FRICTION REDUCTION MEMBER IN A CASSETTE

BACKGROUND OF THE INVENTION

1. Field of the invention

The present invention relates to a friction reduction member in a cassette provided between both/or one of the shells of the cassette and a magnetic tape housed in the cassette for reducing friction to be produced between the shells and the magnetic tape.

2. Description of the Prior Art

Fig. 4 shows a prior cassette, so-called digital record/play audio tape (DAT cassette). The cassette comprises a box-tape case composed of a lower shell 2 and an upper shell 1 vertically laid over the lower shell 2, a pair of hubs 6, 6 rotatably mounted within the box-type case, a magnetic tape 5 wound around a pair of hubs 6, 6 and interposed between the upper and lower shells 1, 2, and a thin friction sheet 7 inserted between the magnetic tape 5 and the upper and lower shells 1, 2.

As shown in Fig. 4, the prior friction sheet 7 employed in the prior cassette is disposed between the lower shell 2 and the magnetic tape 5 and is flat shape having no concave and convex portions, or disposed between the upper shell 1 and the magnetic tape 5 and having a projection 8 at the side of the magnetic tape 5. In the latter sheet, two projections 8, 8 are defined in parallel across a pair of hub holes 9, 9 in the manner to hold the hub holes 9, 9. The projections 8, 8 contact with the magnetic tape 5 at two portions as shown in Fig. 5.

However, the flat friction sheet has a problem in that it does not contact with the magnetic tape 5 at the fixed portion. Another problem is that the portion producing the friction between the magnetic tape and the friction sheet is unevenly distributed at a specific portion, or it is varied whereby a torque resistance applied to the hubs 6, 6 is likely to be varied. The friction sheet having projections has a problem in that although a portion contacting with the magnetic tape 5 is limited to the specific one, resilience of the friction sheet 7 is gradually deteriorated in its quality and the projections 8, 8 and other portions of the friction sheet 7 are liable to be deformed which results in allowing the portion contacting with the magnetic tape to the unstable whereby the same problems like the flat friction sheet just mentioned above will occur.

Since the prior friction reduction sheet is flat and flexible the position where the friction reduction sheet contacts with the hub or the magnetic tape is varied in each occasion.

That is, inasmuch as the prior friction reduction sheet contacts with in some case or does not contact with in another case with the hub or the magnetic tape, the position where the friction reduction sheet contacts with the hub or the magnetic tape, namely the position where the friction resistance generates is varied in each occasion so that the resistance torque to be generated when the magnetic tape is rotated is varied. Furthermore, inasmuch as the friction reduction sheet is flat, the friction reduction sheet has no function to vertically support the magnetic tape.

The other prior friction reduction sheet having a projection always contacts with the hub or the magnetic tape at the projection. Hence, the position where the projection of the friction reduction sheet contacts with the hub or the magnetic tape is not varied in each occasion so that the

substantially constant resistance torque is obtained when the hub is rotated. Furthermore, the friction reduction sheet can vertically support the magnetic tape due to the elasticity of the projection of the friction reduction sheet. However, since the friction reduction sheet is made of a thin and flexible sheet the elasticity is gradually lost as the shape of the projection is gradually collapsed the function set forth above will be remarkably lost.

The friction sheets 7, 7 are inserted to prevent the magnetic tape 5 from directly contacting with the shells 1, 2 having a greater friction force and to reduce the friction resistance. Accordingly, it is preferable to reduce the friction resistance between the friction sheets 7, 7 and the magnetic tape 5, especially to reduce a torque resistance applied to the hubs 6, 6 caused by the friction between the friction sheet 7 and the magnetic tape 5.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a friction reduction member enabling to reduce a friction resistance applied to a magnetic tape 15 and stabilize a torque resistance applied to the magnetic tape 15 caused by the friction resistance so that the magnetic tape 15 is stably and surely rotatable in smooth for solving the problems in the prior friction sheet.

To achieve the above object, the disclosed friction reduction member is shaped of a pair of rod member, and is provided between both or one of the upper and lower shells 11, 12 and the magnetic tape 15 each is wound around a pair of hubs 16, 16 in the manner to hold the hubs 16, 16, that is are arranged to hold the hole and contact with the hub, namely, arranged in confronted with each other relative to the hub hole and contact with the hub.

