 3 has a drive shaft 9 projecting upwardly into the uppr side of the base plate 9 for co-rotatably supporting thereon the turntable 4.

The clamper 5 is held on a support plate 10 via holder 11 in confronting relation to the turntable 4. The support plate 10 is disposed above the base plate 7 and movable in a direction parallel to the axis of the drive shaft 9. The holder 11 is composed of a leaf spring.

The pickup unit 6, as shown in Figures 2 and 3, includes a generally rectangular body 13 having an objective lens 12 mounted therein at the upper end of the body 13. To the body 13, a frame-like connecting portion 14 is secured by a pair of set screws 22, 22. The connecting portion 14 extends laterally outwardly from one side of the rectangular body 13 and is held in driven engagement with a nut 15 which is loosely but non-rotatably received in a recess (not designated) fromed in the connecting portion 14 adjacent to the distal end thereof. The thus-received nut 15 is slightly movable in a circumferential and an axial direction of the same until its engagement with the connecting portion 14.

The base plate 7 supports on its underside a pair of opposedly disposed puckup support blocks 16a,

16b secured to the base plate 7 by means of non-ullustrated screws, as shown in Figure 2. A pair of parallel spaced guide rods 17a, 17b extends between the guide rods 17a, 17b through a pair of guide holes 18a, 18b, respectively, in the body 13 so that the pickup unit 6 is reciprocally movable in a plane extending parallel to the underside of the base plate 7. The guide hole 18a which is slidably fitted with the guide rod 17a has a circular cross-sectional shape and serves as a main guide in cooperation with the guide rod 17a. On the other hand, the guide hole 18b slidably receiving therein the guide rod 17b has an oblong cross-sectional shape and serves as an auxiliary guide in cooperation with the guide rod 17b. The pickup support blocks 16a, 16b further support thereon a pickup feed screw 19 extending parellel to the guide rods 17a, 17b and held in threaded engagement with the nut 15 which is engageably received in the connecting portion 14 with a small gap or clearance defined therebetween. The connecting portion 14 is provided on its underside with a resilient member 20. The resilient member 20 is formed of a leaf spring and has a T-shaped configuration composed of a transverse head 20a and a longitudinal stem 20a extending perpendicularly from a central portion of the head 20a,

the stem 20a terminating in a bent end portion (or lateral projection) 21. The transverse head 20a is secured at its opposite ends to the underside of the body 13 by means of the set screws 22. The distal end portion of the longitudinal stem 20b including the lateral projection 21 underlies a lower peripheral wall portion of the nut 15. The nut 15 has in its lower peripheral wall portion a V-shaped notch or recess 23 extending in a direction parallel to the axis of the nut 15. The V-shaped recess 23 interlockingly receives therein the bent end portion 21 of the longitudinal stem 20b in which instance the bent end portion 21 is urged against the bottom of the V-shaped recess 23 under the resiliency of the longitudinal stem 20b. The resilient member 20 thus arranged concurrently applies a resilient force or pressure tending to urge the nut 15 in the radial direction of the pickup feed screw 19 and a resilient resistance tending to prevent movement of the nut 15 in a circumferential direction which would otherwise occur when the pickup feed screw 19 is rotated. The upper portion of the body 13 of the pickup unit 6 projects into the upper side of the base plate 7 through an elongate opening 7a which is formed in the base plate 7 and extends parallel to the pickup feed screw 19 for the passage of the upper portion of

the body 13. With this construction, when the pickup feed screw 19 is rotated in forward and reverse directions, the pickup unit 15 is reciprocally moved along the guide rods, 17a, 17b in the directions indicated by the arrows A and B in Figures 2 and 3 under a feed action of the pickup feed screw 19 exerted on the nut 15.

The pickup feed screw 19 has opposite end portions journaled on a pair of bearings 24, 25 formed integrally with the respective pickup support blocks 16a, 16b. One end of the pickup feed screw 19 is firmly connected to a pulley 26 which is driven by a feed motor 27 via an endless belt 28 to thereby rotate the pickup feed screw 19 through a predetermined amount of angular distance so as to achieve the pitch feeding of the pickup unit 6. In Figure 1, denoted at 29 is a disc rack for holding therein a plurality of disc-type recording mediums, and at 30 a disc drawer mechanism for withdrawing a desired disc-type recording medium from the disc rack 29 and setting the same onto the turntable 4.

The disc-type recording medium player 1 of the foregoing construction operates as follows. After a disc-type recording medium 31 (see Figure 4) is set on the turntable 4, the clamper 5 is lowered to grip

the disc-type recording medium 31 by and between the clamper 5 and the turntable 4. Then the motor 3 is driven to rotate the turntable 4 and consequently, the disc-type recording medium 31. At the same time, the feed motor 27 is driven to rotate the pickup feed screw 19 for moving the pickup unit 6 stepwise by a constant distance along the guide rods 17a, 17b.