According to the present invention there is provided a cassette comprising a case with an upper shell and a lower shell, a pair of hubs being mounted within the case, a magnetic tape being wound around the hubs, and a friction reduction apparatus which friction reduction apparatus comprises a rigid elongate friction reduction member positionable within the case adjacent at least one hub so as to contact the hub and/or the magnetic tape.

The friction reduction member according to one embodiment of the present invention has a pair of rod shaped members which are arranged in confronted relation relative to the hub hole in parallel with each other in order to contact with the hub. Accordingly, the hub or the magnetic tape always contacts with the peripheral surface of the rod shaped friction reduction members, whereby the position where the friction reduction members contact with the hub or the magnetic tape is not varied in each occasion, and the substantially constant resistance torque is generated. Furthermore, since the friction reduction member is a rigid rod shaped member there does not generate a deterioration of elasticity of the rod shaped reduction member due to collapse of the shape of the rod shaped member.

Inasmuch as the friction reduction member 18 is not flat but rod shaped, the friction reduction member 18 is not deformed like the prior flat friction sheet so that the portion contacting with the magnetic tape 15 is not unstable and the friction reduction member 18 always contacts with the magnetic tape 15 and/or the hub 16 at the fixed portion thereof along the rod shaped friction reduction member without contacting with the magnetic tape 15 at the surface thereof. Accordingly the friction resistance applied to the magnetic tape 15 is reduced as a whole, and also a torque

resistance applied to the magnetic tape 15 caused by the friction resistance is stabilized. As a result, a smooth and safe rotation of the magnetic tape 15 is assured.

The above and other objects, features and advantages of the present invention will become more apparent from the following description taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a plan view showing a cassette with an upper shell thereof being omitted according to an embodiment of the present invention;

Fig. 2 is an enlarged cross sectional view of a friction reduction member according to an embodiment of the present invention along II-II of Fig. 1;

Fig. 3(a) is an enlarged plan view showing one end of a friction reduction member engaged with a projection provided at a side surface of a shell according to an embodiment of the present invention;

Fig. 3(b) is an enlarged plan view of showing one end of a friction reduction member engaged with a bearing provided at a side surface of a shell according to another embodiment of the present invention;

Fig. 3(c) is an enlarged longitudinal cross sectional side view showing one end of a friction reduction member engaged in a groove provided at a bottom surface of a shell according to still another embodiment of the present invention;

Fig. 4 is an exploded perspective view of a prior cassette shown from the bottom side thereof; and

Fig. 5 is a cross sectional view of prior cassette taken along V-V in Fig. 4.

DESCRIPTION OF THE PREFFERED EMBODIMENT

An arrangement of a friction reduction member according to an embodiment of the present invention will be described with reference to Figs. 1 through 3. The arrangement of a cassette is substantially same as the prior cassette, namely, the cassette comprising a box type case composed of an upper shell (not shown in Figs. 1 through 3), and a lower shell 12 vertically laid over the upper shell 11, a magnetic tape 15 wound around a pair of hubs 16, 16 respectively rotatably mounted on a hub bearing (not shown) provided at hub holes 14, 14.

The friction reduction member employed in the present invention is arranged in the manner to hold the hubs 16, 16. The friction reduction member 18 as shown in Fig. 1 is hollow and straight, and comprising a pair of ones across the hub holes 14, 14 which are provided at the lower shell 12 in parallel with each other. A pair of friction reduction members 18, 18 contact linearly with the magnetic tape 15 by engaging the hub 16, 16 having the magnetic tape 15 wound therearound with the hub holes 14, 14.

Although it is possible to arrange the rod shaped friction reduction members 18, 18 to contact with only the magnetic tape 15, it is preferrable to arrange the rod shaped friction reduction members 18, 18 to contact with the hubs 16, 16 at a portion thereof so that the advantage of the present invention will be carried out effectively.

The friction reduction members 18, 18 can be naturally arranged between the upper shell and the magnetic tape 15. The friction reduction members 18, 18 are arranged laterally across the hubs 16, 16 (right and left) at the lower shell

12 according to the embodiment as shown in Figs. 1, 2, but the can be arranged vertically across the hubs 16, 16 (forward and backward) at the lower shell 12, or they may be bent or curved across the hubs 16, 16.

The friction reduction members 18, 18 employed according to the present invention are smooth and made of a resin having high friction resistance value relative to the magnetic tape 15. However, the friction resistance members 18, 18 are preferrable to be subjected to an antistatic finish to prevent an obstacle caused by the static electricity. The friction reduction members 18, 18 have typically hollow tubular shape in cross section thereof as shown in Fig. 2, but they may be formed without having hollow tubular shape in cross section, or the cross section thereof may be not circular shaped. When friction reduction members 18, 18 are formed respectively in a circular shape in cross section, the friction reduction members 18, 18 are preferrable to be rotatably mounted relative to the lower shell 12, whereby curved portions of the friction reduction members 18, 18 are uniformalized to prevent extreme bending of the friction reduction members 18, 18 and the friction reduction members 18, 18 are kept substantially straight. The bending or flexion of the friction reduction member caused by contacts between the rod shaped friction reduction member and the hub or the magnetic tape is corrected while it is slightly rotated. The friction reduction members 18, 18 have several forms as shown in Figs. 3(a), 3(b), 3(c).

In Fig. 3(a), the friction reduction member 18 is engaged in a projection 19 protruded from a side surface of the lower shell 12 at the end thereof so that the friction reduction member 18 is rotatably supported thereby.

In Fig. 3(b), the friction reduction member 18 is engaged in a bearing 22 provided at a side of the lower shell 12 so that the friction reduction member 18 is

rotatably supported by the bearings 22 provided at both sides of the lower shell 12.

In Fig. 3(c), the friction reduction member 18 is engaged in a groove 23 provided at a bottom surface of the lower shell 12 so that the friction reduction member 18 is supported by the groove 23.

Although the invention has been described in its preferred form with a certain degree of particularity, it is to be understood that many variations and changes are possible in the invention without departing from the scope thereof.

* C L M S *

CLAIMS

1. A cassette comprising a case with an upper shell and a lower shell, a pair of hubs being mounted within the case, a magnetic tape being wound around the hubs, and a friction reduction apparatus which friction reduction apparatus comprises a rigid elongate friction reduction member positionable within the case adjacent at least one hub so as to contact the hub and/or the magnetic tape.

2. A cassette according to Claim 1, wherein the rigid elongate friction reduction member is positionable adjacent both hubs.

3. A cassette according to Claim 1 or 2 wherein the rigid elongate friction reduction member is positionable so as to contact the at least one hub.

4. A cassette according to Claim 1, 2 or 3, wherein the friction reduction apparatus further comprises a second rigid elongate friction reduction member.

5. A cassette according to Claim 4, wherein the two rigid elongate friction reduction members are positionable in parallel.

6. A cassette according to Claim 4 or 5, wherein the two rigid elongate friction reduction members are positionable equidistant from at least one hub.

7. A cassette according to Claim 4, 5 or 6 wherein the two friction reduction members are both positionable between either of the upper shell or the lower shell and the hub and/or the magnetic tape.

8. A cassette according to Claim 4, 5 or 6 wherein one friction reduction member is positionable between the upper shell and the hub and/or the magnetic tape and the second friction reduction member is positionable between the lower shell and the hub and/or the magnetic tape.

9. A cassette according to any one of Claims 1 to 8 wherein the friction reduction member(s) is dimensioned so as to extend the length or width of the cassette.

10. A cassette according to any one of Claims 1 to 9 wherein the friction reduction member(s) is rod-shaped.

11. A cassette according to any one of Claims 1 to 10 wherein the friction reduction member(s) is hollow.

12. A cassette according to any one of Claims 1 to 11 wherein the friction reduction member(s) is of circular transverse cross-section.

13. A cassette according to Claim 12 wherein the friction reduction member(s) is mountable for rotation within the cassette.

14. A cassette according to any one of Claims 1 to 13 wherein the friction reduction members comprise a resin having a high friction resistance value relative to magnetic tape.

15. A cassette according to any of Claims 1 to 14 wherein the friction reduction member(s) has an antistatic finish.

16. A cassette substantially as hereinbefore described with reference to, and as shown in Figures 1, 2 and 3 of the accompanying drawings.