During the movement of the pickup unit 6, the nut 15 is continuously urged in the radial direction of the pickup feed screw 19 by the resilient force or pressure exerted from the resilient member 20 while at the same time the nut 15 is also subjected to a resilient resistance tending to prevent movement of the nut 15 in the circumferential direction thereof. With these resilient forces, the nut 15 is prevented from oscillating circumferentially even when the forward and reverse rotations of the feed motor 27 are frequently repeated at short period of intervals.

Owing to the resilient pressure tending to urge the nut 15 in the radial direction of the pickup feed screw 19, the nut 15 is held into close fitting engagement with the pickup feed screw 19 without intervention of a clearance therebetween. With this clearance-free fitting engagement, the nut 15 is smoothly and stably movable in the logitudinal

direction of the pickup feed screw 19 in immediate response to the rotation of the pitch feed screw 19.

Figure 5 shows a second embodiment of the present invention wherein a half nut 15a is employed in place of the usual round nut 15, for facilitating the assembly of a pickup feed mechanism.

Figure 6 illustrates a third embodiment of the present invention wherein a half nut 15a identical to the half nut 15a of the second embodiment is incorporated in a pickup feed mechanism. This embodiment differs from the second embodiment in that a resilient member 20' is integrally formed with a connecting portion 14a molded of a resilient synthetic resin. With this integral formation of the resilient member 20' and the connecting portion 14a, the number of components of the player can be reduced.

All other structual and functional details of each of the second and third embodiments are the same as those already described with the first embodiment shown in Figures 1 through 4. With this structural and functional similarity in view, those parts which correspond to those shown in Figures 1 through 4 are denoted by corresponding reference characters and a further description is not necessary.

As described above, the present pickup feed

mechanism for disc-type recording medium players includes a resilient member which is disposed on a connecting portion for concurrently applying a resilient force or pressure tending to urge a nut in the radial direction of a mating pickup feed screw and a resilient resistance tending to prevent movement of the nut in the circumferential direction of the same. The thus resiliently biased nut is prevented from oscillating or vibrating in the circumferential direction even when a feed motor is repeatedly driven to rotate alternately in forward and reverse directions at a short cycle time. As a result, an undesired chattering between the nut and the connecting portion can be avoided. Thus, even with the presence of a small gap or clearance between the pickup feed screw and the nut, only a negligible amount of vibration and impact shock is produced in the vicinity of the nut. Therefore, an objective lens which is mounted in the pickup unit is substantially free from vibration and hence capable of reading out the information rapidly and reliably from the recording surface of a disc-type recording medium.

Furthermore, owing to the resilient pressure tending to urge the nut in the radial direction of the pickup feed screw, the nut is held in close fitting

engagement with the pickup feed screw without intervention of a clerance therebetween. With this clearance-free fitting engagement, the nut can be moved longitudinally of the pickup feed screw in immediate response to the rotation of the latter. Consequently, the pickup unit is movble in response to the rotation of the feed motor without delay, thus providing an improved degree of accuracy in reading out the information.

Obviously, various modifications and variations of the present invention are possible in the light of the above teaching. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.



CLAIMS:

1. A pickup feed mechanism for disc-type recording medium player including a pickup unit, comprising:

at least one guide rod slidably supporting thereon the pickup unit;

a connecting portion connected to a body of the pickup unit;

a nut loosely but non-rotatably received in a portion of said connecting portion and slightly movable relative to said connecting portion until its engagement with said connecting portion; and

a power-driven pickup feed screw extending parallel to said guide rod and held in threaded engagement with said nut, said pickup feed screw being drivingly rotatable to feed the pickup unit along said guide rod, and a resilient member is disposed on said connecting portion engageable with said nut for concurrently applying a resilient pressure to urge said nut in the radial direction of said feed screw and a resilient resistance tending to prevent rotation of said nut, characterized in that said nut is arranged on a connecting portion extending out from a main body of said pickup unit to permit limited movement of said nut in the direction of

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rotation of said feed screw and in the direction of movement of said pickup unit.

2. A pickup feed mechanism according to

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claim 1, said nut having in its peripheral surface a recess, said resilient member having a projection interlockingly engageable with said recess.

3. A pickup feed mechanism according to claim 2, said recess comprising a V-shaped notch extending in a direction parallel to the axis of said nut.

4. A pickup feed mechanism according to claims 2 or 3, said resilient member comprising a leaf spring extending outwardly from said connecting portion and terminating in a bent end portion received in said recess.

5. A pickup feed mechanism according to any one of the preceding claims 1 through 4, said resilient member being integral with said connecting portion.

6. A pickup feed mechanism according to claim 5, said connecting portion and said resilient member being integrally molded of a resilient synthetic resin.

7. A pickup feed mechanism according to any one of the preceding claims 1 through 6, said nut comprising a half nut.

8. A pickup feed mechanism substantially as hereinbefore described with reference to and as illustrated in Figures 1 and 4 of the accompanying

drawings.

9. A pickup feed mechanism substantially as hereinbefore described with reference to and as illustrated in Figures 1 and 4 modified as in Figure 5 of the accompanying drawings.

10. A pickup feed mechanism substantially as hereinbefore described with reference to and as illustrated in Figures 1 and 4 modified as in Figure 6 of the accompanying drawings.